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Fabbrica della Conoscenza

XIV Forum Internazionale di Studi

Le Vie dei Mercanti

Carmine Gambardella

WORLD HERITAGE and DEGRADATION

Smart Design, Planning and Technologies

La Scuola di Pitagora editrice

Fabbrica della Conoscenza numero 61
Collana fondata e diretta da Carmine Gambardella

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WORLD HERITAGE and DEGRADATION
Smart Design, Planning and Technologies
Le Vie dei Mercanti
XIV Forum Internazionale di Studi

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Scholars has been invited to submit researches on theoretical and methodological aspects related to Smart Design, Planning and Technologies, and show real applications and experiences carried out on this themes.
Based on blind peer review, abstracts has been accepted, conditionally accepted, or rejected.
Authors of accepted and conditionally accepted papers has been invited to submit full papers. These has been again peer-reviewed and selected for the oral session and publication, or only for the publication in the conference proceedings.

Conference report

300 abstracts received from:

Albania, Benin, Belgium, Bosnia and Herzegovina, California, Chile, China, Cipro, Cuba, Egypt, France, Germany, Italy, Japan, Jordan, Kosovo, Malta, Massachusetts, Michigan, New Jersey, New York, New Zealand, Poland, Portugal, Russia, Slovakia, Spain, Tunisia, Texas, Turkey.

More than 550 authors involved.
212 papers published.

Preface

The theme of the XIV Forum “Le Vie dei Mercanti” is an international discussion on the disciplines of architecture, design and landscape through the presentation of research and operational projects on the conservation and valorisation of World Heritage and “smart” regeneration of degradation, with analyses and proposals ranging from the design at all scales, to architectural assets, the territory, infrastructures and the landscape. Academics, along with professionals who have a role in the governing, managing and controlling of public agencies, institutions and the business world are invited to submit papers related to design objects, architecture and landscapes. This is with the aim of conserving and recovering, valorising and regenerating, managing and designing (or re-designing), for the more general improvement of the quality of life, in an innovative and contemporary relationship between man and the environment, through “beauty”, while respecting the history, traditions, identity and principles of sustainable development, as well as being attentive to the needs of our and future generations. Internet of Everything, smart design, planning and technologies, building information modelling, in this age of globalization, have become operational tools – that alongside the traditional ones of the profession – for the protection and promotion of the World Heritage, are considered as well as shared by the whole of Humanity, and the regeneration of the degradation and the “Minor Heritage”, in all aspects, and as contemplated by the UNESCO Conventions on tangible and intangible assets and the European Landscape Convention. The event aims to create a critical transversal dialogue, open to cultural and “unlimited” influences, in a logic of integration between the skills that extends, and is not limited, to the following disciplines: anthropology, architecture, archaeology, history art, cultural geography, design, ethnology and folklore, economy, history, landscape, museum management, philosophy and political science, urban history and sociology, cultural tourism, planning and integrated management. The location is exceptional. Campania, with six sites included in the World Heritage List, two UNESCO Man and Biospheres, two sites on the List of Intangible Heritage, is one of the richest regions in the world for cultural and landscape heritage.

Carmine Gambardella

Le Vie dei Mercanti XIV International Forum
WORLD HERITAGE AND DEGRADATION
Smart Design, Planning and Technologies
Aversa | Naples 16 - Capri 17, 18 June 2016

Painted tombstones of the Lucania era in Paestum

Representation of customs and traditions, divulgation of the cultural heritage

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Abstract ID n° 003

This contribution is an exercise of restitution of illusory spaces that, through the integration between the geometric/descriptive analysis and the potentials of the software, verifies the high level of representation reached in the funerary paintings discovered in the archaeological park of Paestum.
The authors, artisans or artists, show a knowledge of the perspective rules when they represent the objects of the scene even considering the fact that "the paintings, were made with technique similar to a fresco painting executed on location in a short period of time, when the four walls to be decorated were already inserted in the pit".
Since the practice of survey is a phase of the study, it is fundamental that the geometrical structure thought to be the basis of the composition is defined together with the relationship between the different parts.
After tracing the borders, the elements of the perspective method are defined to establish, in proportion, the dimensions of the represented objects to reconstruct them in the virtual space.
To the value of the sign one adds the ability to represent the space intended as environment in which facts, events and ways of life are narrated in memory of the social conditions and level of civilisation.
To images that illustrate facts and objects of common life one finds the metaphoric representation of the passage from life to death on the tombstone of the 'diver' inserted in a landscape with a structure worthy of investigation.

Keywords: Model, synthesis, geometry, drawing

1. Telling trough signs

The painted stones on the tombs of Paestum witness the habits and customs with representations whose communication effect, notwithstanding the speed of accomplishment, indicates a technical level that joins the manual ability with the capability to 'graphisise' the visual perception [1].
The story is conceived in scenes that follow each other without interruption delimited at the top by a composite decoration and at the bottom by a simple ribbon that serves as proscenium, i.e. as fundamental line, first clue of deepness.
The spatial illusion is constructed with the not so easy representation of the various positions that the characters take up in the scenes, such as the position of the feet at different distances from the bottom ribbon / fundamental line, and with the superposition of figures or part of them.
The line of the apparent contour of the figures has different thicknesses to delineate both the bulky parts and the ones in the foreground in any way elegant and conforming to the movement of the character.
The accessory objects are represented in perspective with the graphical traces that follow, wholly or partly, the rules of perspective projection as we know them today.
Hence the background, even if completely white, is perceive as a real space only populated in the foreground.

2. Choice of the sight position

In the stone where a defunct is represented on the death bed, the choice of the sight position, below the plane of the net, creates a view that indicates a certain certainty in representation.
Correct the perspective of the feet, that are represented aligned correctly and converging to the vanishing of the vertical planes and surprising is the attempt of their perspective with three vanishing points noting that their vertical axes have a vertical vanishing point. (Fig. 1)

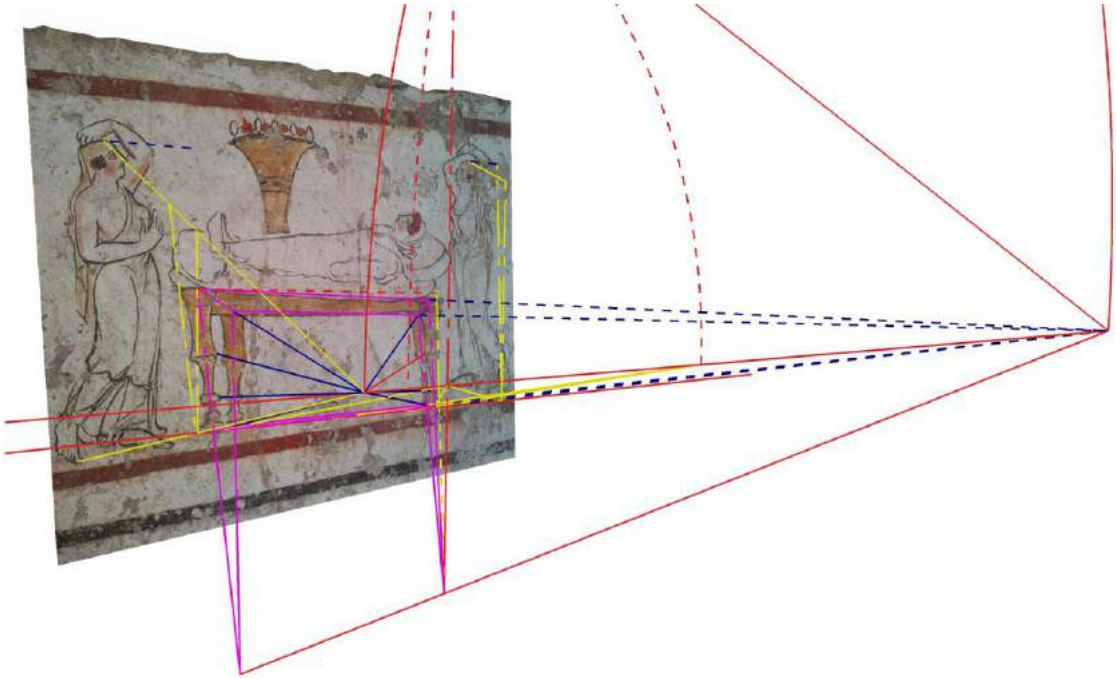

Fig. 1: Research of the perspective layout

Having defined the position of the observer and having reconstructed the volume of the bed, its central projection on the plane of the sheet coincides with the painted image.
The character on the right, in the volumetric reinstatement, has a height lower to the one on the left creating the doubt on whether it is an error, of an objective difference, or a juxtaposition of two distinct views given the lengthened composition. (Fig. 2)

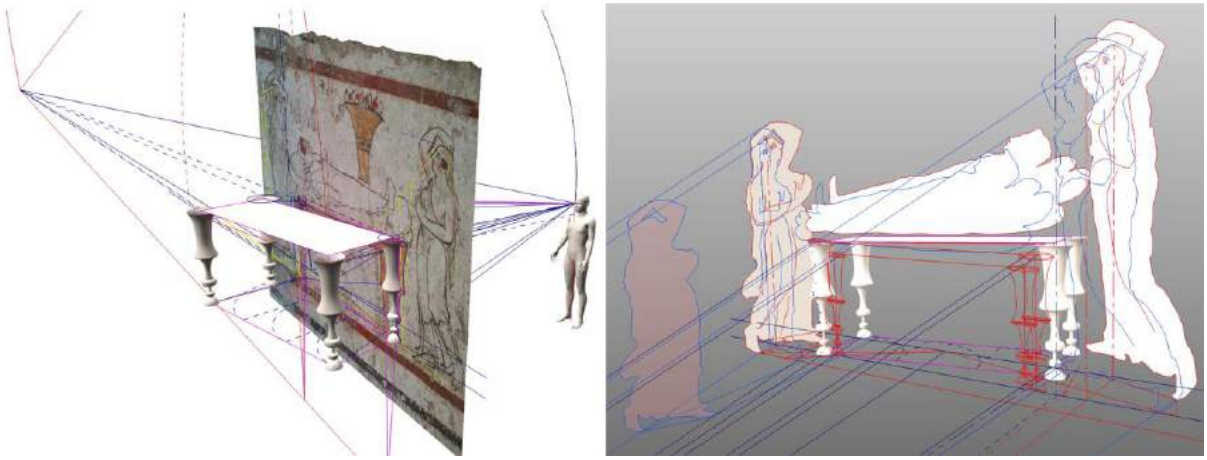

Fig. 2: Verification trough the computer model

3. Snapshot

In the scene of the chariots race, to the almost perfect representation of the carriage, one adds the ability to fix the dashing of the horses, and the swaying pose of the charioteer during the race.
Of particular value is the representation of the curves that define the difficult contour of the horses, of the human figure, of the bridles that get entangled with the wheels. (Fig. 3)

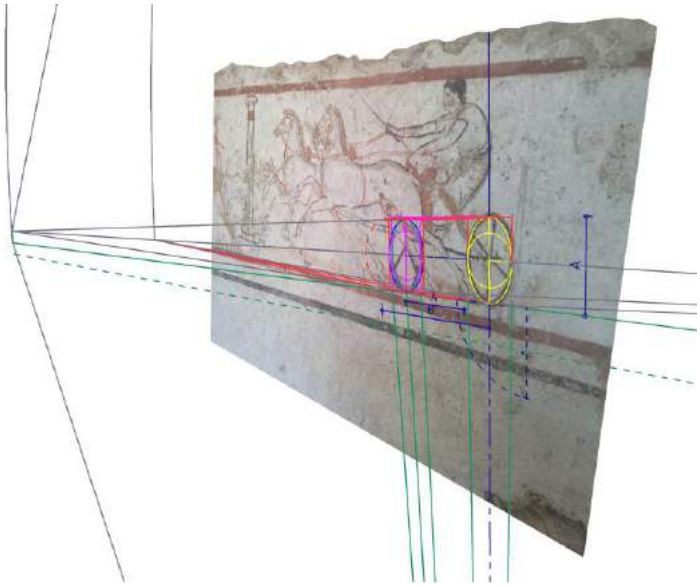

Fig. 3: Graphical structure

In tracing the composition one obtains a perspective structure with three vanishing points with the almost perfect representation of the wheels.
With the help of the computer model of reinstatement, built after having established the elements of the projection, one discovers that the dimensions of the chariot, of the horses and the charioteer respect, in proportion, the represented realities.
Only the horse in the background to be in a symmetrical position with the carriage's axis, should be represented in closer proximity to the one on the foreground but, doing so, the circular spacers of the bridles would not show. (Fig. 4)

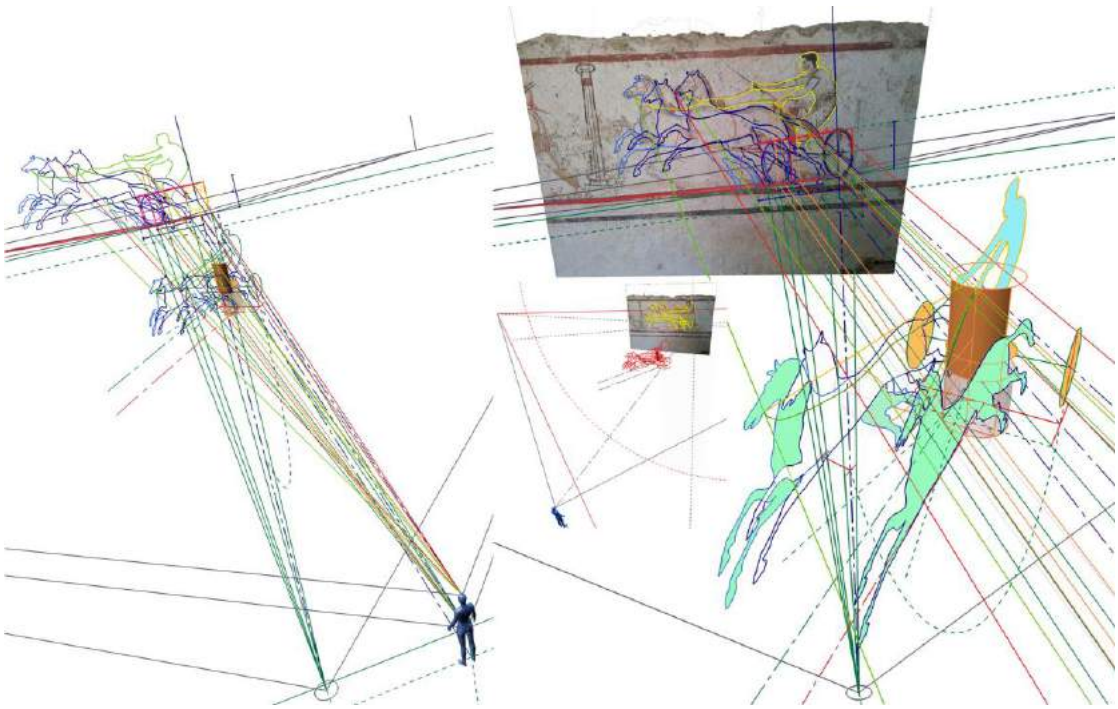

Fig. 4: Spatial reconstruction of the scene and components

4. Desire to know

Observing the cover of the Tomb of the Diver one remains fascinated by the elegant and casual lines that compose the scene from the angles of the frame, to the trees, to the mirror water surface up to the majestic silhouette of the Diver himself.
Very stylized environment that seems a part of a hygrophile forest typical of the WWF Oasis of Persano in the part of the Piana del Sele. [2]
From the metaphorical meanings to the artistic value everything has been said about this particular work that has become an icon amongst the most known of the Mediterranean cultural heritage.
Unexpectedly the author, driven by the duty to narrate, adds the structure from which the actor throws himself in the water.
It's checkered composition has nothing to do with the other elements of the composition and is commonly described as a high brick structure.
In brick wall structures the vertical joint lines are non-aligned and non-continuous and anyway the blocks are of equal width and not of different dimensions as in the first alignment on the right.
Furthermore the cantilevered stone at the top presents a groove on the right that, from a statics point of view, is a contradiction.
If one considers the representation as a parallel projection, oblique and frontal the apparent contour of the Diver becomes, choosing a convenient angle, exactly the silhouette is being study and of interest is the fact that a structure with wood rods, the most appropriate material from any point of view, will have its projection coinciding with that represented on the stone.
Finally the strange rectangle with a concave angle could be the projection of the diving platform with the space to access it with a ladder. (Fig. 5) (Fig. 6)

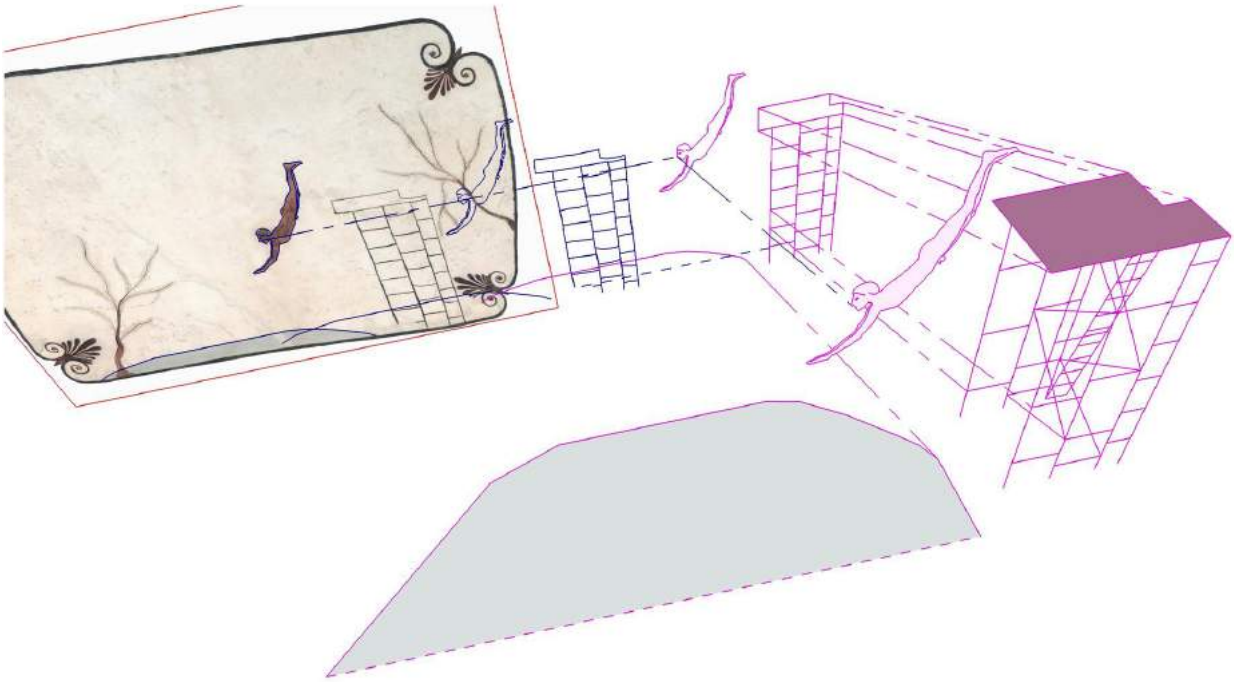

Fig. 5: Elements of the parallel oblique projection (axonometry)

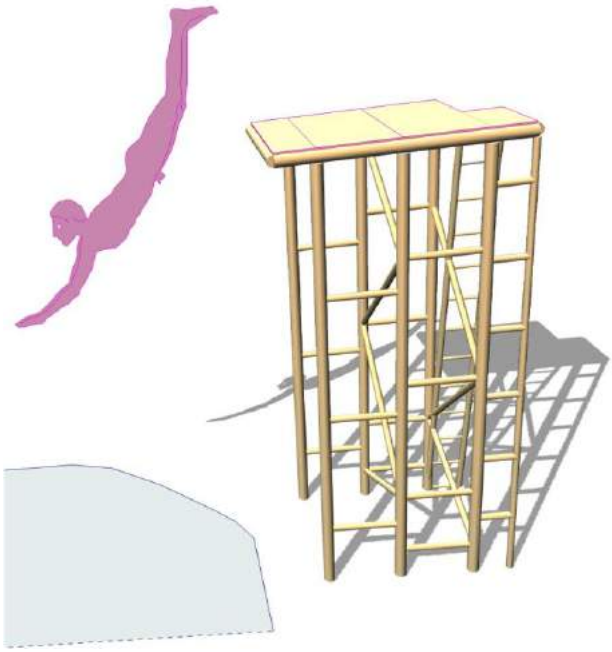

Fig. 6: Probable reconstruction of the platform

5. Details

To the elegance of the curves of the contours of the characters one adds the perfect representation of the postures during the fighting.
Almost always represented in the act of striking one appreciates the exact position of the feet that corresponds to the relative position of the limbs.
The fact that the warriors brandish the weapon with the right hand is deducted from the position of the thumbs, from the representation of the glutei and by the spears drawn behind the body. (Fig. 7)

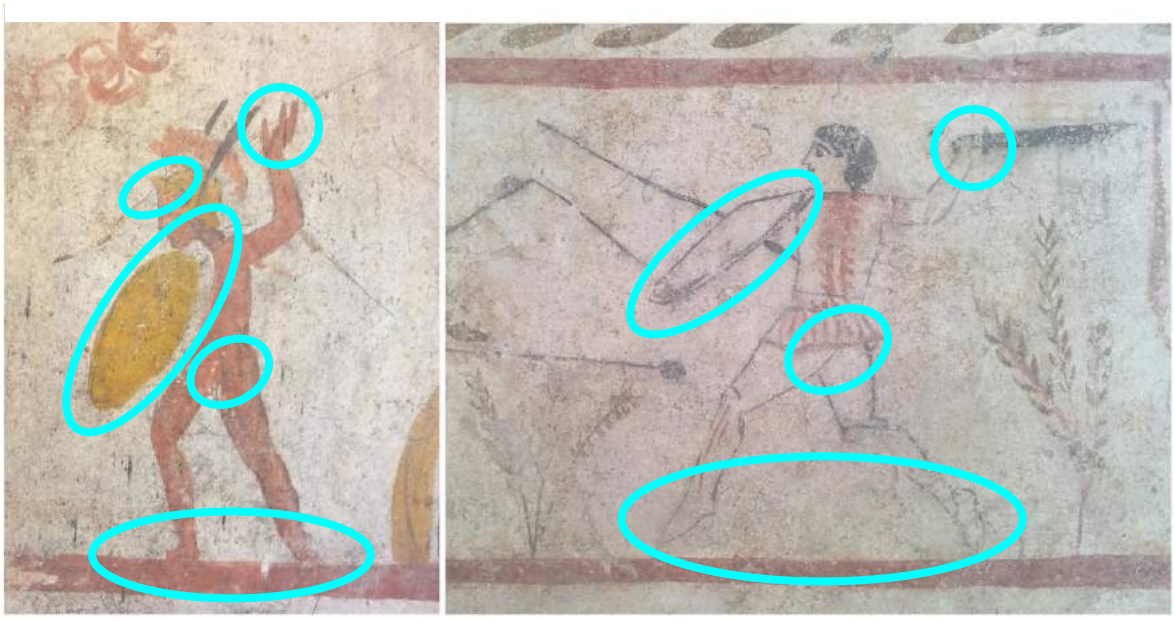

Fig. 7: Correct deepness clues

One of the characters could, excluding mistakes in the representation of the hand that holds the spear, be left-handed for which the position that is shown turns out to be correct, and shows the spinning of the body before flinging the weapon.
The lower limbs of another warrior, with respect to the torso, are in the wrong position, unless the intention was to represent him from behind. (Fig. 8)

Fig. 8: Perspective forcing

In some cases, details that objectively seem wrong, are so because of the necessity/duty to anyway show the detail that cannot be ignored.
A tip of a spear not represented because it is hidden by the body would not have a communicative result. (Fig. 9)

Fig. 9: Painting as novel

6. Observations

The divulgation of the cultural heritage has become, in time, an economic opportunity that local administrations cannot exclude.
To make the task easier, information technology contributes since it reaches the potential beneficiaries most remote and, in the various sites of cultural interest, the tourist guides have been replaced with the most sophisticated devices to expose the works of art.
The technological devices will substitute school textbooks using their rhetoric and repetitive aspect.
In order not to reduce to pure description the study of history of art, the illustration of the works of art, apart from the classic review, should be supported by a basic graphical study that, retracing the elaboration of the work, brings to conclusions by virtue of pure logic.

Bibliographical References

[1] Referring Web Pages Web: http://www.museopaestum.beniculturali.it

[2] Referring Web Pages Web: http://www.giornaledelcilento.it

Le Vie dei Mercanti XIV International Forum
WORLD HERITAGE AND DEGRADATION
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Collected and Collecting in Christchurch, New Zealand

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Abstract
Recent neuroscience studies suggest memory is not only 'associative,' but also involves a constant interaction between existing memories and new experiences. Using Christchurch, New Zealand as a case study, this paper argues that miniature, temporary, olfactory, and even virtual events may be all that is required to evoke prior memories of a city centre that has suffered great degradation following a natural disaster. Christchurch was hit by two large earthquakes between September 2010 and February 2011. Since the earthquakes, new businesses evoking urban memories have been set up including a furniture business that makes use of timber from ruined houses otherwise destined for landfill and a model making business to make miniatures of houses and buildings lost in the earthquakes. Other groups have been set up especially to explore the voids within the shattered urban fabric before the city 'rebuild' commenced. The digital realm has also had its part to play in recording 'before and after' quake temporalities; *Google* used Christchurch as the launch site for its new *Time Machine* device within their *StreetView* tool. The role of urban memories within Christchurch seems almost palpable. This paper will attempt to unpack some of the collective evocations of the recent disaster and examine their relevance as 'communicative' and 'cultural memory.'

Keywords: Christchurch; urban memories; collective memories.

1. Introduction
This paper takes as its starting point the association of 'heritage' with memories, most commonly built memories of what the previous 'may' have looked like. Remnants, be they intact or in ruins, evoke another temporality, which has always been valued as a touchstone of the past. But what happens when urban buildings that make up a large part of a city's fabric or heritage are devastated by a natural disaster? Recent neuroscience studies related to the 'prefrontal cortex' (the front part of the mammal's brain), suggest that "memory interference may come from within, that is, from the reservoir of memories and alternatives which in that particular context the subject has experienced or is likely to experience" [1], suggesting that memory is not only 'associative,' but also a constant interaction between existing memories and new experiences. The physiology and neuropsychology aspects of what might make up human memory seems a poignant starting point from which to consider what affects personal memories and later on what might constitute a collective cultural memory against the backdrop of a sudden, momentous, and unexpectedly devastating event that hit the urban populace of Christchurch, New Zealand.

2. Background
When people think of New Zealand, the rugged mountains and glacial blue rivers of the South Island most often come to mind. New Zealand is small country in the South Pacific; currently it has a population of about 4.4 million people. Christchurch is a provincial city in the South Island. It was New Zealand's second largest city with a reputation of being the 'Garden City' of New Zealand. Then out of the blue, when the author just happened to be staying in the city, the first 7.1 magnitude earthquake hit on September 4, 2010. A second large earthquake occurred February 22, 2011, claiming the lives of 185 people. These abrupt and life-changing events were shared collectively by all those in the city, yet experienced differently by each individual.

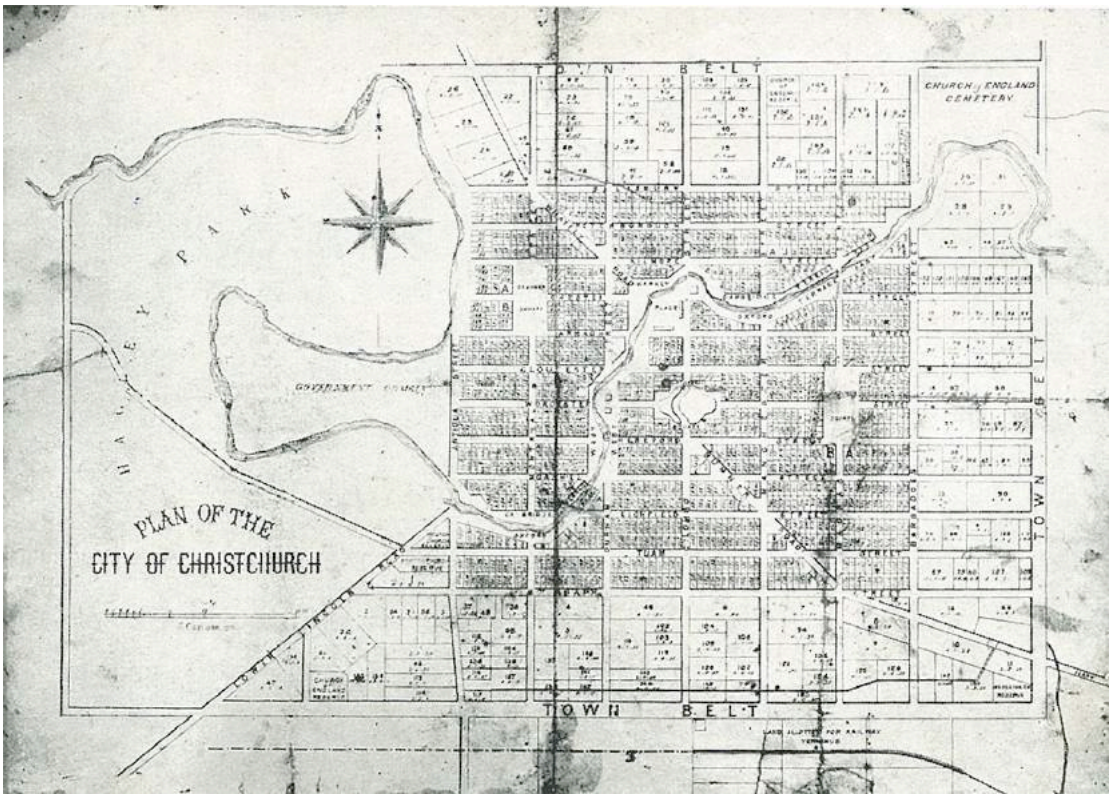

Fig. 1. J.Cartman's 1850 plan of early Christchurch
Image in the public domain c /- Archives New Zealand

Figure 1 above is the 1850 plan of the proposed city of Christchurch. Much of the central city was built over an existing swamp on part of the Canterbury Plains, a location the city fathers deemed more suitable for a city than the original nearby port town of Lyttelton. It took some 30 years to establish the drainage system and water supply needed to make many parts of the new city attractive to settlers. The town was for many years "recognized as one of the most unhealthy in New Zealand" [2]. The nearby Southern Alps also discharge their 'winter-melt' via large fanned gravel rivers. These gravel bottomed braided rivers "formed the sub-structure of the plain" [3]. It was like 'establishing a city on a bed of marbles', as became evident in the quakes of 2010–11.

3. Case Study Discussion

This paper case studies the earthquake struck city of Christchurch in an attempt to discuss various aspects around the temporalities of urban heritage memory. Some of the many scholars within the fields of temporality and urban memory are referenced in the discussion.

3.1 Urban waste recycling

The earthquakes have probably highlighted for many people the old saying: 'You don't know the value of something until you lose it'. The post-earthquake period of Christchurch can be nuanced as a new temporality created by the 'release' of latent memories held within everyday objects. As a response to the large-scale destruction of urban and suburban homes following the earthquakes, Juliet Arnott initiated a company called *Rekindle* in 2012 (refer to Figures 2 and 3 below). The native timbers that made up a large part of Christchurch's (and typically New Zealand's) 'timber balloon-frame' constructed homes are re-used in various *Rekindled* design products. Rather than allowing such demolition timbers to end up crushed as landfill, *Rekindle* engages with 'salvage' and 'recycling' as a large part of its *modus operandi* with obvious environmental and economic benefits to the community. Such native timbers are often not available on the market in modern times and are thus irreplaceable. *Rekindle* goes further, claiming that there is significant cultural benefit as "each home also contains a story of social history – time encapsulated in layers of paint and wallpaper; 1980s renovations; perishing lino hidden under carpet; memories big and small" [4]. The patinations and colours of the original house timbers are exposed and given a new life within *Rekindle*'s chairs and tables. Do such abstractions give an affirmation of a past period, i.e. pre-quake, while at the same time pointing towards a new temporality, which they now inhabit? Tim Ingold has described a "'dwelling perspective'

to which the landscape is constituted as an enduring record of…the lives…of past generations who have dwelt within it, and left there something of themselves" [5]. Are such 'rekindlings' really glimpses of some earlier Victorian heritage fabric, morphed to give new meanings (and by inference generating new memories, which are ever evolving) within a new 'deconstructivist' type of temporality, involving various readings of the new evocations, and hence a variety of new meanings and varied associated memories?

Fig. 2. *Rekindle's* chairs set amongst Landfill
Both photos c/- *Rekindle.*

Fig.3. Detail image of *Rekindle's* chairs

People in Christchurch, and New Zealand for that matter, already use the phrases 'post-quake' and 'pre-quake' to designate specific time frames either side of this momentous event. But what are some of the touchstones of this former period? Whilst we all live in the present, and from time-to-time look back over our shoulders, could a new paradigm of meaning for the next generations be unravelled by the use of these snippets of texture and coloured original timbers, taken and manipulated by hand? Is this another layer of memorizing the city's history, and/or do they remain merely furniture to sit in?

3.2 Google's Time Machine device

From my own observation (as an only occasional visitor to the city of Christchurch, primarily to visit family), I found driving in the CBD post-quake very disconcerting, as "70% of the original CBD buildings have been demolished" [6]. I now realised whilst negotiating the ravaged city grid, that in deciding to take a particular turning, it was a particular building that I had previously relied upon as that junction marker. Street signs are not always easy to locate whilst at the steering wheel and with so many buildings having been pulled down, these visual markers were now gone. Although hardly a scientific study, my resident sister and her friends confirm this belief. Perhaps buildings and by inference urban heritage fabric are part of our collective cultural memories, as reflected by that old saying 'one doesn't appreciate something till it's gone'. So as I struggled in real-time to navigate the car, confused by conflicting memories of pre-quake urban landscapes, I asked myself is this evidence of a new urban temporality? However, the more often I drove these routes, the more my recollections seemed to be overlaid with the evidence before my eyes, until I had trouble remembering the original landscapes at all. In my case this took as little as three days over the Labour Weekend of 2013. This is in contrast to Assmann's notion of the "three generation cycle of communicative memory" [7]. Rather than disputing this idea, I suggest that these earthquake events were extra-ordinary, and that it may be possible to forget rather more quickly in such unique circumstances if tangible evidence is removed.

An urban-scape that 'was once there', if that reality has been destroyed, it may now be possible to view it digitally using Google's new Time Machine device within the StreetView tool in Google Maps (refer to Figures 4 and 5 below). Google released the Time Machine device on April 24, 2014. This gizmo provides views of many streetscapes 'prior to' and 'after' the Christchurch earthquakes. (Note: The reader should use the tree on the left as a datum for comparison). Is this a step back into a previous heritage temporality via digital means? It seems that the populace wanted it: "As [the] Google New Zealand public policy manager Ross Young said many people had asked for old street view images to be preserved and made publicly accessible. 'We know that the ability to see how a place looked has special significance for this [Christchurch] community…'" [8].

Fig. 4. Corner of Durham & Kilmore Streets pre-quake via Google's Time Machine

Fig. 5. Corner of Durham & Kilmore Streets post-quake image

Both photos c /- *Brady Dyer Photography*

3.3 Heritage memories via the miniature

Another new business *Scaled Down,* set up by Richard Gardiner, has had a steady stream of commissions since the earthquakes for miniature models from customers wanting to "have something more memorable than a drawing or a photograph of [one's demolished] home [or building]" [9] (see Figures 6 and 7 below). It should be noted that often families lost everything in the quakes, not only their homes but also possessions including photographs. Do such models trigger the previous owners' memories as strongly as the 1:1 scaled reality they once inhabited? In the future will these Marquettes overtake the owners' actual memories of dwelling in those buildings? Or will they blur the building-owners' original memories, as their miniature image interacts with on-going new experiences (including other types of media) in 'an associative' way to create new memories, as the likes of Fuster and Doreen Massey [10] consider that we all do in a perpetual fashion?

Fig. 6. Lyttelton Police Station 2011

Fig. 7. Model of the Lyttelton Police Station

Both Photos c /- *Scaled Down.*

3.4 Nature carries on

On another personal note, in early January 2013 the author (and family) took a punt boat ride along the River Avon into the "Red Zone" (the so-called area of the CBD that was cordoned off following the fatal 22 February 2011 quake). The eerie silence was almost palpable, as we drifted quietly alongside the abandoned Town Hall / Concert Chamber Building and numerous other multi-storey office buildings and hotels. All of these buildings would normally have been teeming with people going about their business. However, the thing that most struck all of us was the seemingly constant flow of 'nature'; the large oak trees and willows adjacent to the river had ridden out the earthquakes with apparent ease. Birds were still singing and crickets were chirping amongst ruins that looked like something out of a war zone. One ponders: does this disruption remind us of the planet's rhythms? Lefebvre speaks of such rhythms as composing our time-space, whether they be everyday patterns or social events. He suggests that there are rhythms that make up any temporal-spatial reality [11].

And yet it would seem we crave these very patterns. As Sarah van der Burch says: "one thing I am surprised about is how much I love normal…[after the surviving the earthquake, and]…the beauty of the mundane, getting back to the same little things we do every day and how lovely that feels to me" [12].

3.5 Temporal architectural interventions

Other Christchurch groups have set themselves up to take advantage of new commercial opportunities on the now vacant sites within the urban fabric. Such groups include *Gap Filler*, *ReStart* and *Life in Vacant Spaces (LIVS)*.

Yet another new group FESTA, Festival of Transitional Architecture, has specifically set out to explore such sites in a non-profit way, not only spatially but temporally, claiming "Christchurch has an unparalleled opportunity to be a global epicentre for creative urban renewal through transitional and experimental architecture, art and performance" [13]. "Large and small transitional projects have already provided a way of creatively and immediately reoccupying and regenerating the central city. They give us a chance to experiment, meet pressing needs and they inform our long-term decisions. FESTA desires to harness the community's craving to be involved in creating their city. This festival will be an on-going and unique event that learns from and informs the exciting transitional city" [14].

The author is one of a team of Architecture Studio tutors who have helped second-year Bachelor of Architecture students in Auckland (some 1000km away from Christchurch) to design and realize various projects for FESTA events. In 2012 the event was named 'LUXCITY' (see Figure 8 below). This was FESTA's first such 'happening' with an expectation that 2000 people would attend the 'one off' night time event on October 27. In actual fact over 20,000 people attended. It turned out that this was the first time that many Cantabrians had returned to the CBD since that disastrous February 2011 day some 20 months earlier. For a few hours there was an emotional outpouring of awe and warmth by Christchurch city's inhabitants, many of whom were still living in broken homes and without functioning toilets. As the sister-in-law of another tutor said, it was "a time to forget, even if it was for just a few hours" [15]. Is this then a form of forgetting by remembering something new, rising phoenix like from a particular tainted site, for a very short period of time (4 hours); a way of creating some small joy for a collective audience? Perhaps Paul Ricoeur might agree, with his deep meditations about forgetting as a way of humane negotiation between memory and history [16].

Fig. 8 Images of LuxCity 2012 for *FESTA*
Photos c/- *Silhouette Carnival, Altitude,* and *Archrobatics* groups respectively

3.6 "Olfaction" memories

Everyone in Christchurch has learnt at least one new word through the course of these events: *liquefaction.* Liquefaction is an upwelling of silt and groundwater, often through earthquake caused fissures in the earth; and in Christchurch it has an associated "stench". As New Zealand's Institute of Environmental Science and Research described, a lot of Christchurch's "liquefaction silt and groundwater became contaminated with sewage due to earthquake damage to the sewerage infrastructure" [17]. For many people reacting to the subsequent aftershocks, and further discharges of liquefaction, this foul smell brought back strong emotional responses tied to the original devastating earthquake. In Johan Willander's thesis entitled *Autobiographical Odor Memory* he concludes "that odo[u]r memories [are] more emotional than verbally evoked ones," [18].

3.7 Urban infrastructure issues

Fig. 9. New Zealand's first public solar-charge table
Photo c/- *The Christchurch Press.*

In an attempt by the Christchurch City Council to show it was regaining some semblance of control, that it could handle 'SMART' technology, and that it 'had its finger on the pulse' a 'solar table' was installed in a public space on 19 May 2014. The Council claimed to have "launched the country's first free public solar-charge table, allowing users to plug in their smartphones or tablets to charge while hanging out in the food-court at [the] Re:Start Mall" [19]. The 'for and against' online feedback to the initiative is currently approximately equal. But the intensity of the naysayers' responses outweighs the votes of support. One such example (by a respondent named 'Kuzak') is:

> What a waste of rate payers money. The CCC yet again wastes money on PR rather than fixing things that are broken. So you have to stand and wait with your phone while it gets charge, what a waste of time. Car phone charger, desk charger and back up batteries are cheap - it should be users responsibility to charge their phone not the ratepayer…Maybe the [tens of thousands of dollars] spent could have been spent on things that impact people (and their cars) like the holes in the roads on the East side of town. Nice how the west side get new footpaths and roads touched up again, while the east still waits [20].

This 'not so smart' use of public money raises the question: who decides to spend the rate payers' money on these projects? It seems that when 'man-on-the street' type projects don't find favour with the Council and don't receive financial backing, in fact such non-action often draws communities even closer together and Kiwis work out ways of how to 'get on and just do it.'

3.8 Other methods of heritage memory making

In contrast to these 'person in the street' evocations of memory are mechanisations of the 'powers that be', that is the 'top down' Council and central Government type bodies. Although democratically elected, such organizations seem to see themselves as being the guardians of 'cultural memory', as though speaking for the whole 'collective'. (The notion of 'collective memory' is espoused by the likes of Marita Sturken [21]). These agencies are striving to record memories for future generations via museum building, salvaging ruins, or 'rebuilding' as deemed fit. However, given the 'digital temporalities' that we currently inhabit, are such methods too expensive and outmoded? As Orhan Pamuk suggests in his *Modest Manifesto for Museums*:

> Large national museums such as the Louvre and the Hermitage took shape and turned into essential tourist destinations…the[se] institutions, now national symbols, present the story of the nation – history, in a word – as being far more important than the stories of individuals. This is unfortunate because the stories of individuals are better suited to displaying the depths of our humanity...We all know that the ordinary, everyday stories of individuals are richer, more humane and much more joyful…The future of museums is inside our own homes.
> [22]

James Young also supports this notion: “traditionally, state-sponsored memory of a national past aims to affirm the righteousness of a nations birth…and recalls the martyrdom of those who gave their lives in the struggle for national existence – who…died so that a country might live” [23].
In contrast to this (and as explored by Garde-Hansen et al. in their book *Save As…Digital Memories* [24]), many of today’s social media outlets including Facebook and Twitter, and numerous blogs are increasingly taking on the role of immortalizing ‘the living’ (albeit digitally), and hence ‘remembering the self’ via postings of thoughts / feelings / reflections. As van Dijck [24] argues we individually collect so much more digital data, especially digital photos than we ever did in our “memory shoeboxes” that got tucked away in cupboards, largely because it’s at no cost. Why cannot our collective memories be similarly held?
Is it already becoming evident that ‘digital time-space’ is morphing our ‘real time’ lives? Pete Hayward recalls returning from Quail Island (in Lyttelton Harbour), during the February 2011 quake and “the bizarre thing of being rung by my brother in Queensland [Australia] before I had even arrived back on the ferry to Lyttelton. He was telling me what was going on!” [26].
Is this an extension of Anna Reading’s idea of “globital time” [27]? Writing about the 2005 London bombings she explored the ‘speed of media’ in global terms via the miniaturization of handheld mobile devices. I am suggesting here more than just merely recording events on a mobile; the mobile device user can now be informed (and even directed) from afar in ‘real-time’, such is the speed that digitization now provides us and this is propagated by positioning of ‘big-brother cams’ around a city.

4. Conclusion

It remains to be seen if we are ‘still too close in time’ to the 2010–11 earthquakes to see their full impact upon Christchurch’s urban fabric. The above cases make up a portrait in time, being a fragmented collection of stories and examples of how individuals have responded, and continue to respond, to these extraordinary events. Some responses have been ‘smart’ and some ‘not so smart’. *C’est la vie.* This paper I hope has exposed some aspects of heritage memory from within this unique urban context. As the Council and central Government strive to work out meaningful ways to commemorate the ‘collective cultural memories’ (via the planning of ‘memorials’), this paper argues that these are in fact already with us. If one understands how to look within our post-quake artefacts and digital landscapes, heritage traces are already evident and these various readings comprise part of a collective and communicative memory.
I conclude (perhaps surprisingly) with Henri Lefebvre‘s idea of ‘cyclical rhythms’ that come through most strongly in the context of this particular city’s history. In one sense, ‘history repeats’. The city of Christchurch at the time of its inception in 1850 went for a period of 32 years while the swamps upon which large areas of the city were built upon were drained. Meanwhile the city gained the infamy of being the country’s unhealthiest place. And yet current residents of the suburb of Bexley, many of whom are still (in 2015), without functioning toilets in their houses, have been transported back’ 130 years across time and space by the recent up-wellings of ‘sewage tainted liquefaction’. These I suggest are ‘intense’ memories, often untimely and unwelcome reminders with each renewed exposure to that smell. Is this an overarching collective memory that affects each individual differently, yet links them together in an unearthly (yet rather earthy), and spookily historic way?

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Wayfinding and environmental communication in museums for the promotion of cultural heritage and sustainability.

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Abstract
Complex buildings intended for public use (e.g., museums) are characterized by different spatial and functional features, and can often cause a sense of disorientation in users, forcing them to a "cognitive stress" in making a mental map of the environment. *Where to go? Where is the way out?* These are the questions that typically arise. The success of the building and of its cultural contents very often depends on how effectively the visitors' self-localization difficulties are resolved.
In this paper, after a methodical review of the applications of wayfinding systems at international level, we propose a design methodology based on levels of action differentiated by type of museum which, in addition to direction signs, include the characterization of both space and architectural elements.
The proposed solutions, characterized by high levels of performance, specific perceptual connotations and use of innovative materials, bring about several advantages both for visitors and managers, in the perspective of cultural heritage valorization, by: (i) increasing the sense of welcoming and safety of the structure (reduction of stress factors); (ii) optimizing resource utilization, e.g., by reducing the time spent by staff to help visitors (economic factor); (iii) conveying the sensation of a well-organized service, so as to increase the number of visitors (sustainability factor); (iv) improving the dissemination of the exhibits' cultural themes (cultural factor).

Keywords: wayfinding, signage, cultural heritage enhancement, technological solutions.

1. Introduction
Moving within an environment is one of the most complex cognitive endeavours, involving the use of several mental abilities, such as memory, attention, perception and decision-making (Thorndyke, Hayes-Roth, 1992). The term *wayfinding* represents a set of perceptual, cognitive and behavioural processes which engage the user in reaching a "destination" (Lynch, 1960). In these processes, activities such as "looking for", "deciding" and therefore "moving" are involved (Mollerup, 2005). These activities require certain abilities: creating maps and processing information to decode the surroundings, defining an action plan and implementing decisions.
The research and experimentation field involved in the study of orientation relates to planning of space and artifacts that can be used in looking for a destination. Therefore, wayfinding does not include communication systems only (directional signage), but also involves organizing and characterizing space (Arthur, Passini, 1992). Orientation is not determined only by the ability of understanding the explicit instructions imparted by signals, but, more completely, by the ability in responding to sensorial stimuli, to solicitations coming from materials and colors, to reception and affordance of the environment (Baroni, 1998).
These stimuli are especially important in places where the attention of users is directed to something different. Such a situation occurs within museums: visitors, attracted to artworks, often lose the sense of space which causes difficulties in recognizing the correct theme-based itinerary.

Large museums create significant difficulties in orientation given the close relationship between the activities directly related to the main use of the building (fruition of the exhibition material) and the rich and complex range of supporting services (food courts, conference rooms, etc.).
In order to address these problems it is necessary to define a wayfinding strategy starting from the following elements: knowledge of behavioral and cognitive aspects related to perception of space; identification of the senses involved; and implementation of Design for All principles (Villani, 2013). This strategy is needed in order to outline efficient solutions in relation to users.
Different solutions can be defined in close relation with the type of museum, and they can acquire high performance levels and specific perceptual features as well, with the contribution of innovative materials.
This paper aims at defining a set of viable solutions that can be advantageous both for museum users and managers, by means of the identification of recurring problems and of a dedicated study of space and technological solutions applied in a number of international museums.

2. Wayfinding in museums for cultural heritage enhancement from a quality perspective

If we want to describe wayfinding with respect to museum settings, we can say generally speaking that it helps us moving in the exhibition space, choosing the correct theme-based itinerary and reaching supporting services and emergency exits. Developing an integrated wayfinding system, while including both architectural elements and directional signage in planning spaces, produces several advantages:

- the user's ability of finding directions and understanding the surrounding environment creates a sense of control and reception of the facility, which are key factors in reducing stress, anxiety and fear (Arthur and Passini, 1992);
- intuitive orientation implies less time spent by museum staff to assist people who do not understand provided information;
- a comfortable and cognitively clear environment contributes to a positive visit experience;
- easiness in orientation conveys the feeling of a well organized, quality service.

The diversity and variety of museum facilities over the Italian territory makes it difficult to plan general or common operations needed to effectively enhance the sites themselves.
Each site should be deconstructed and analyzed in detail as regards its peculiarities (both from the building and symbolic perspective).
Therefore, each orientation system should be conceived according both to the hosting "container" and to the "content". This means that actions to be taken depend on the factors defining the identity of a museum:

- the historical and cultural value and its relevance within cultural heritage;
- protection rules of the site;
- the value of displayed artworks;
- artistic, esthetical and architectural features.

These factors outline the quality standards to be achieved. These should be complemented by adequate parameters concerning the wayfinding system, in order to assess the overall satisfaction and appreciation level.
Today, many quality assessment systems for museums (or archaeological sites) are present all over Europe. In these systems, the communication framework is considered as a distinguishing element for accreditation by certification authorities.
For example, in the *Accreditation Scheme* (UK), one of the requirements is the presence of a legible and comprehensible signage, both indoors and outdoors[1]. In Spain, instead, the accreditation system is entrusted to local administrations, that include as a minimum requirement the presence of proper guarantees regarding indoor and outdoor signage and information tools for exhibits[2].
The program *Herity* (*Heritage* + *Quality*), widespread at international level, examines four fundamental aspects to determine quality: perception of cultural value; the state of preservation and renovation; information conveyed to visitors; reception quality[3]. The evaluators are the visitors themselves, as well as internal staff, other than external evaluators. It is apparent that, even though not explicitly, meeting the orientation requirement positively affects the overall assessment of museums.

2.1 Good practice examples in wayfinding strategies for museums

In many museum facilities the wayfinding system's choice, with different levels of action and technical solutions, interacts emotively and sensorially with the visitors, but it often contributes to improving the museum's public image as well. There are several cases in which this solution was adopted, which were found by means of a detailed study of international museum projects, where wayfinding was used to promote their uniqueness.
Two case studies are briefly described here, for the sake of example, which effectively exemplify two different approaches to wayfinding planning. They also represent opposite museum contexts in terms

of building consistency, relevance, permanent or provisional nature of the exhibitions and architectural constraints system.
The traditional approach used for reorganizing the entire wayfinding system of the British Museum in London, and the unusual wayfinding adopted for the Walker Art Center in Minneapolis, both share the intent of improving the museums' public image through a new found identity.
In the case of the British Museum in London, the objective was to improve the contemporary image of the great international museum by making spaces and signals more functional, which gave a hierarchical order to the information being provided. The chosen technical solutions ensure that requirements related to ergonomics, legibility, clarity of symbols, durability and safety are met. The system of artifacts (graphical banners, totems, directional aids, paper maps etc.) has been particularly well-crafted in its coherence and all elements have been located in "decisional points" of the museum.
The system is very articulated, but with its simplicity and clarity it succeeded in revitalizing the museum, despite the extremely rigid and protected context (Fig. 1).
The approach adopted in the Walker Art Center in Minneapolis (contemporary museum) is completely different: the idea of a new identity system of the museum facility derives from the intent of accompanying the audience and involving it in the visit experience. Given the smaller size and the flexibility of the architectural structure, it was chosen to apply an organic design experimentation, which is open and participatory at the same time. It is based on the creation of a new language, by means of digital technologies to create "lines of words and textures" containing information, that can be installed on any supporting material (Fig. 2).
Many other projects like these, applied in museum contexts, were able to use wayfinding not just as "user instructions" for the buildings, but as narrative elements conveying new messages, with positive effects on the enhancement of their cultural contents.

3. Roman museums: a teaching and research experience

The studies performed allowed to propose an approach to designing wayfinding systems in museums with the objective of defining, for each museum type, different action levels to implement by means of choosing techniques and materials appropriate to the features of the sites. Some of the several museum centers spread over the territory of the Capital City of Rome were selected for the experimentation[4].
The identified action levels are consistent with the experiences performed on the field and experimented while teaching the university course "Technologies and planning II", part of the graduate degree in Industrial Design of the Faculty of Architecture, University of Rome "La Sapienza".
The work that was carried out involved the selection of representative museum sites, the preliminary analysis of problems found in the wayfinding system, and the development of design guidelines – addressing professionals charged with planning decision-making and operative activities (contractors and investors, designers etc.). These guidelines are illustrated by means of technical choices related to artifacts to improve orientation and consequently the enhancement of the site itself.

3.1 Methodology and results

The methodology involved planning and carrying out a set of phases whose results required the contribution and interaction of several multidisciplinary stakeholders (researchers, museum managers, designers, cultural heritage enhancement experts, visitors, students etc.). The general objective was raising awareness in designers and museum managers as regards the potential of wayfinding with respect to cultural heritage enhancement. The specific objective was proposing design guidelines in which, by a focused usage of principles and artifacts for wayfinding, different action levels can be identified in relation to the type of museums.

3.1.1 First phase: classification of museum sites by typology and function, based on three macro groups corresponding to homogeneous actions and selection of a representative case study for each group:
a) Historical-archaeological museum. This category includes all museums placed in historical and therefore protected buildings. The main feature of these sites is their twofold function: both the building and the artworks it contains are valuable elements that can be enjoyed and enhanced through minimum action strategies.
b) Interactive museum. This group includes scientific, technological and astronomical museums, namely, all those facilities that must necessarily allow the observer to interact with space, contents and artifacts, in order to better understand their shape, composition and functioning. Buildings hosting this type of museums have a higher level of flexibility and therefore a potential action level involving installations, variations and reconfigurations of spaces and equipment.
c) Contemporary museum. The numerous exhibition buildings created in recent years by means of renovation actions are more and more inclined to become mutable spaces, whose structure and contents allow more substantial actions. The contemporary museum loses the rigidity of historical

museums, acquiring adaptability features for different needs. Spaces covered by visitors are different each time, exhibitions are mostly temporary and itineraries are variable and surprising.
Selected case studies:
a) Etruscan museum of Villa Giulia, Rome.
b) Civic Zoology museum, Rome.
c) MACRO in Via Nizza, Rome.

3.1.2 Second phase: analysis of museum features and of the adopted wayfinding system. Detection of problematic aspects.
Each facility has been subjected to an accurate direct investigation organized by a sequential analysis of distinguishing features: the museum context, the characteristics of the building complex, the exhibition theme, the exhibition itinerary etc.
The orientation system was also examined, identifying peculiar elements, the usage level of information provided by signage, adopted technological solutions and finally shortcomings and critical aspects.
a) Etruscan Museum of Villa Giulia for the group "Historical-archaeological museum":
Once beyond the entrance, one immediately realizes that the museum completely lacks an appropriate wayfinding plan. The information system appears to be uneven and fractured. Several supporting materials are used: wooden *palettes*, improvised paper stamps, metal plaques, appliqués on glass surfaces, etc. An overall semiotic or unified graphical project cannot be identified. Directions have been written in different font sizes and styles, together with unconventional symbols which could be misinterpreted by the user (Fig. 3).
b) The Civic Zoology Museum for the group “Interactive museum”:
Located behind the *Bioparco* (zoological garden), the museum is formed by eight exhibition theme units, along with a room for temporary exhibitions and a research laboratory in the lower floor.
Found problems are related to the contrast between the engaging aspect of the museum and the recurring orientation difficulties (see Fig. 4). Although the overall surface is quite small, the lack of a clear “division” between a room and the other produces a sense of disorientation. In fact, the itinerary, though being circular – and therefore quite intuitive – is not marked by supporting artifacts. Identification plaques or plates are placed on the walls, but are not clearly visible or understandable, especially considering the young age of the 90% of visitors (students, scout groups, etc.).
c) MACRO in Via Nizza, for the group “Contemporary museum”:
The museum was created by recovering part of the spaces of a former brewery. It extends over a surface of about 10.000 square meters, distinguished by wide perspectives, dynamism, fluid spaces and flexible environments. It is difficult to grasp the spatial “boundaries”, since the surface of the building, the height and spread of environments convey a sense of confusion and loss of orientation, amplified by the scarcity of visual and directional indications. Several artifacts are used for the wayfinding system, but they are not very effective, both because of chosen colors (white, red, and black which blend with the walls) and location (vertical totems are lost in the wide space where they are placed). Identification plaques have low visibility because of poor contrast; landmarks are not sufficiently identifiable in relation to space; maps or brochure supporting visits are completely lacking (see Fig. 5).
The final result of this phase produced a scheme of critical points that should be addressed, both in terms of efficiency of the orientation system and from the perspective of enhancement and promotion of the quality of the museum.

3.1.3 Third phase: definition of action levels classified by museum typology and implementation of technical choices in the selected case studies.
In order to configure possible approaches to planning, three strategic levels were defined according to implementation complexity, financial feasibility and potential impact on the building.
Level 1: low financial/physical impact action, through the improvement of traditional existing signage with “minimum change” actions, favoring the use of traditional materials, or by replacing existing signage with “light” signage reconfiguring images and spaces to make them more visually appealing and accessible.
Level 2: more intense action, applied by replacing the entire signage and thus reconfiguring the entire wayfinding system, by means of interactive or customizable technologies. This can be augmented by a more modern morphology created with innovative materials (such as sensory materials or nanotechnologies).
Level 3: radical rearrangement action, acting on the reorganization and reconfiguration of spaces and indoor itineraries. In this case, wayfinding is integrated within a renovation program, and is therefore an integral part of the project. The assignment of new functions to spaces is planned together with the wayfinding system, the indoor design, the environmental aspects (lighting, ventilation etc.), and multimedia aspects (sound, visual effects, apps, etc.).

Choosing one of these three action levels depends on the identity of the museum and is gauged according to the features of the site, in order to avoid disruptive and inconsistent actions.
In the implementation phase, an action level was assigned to each case study, with the purpose of developing a “planning guide” able to point out, though synthetically, the objective to pursue:

a) Etruscan Museum of Villa Giulia – Level 1

In order to protect the identity of the site, while evening out the orientation system, it would be appropriate to create a “thematic” project to be applied to each wayfinding artifact: a new distinguishing symbolism (identifying the Etruscan art theme), a new font style, new pictograms or new images. The choice of supporting materials for signage should favor light elements to be placed in critical points and anchored using non disruptive systems, so as to preserve the visibility of the architecture and artworks. If possible, they should be made of durable materials and be integrated seamlessly with the exhibition style and theme. An experimental project interpreting these indications is given here as an example (Fig. 6).

b) Civic Zoology Museum – Level 2

The museum is a veritable teaching center: each item and exhibit can be an element of discovery and play, given the target user group. The prevalence of children will steer technical choices towards interactive and amusing artifacts. A child should be able to discover the contents of the museum by using all senses; natural habitats recreated in the museum could be the setting for new surprising objects, changing each time: audio, tactile or perfumed elements; appealing graphical items; shape-memory or iridescent materials; luminous objects. The circular itinerary could be characterized by new elements to confer visibility to each room and facilitate the understanding of the proposed themes. In order to facilitate the understanding of these planning guidelines an operative experimentation is proposed (Fig. 7)

c) Macro in Via Nizza – Level 3

The possibilities for reconfiguring the entire wayfinding system in such a wide and open space can be several: it could be possible to add new architectural elements, new landmarks, or completely change both itineraries and the setting of indoor spaces, by means of three-dimensional elements.
The large available space could host the installation of distinguishing decoration items, in which a built-in orientation system could be embedded. More complex technical elements (luminous, tactile or sound objects) could also be used.
The difficulty in operating in such a flexible space should be addressed by trying to create a hierarchy of spaces and information to be used. The ostensible planning freedom could also be exploited with actions aiming at assigning several functions to each space, defined so as to provide the users with a customizable visit according to their needs and interests. Reception and guidance should be therefore guaranteed by using supporting elements spread over the space, independent of the chosen itinerary (see Fig. 8).

4. Conclusions

Design and planning solutions, defined based on action levels, were identified with the purpose of bringing out the potentials of wayfinding in terms of promotion and enhancement of museum facilities, while respecting protection requirements of valuable sites. Critical points highlighted and tentatively addressed here, shifted the focus towards aspects that are often ignored and seldom integrated in the design of museum spaces.
Wayfinding is not a secondary discipline with respect to design, but it integrates the latter and affects its quality in terms of understanding of designed space. The clarity and straightforwardness of information being conveyed should be absolute, as well as the planning and function of spaces.
A more scientific approach to wayfinding will allow solving many problems related to user needs, reception, organizational image of the facility, management of visitors flow, which are all strategic factors for assessing quality.
By adopting a functional wayfinding project, complete and integrated with spaces and configuration of sites, visitors will be able to appreciate the richness of cultural heritage. Unknown museums will therefore acquire reliability and pleasantness that determine their financial (increased number of visitors) and educational-didactic (quicker dissemination of proposed cultural themes) success, ensuring their full sustainability.

Fig. 1: Traditional wayfinding to improve the public image of the British Museum, London, UK.
Design: Lucy or Robert, 2006-2011

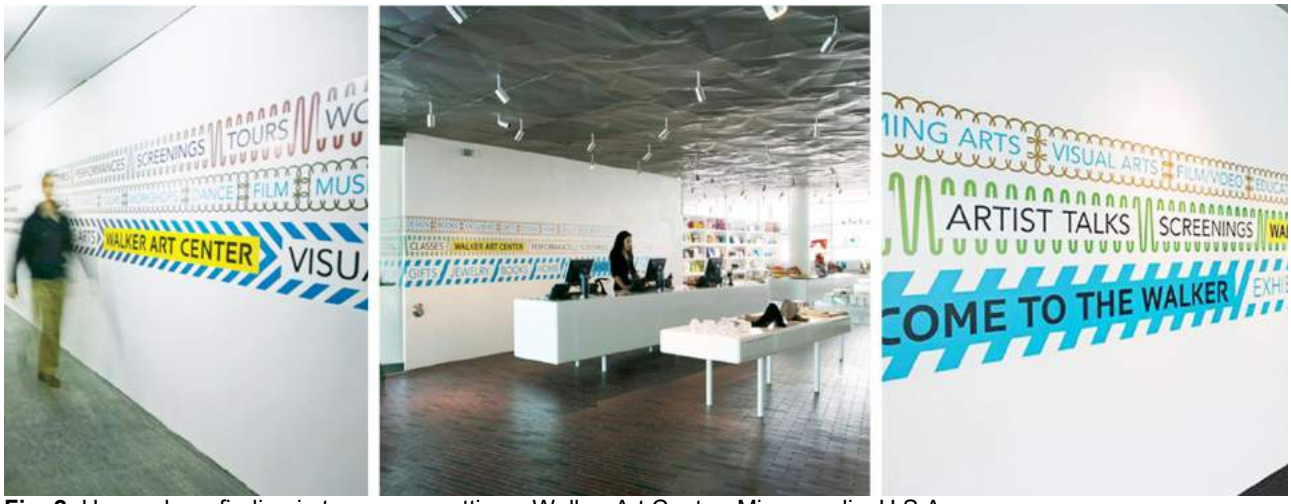

Fig. 2: Unusual wayfinding in temporary settings. Walker Art Center, Minneapolis. U.S.A
Design: Andrew Blauvet, 2005

Fig. 3: Etruscan Museum of Villa Giulia, Rome. Critical aspects found in the current wayfinding system: poorly organized signage and dazzling phenomena.

Fig. 4: Civic Zoology Museum, Rome. Critical aspects found in the current wayfinding system: excess of information near the main entrance; request for interactivity by target users.

Fig. 5: Museum of Contemporary Art MACRO in Via Nizza, Rome. Critical aspects in wayfinding are related to space configuration, to the dynamic and articulated system of connections, ramps, gangways, and to poorly visible color choices for the current artifacts.

Fig. 6: Possible artifacts proposal for wayfinding in the Etruscan Museum of Villa Giulia: composite wooden engraved plaques, light and coherent with the indoor style. The shape, font and colors recall the Etruscan art theme.

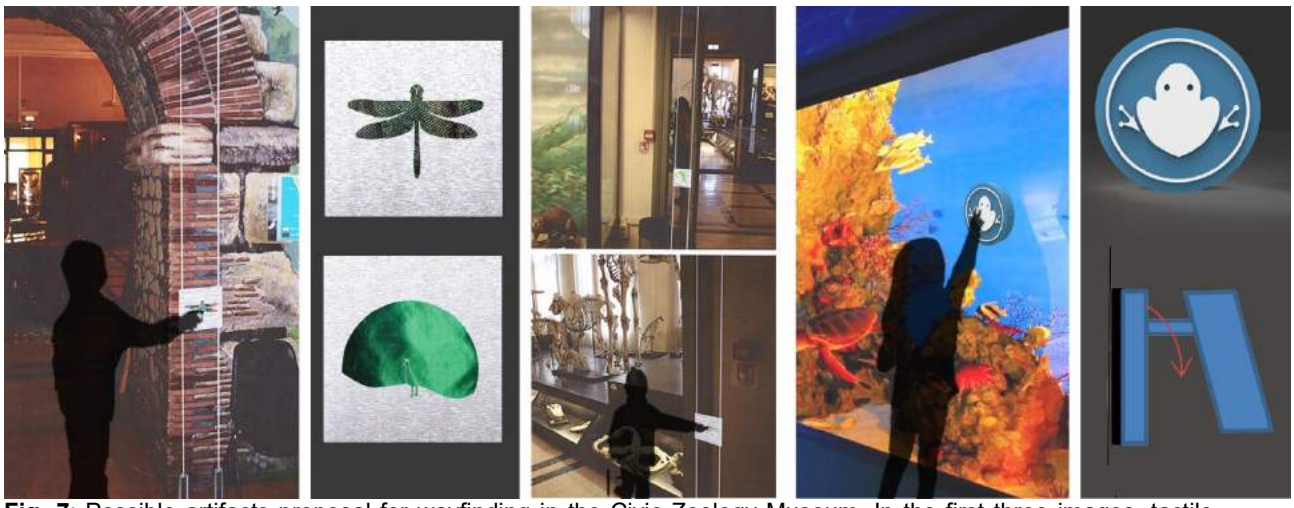

Fig. 7: Possible artifacts proposal for wayfinding in the Civic Zoology Museum. In the first three images, tactile artifacts made of metal plates supporting various cloth textures to simulate the skin of the animal being exhibited. These artifacts, hanging from or fixed to the wall, become interaction elements for younger visitors.
On the right, a scented diffuser whose shape identifies the theme of the room and whose functioning involves the user through sensorial stimuli.

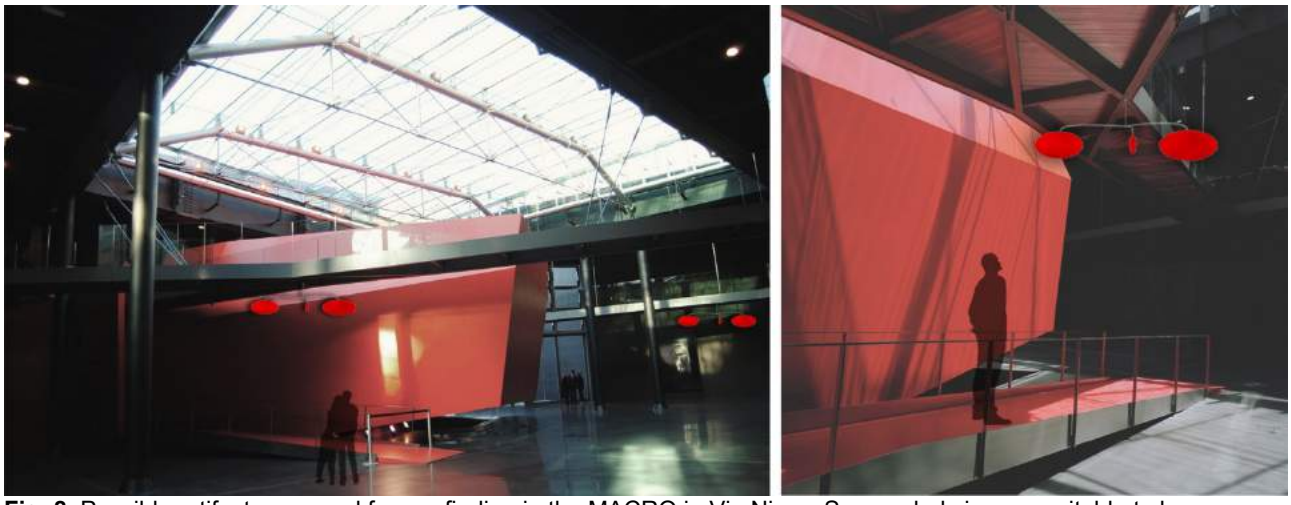

Fig. 8: Possible artifacts proposal for wayfinding in the MACRO in Via Nizza. Suspended signage suitable to large spaces, simple in shape and chromatically consistent with the museum theme. This signage is augmented with the help of innovative technologies using vibro-transducers embedded in the artifacts, which, thanks to a special magnetostrictive alloy, create a link between movement and emitted sound, guiding visually impaired visitors as well.

Notes

[1] *Gli standard di qualità in ambito museale*, 2013. Report by “Agenzia per il controllo e la qualità dei servizi pubblici locali di Roma Capitale”, p. 7.

[2] Op. cit., p. 8.

[3] http://www.herity.it/4615/index.html

[4] The city of Rome is characterized by a museum heritage including more than 46 state museums (almost 20% of those found in Italy overall) and more than 160 civic or private museums (including monuments and archaeological areas). In 2014 alone, more than 16 million visits were recorded (41% of those all over Italy), which have been increasing in the last two years, thanks to recent initiatives by MiBACT (Source: Sistan http://www.statistica.beniculturali.it/Visitatori_e_introiti_musei_14.htm)

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Thermal comfort in a historic building: the case of the Museum of History of Valencia

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Abstract (Arial – 11 pt – Lower case letters - Bold – left aligned)
The objective of this paper is to analyze the thermal comfort of visitors of the Museum of History of Valencia, a historic building originally used as a tank that provided the city with potable water. A beautiful example of Valencian industrial architecture, the building was built in 1850 and it is considered the first public engineering work of the XIX century in Valencia. It consists of a spacious reservoir, rehabilitated and adapted for its new use in 2000, with a maze of two hundred fifty pillars supporting a roof formed of eleven semicircular vaults made of bricks from local towns.
The authors undertake a literary review of research on thermal comfort and energy efficiency assessment in historic buildings that have been modified and adapted for modern use. The paper discusses the result of the survey performed at the Museum, which evaluate the visitors' perceptions of thermal comfort (temperature, humidity, etc.). Differences in gender, place of residence and age are considered in the analysis. The results of the surveys are compared to the actual internal and external temperature and humidity, which have been recorded over time using data loggers.
The biggest conflict is how to achieve the requisite levels of thermal comfort while simultaneously bringing the buildings up to par with current energy efficiency standards and preserving each building's heritage value.

Keywords: Thermal comfort, surveys, historic buildings, energy efficiency.

1. Introduction

The energetic sustainability is a way of managing and limiting the growth of the energetic consumption [1]. A building is therefore efficient energetically if it offers more services for the same energetic consumption, or the same services reducing energetic expense [1]. Due to the difficulty found when measures of energy efficiency want to be adopted that do not compromise the architectural and patrimonial values that must be preserved, the immense majority of regulations of energy efficiency do not contemplate historical buildings and other buildings with special uses and/or with an important artistic or historical value [2]. Nevertheless, recently some European countries have realized that the constructed heritage cannot be ignored. On the other hand, the conservation of the built-up heritage faces a conflict between the new methods to improve the energy efficiency and the maintenance of the values of the building. Likewise, the personal perception of the thermal comfort (" Mental condition that expresses satisfaction with regard to thermal environment and it is analyzed by means of the subjective evaluation ") must be carefully taken into account [3]. To balance energy efficiency, the needs of conservation of the architectural heritage, and the thermal comfort of the users does not turn out to be an easy task.

The main objective of the architectural renovation is to reach this needed balance and to manage to keep the buildings restored for the future generations with the maximum preservation of the patrimonial values. The most suitable way of maintaining the built-up heritage and keeping it away from the disuse, is to adapt them to the current levels of energy efficiency and thermal comfort. By doing this, not only the useful life of the historical buildings will be lengthened, but in addition it will allow us to enjoy and to admire them, at the present and also for future generations.

2. State of the art

Early studies and publications related to energy efficiency refurbishments of historic buildings began to emerge in the late 1970's and early 1980's [4–9].

For example, it has been noted that the two oil crises in 1973 and 1979, which created the necessity for starting to seek measures for improving energy efficiency of historic buildings, likely explain the sudden rise in research initiatives during the late the 70's and the early 80's. Research from this period largely focused on reducing energy consumption in buildings by improving insulation and building envelope performance. As a result, energy efficiency design technologies, such as passive design, the use of solar systems, and calculation and prediction methods of energy consumption, began to emerge as new research paths for historic buildings [5,7–9].

Research groups usually perform case studies of their own countries, where historic buildings are easily reachable. Sometimes, however, the strong built heritage of a country, like Italy, attracts scientists from abroad [10–24]. Italy is the country that has generated most of the energy efficiency in historic building research [8,9,25–58]. Italy is followed by the UK [12,13,59–66], Spain [67–71] and China [72–74]. While there has been significant research done by international collaborators, those projects have often been led by British [17,18,21,75] and Italian [15,20,23,31,32,76,77] researchers. This distribution may be attributable to several factors, including a country's built heritage, the sheer availability of buildings, and scientific developments. For examples, Italy (followed by Spain and the UK) is one of the countries with the largest built heritage in the world [44,45]. Tourism has been and continues to be one of Italy's fastest growing and most profitable economic sectors, with an estimated industry revenue of €136.1 billion [78], which may explain the economic necessity for cultural preservation. Moreover, of the 5,367,000 monuments registered in Europe, over 4,000,000 are located in Italy.

2.2 Literature review of research in museums, libraries and theatres.

Table 1 below outlines studies from the early 80's that were focused on assessing the energy conservation possibilities in museums, libraries and theatres. Most of the studies analysing museums for energy conservation purposes were published between 1999 and 2014; however, interest in the topic appeared as early as 1983.

Table 1.Museum, Library and Theatre buildings' studies.

Year of Publication	Origin of Researcher(s)	Location of Building(s)	Year of construction
2016	Italy[79]	-	-
2014	Italy[43]	Italy	1454
2014	Switzerland[80]	Switzerland	1600-1900
2014	UK[65]	UK	1855
2012	Spain[67]	Spain	-
2011	Italy[49]	Italy	1700-1900
2009	Italy[36]	Italy	-
2004	Belgium, Italy & Austria[15]	Belgium	1873
2003	Greece[81]	-	-
2001	Italy, Belgium, Austria, UK & New Zealand[77]	Europe	1500
1999	Canada[82]	Canada	1878
1999	Italy[31]	Italy	1582
1983	United States[7]	-	-

Twelve articles, focused on libraries, museums and theatres, have been published and discussed in this section. Again, all of the buildings examined are located in Europe and most in Italy. Since these buildings often house artworks, books and documents that require special conditions for conservation, several studies have focused on analysing indoor air quality. In addition to the variety of the in-house materials, the lack of homogeneous and consistent distribution of heat and vapour in space, this

causes changes in air temperature and relative humidity. For these reasons, technical standards and regulations are essential for assessing the optimal values of the physical parameters in exhibition spaces [36]. An interesting approach to tackle this problem has been the development of maps of indoor microclimatic conditions (spatial distribution of relative humidity, temperature, air velocity, etc.) [19,95] using modelling software.

3. The building of the Museum of History of Valencia

It was built in 1850 to serve as the general reservoir for drinking water for the city, and for more than one century continued to play this role. The building, with its brickwork and great vaults, is a model of an era that made the instrument of change to make the leap to progress engineering.

The reservoir is formed by a maze of two hundred and fifty pillars, which hold up a roof formed by eleven arched vaults made with bricks from local provenance.

Fig 1. Photographs of the exterior of the Museum of history of Valencia (source: MHV).

Fig 2. Photographs of the interior of the Museum of history of Valencia (source: MHV).

In 1998, the restoration of the building and its adaptation to the Museum of History of Valencia (MHV) (Figures 1 and 2) began. The objective of the museum has been to showcase the history of the city from its origins to the present day, making use of municipal archaeological, artistic and cultural funds.

The Museum has a perfectly rectangular geometry and a single plant (Figure 3). The main entrance is located on the north facade (approximately 5 ° West of North).

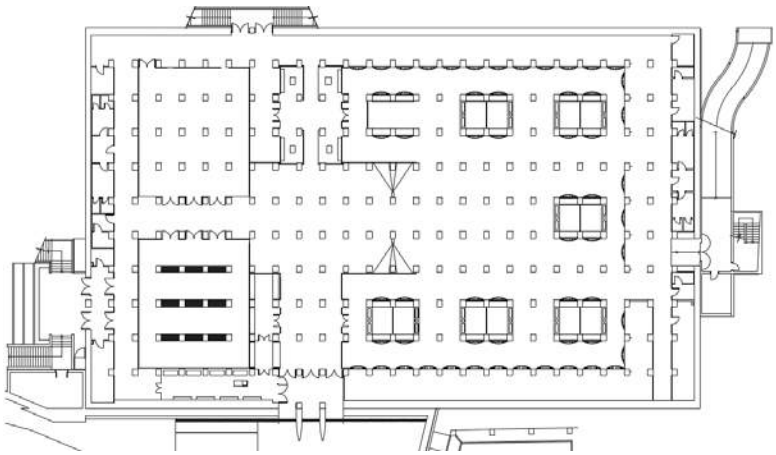

Fig 3. General plan of the History Museum of Valencia (source: own elaboration).

The MHV has four exterior walls, and a significant percentage of them is buried.

4. Statistical study of the thermal comfort

The information compiled in the realized surveys allows us to know and to value the opinions of the visitors of the MHV. The number of visitors registered during the period of monitoring (August, 2015 - February, 2016) is 8.434 persons. 413 surveys have been registered and, by means of statistics calculations, a level of confidence of 95%, a simple error of 5%, and a recommended size of the sample of 368 has been observed have been observed, according to simple random sampling formula [83](knowing the population).

The studied sample is distributed exactly to 50 % between man and women, and the range of predominant age is the one that understands the ages of 18 years and 30 years with 141 polled ones (38%). This range is followed by the ranges of ages of between 31 up to 40 years (22 %), and 41 to 50 years (23 %), with about 85 visitors for each range. Finally, the visitors between 51 years and 60 years do not reach the 40 (10 %), and for what concerns the ones older than 60 years, only 24 answers have registered (7%).

Regarding the origin of the individuals, 54 % of them has answered to be local and 46 % turns out to be from other cities in Spain, and even some of them from other countries.

With regard to the subjective opinion of the visitors of the indoor temperature of the Museum, as shown in figure 4, the values "neutral" (30 %) and "cool" (35 %) have turned out to be the most selected ones together with "warm" (14 %) and “cold” (13 %). The values ”very cold” (5%) and “hot” (3%) have received 18 and 13 responses, respectively. AS the last selected option, “very hot” shows only 1 response. These results show that the level of satisfaction with the indoor comfort is more than acceptable, with a small tendency to point out a little bit too low temperatures.

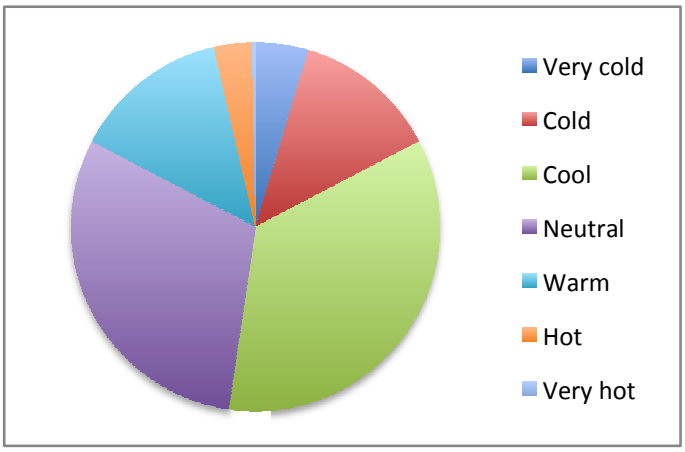

Fig.4. Visitors’ perception of the indoor temperature in the MHV

On the other hand, the quality of the interior air of the building received very positive opinions with 165 answers of "very good " (43 %), 148 of "good" (38 %) and 49 of "neutral" (13 %). The polled ones that were not satisfied with this parameter, answering "bad" (5 %) or "very bad" (2 %), have had 20 and 6 answers, respectively (Figure 5).

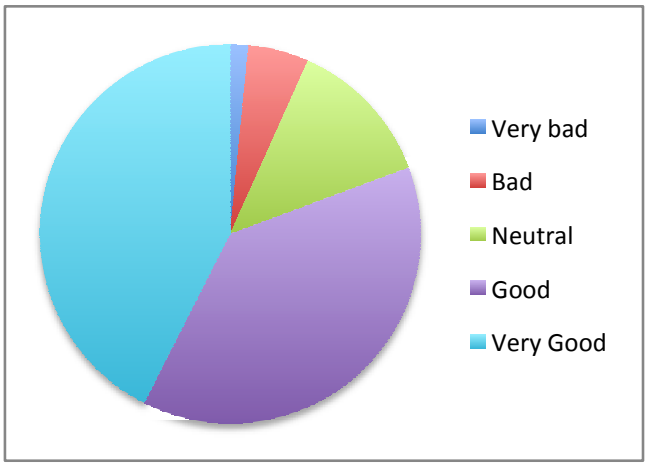

Fig.5. Visitors' satisfaction with the air quality inside the MHV

Regarding to the humidity perceived by the visitors of the Museum, the great majority of them (81% with 312 answers) has expressed acceptable levels ("normal"), and only 45 polled ones have answered that the interior environment seemed to them to be "humid" representing 12 %. To finish, 5% individuals (19 opinions) have replied that the ambient is "dry", and 1% have replied a perception of "very dry" or "very humid" with 4 and 3 responses, respectively (Figure 6).

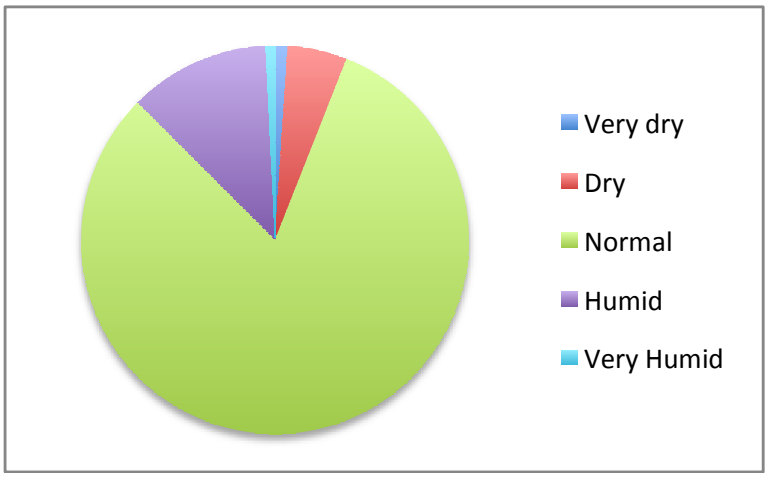

Fig.6. Visitors' satisfaction with the indoor humidity inside the MHV

5. Conclusions

The literature review has revealed that, in the last two decades, the interest and research on energy efficiency and thermal comfort in heritage buildings has multiplied. Europe is the region that has showed the greatest interest in developing policies for adapting heritage buildings to new standards of comfort and sustainability.

The Museum of History of Valencia has been shown to be more efficient than expect.

Regarding the thermal comfort study, most important findings have been that 65% of the visitors find the temperature is ok or a little bit cold. Finally, 94% of the opinions were positive when asked about indoor air quality and 81% of visitors were satisfied with the air humidity, but it has to be mentioned than 12% of people thought that the indoor ambient was humid.

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Surveying, Restoration and Enhancement of S. Francis Convent in Boville Ernica (FR □Italy)

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Abstract
The Convent of Saint Francis in Boville Ernica (FR) presents a single hall church and an adjacent cloister with a a trompe-l'oeil in the main entrance. During centuries the convent underwent processes of modification and transformation, from the XIV century to the half of the XX century. Currently the church houses a museum, while the convent is used as residence.
The work is interdisciplinary and combines: historic studies; architectural survey; metrologic, proportional, constructive analysis; degradation and structural studies.
The project aims to safeguard historical and architectural values, to propose a compatible revitalization of the complex, to enhance the architectural heritage and its urban context.
3D modeling plays an important role, because it is intended not only as a way of outcomes communication, but it is used as a research tool during the whole process: according to a principle of specularity between surveying and planning, the digital model configures itself as an interpretative model for the historical-critical study and becomes the reference and support for the project. In this way the model is an interoperable instrument for data analysis and elaboration, for architectural characteristic study, for protection, valorization and communication.

Keywords: Architectural Heritage; Surveying; Historical-critical analysis; Restoration.

1. The Convent
The St. Francis Convent is located in the medieval village of Boville Ernica (FR, Italy). It includes a portion of the city wall and the square tower with the S. Francis urban gateway.
The convent has an area of about 40 x 40 m. It's arranged around a square cloister, with the church on the east side. It does not differ substantially from the typical plant of Franciscan settlements. On the back side there are the ancient vegetable gardens.
The convent has three floors: a wine cellars downstairs floor, the ground floor with the cloister and the church, upstairs the main floor with monk's cells. The south-west body of the convent blends with the urban walls.
The convent entrance is characterized by a vaulted gate with a trompe-l'oeil, where the "trick" of the vanishing perspective effect augments the perception of the entry depth. The entrance leads into the cloister □with a cistern for collecting water □, it is surrounded by cross vaulted porches.
The Church has a barn typology, with a rectangular hall, covered by coffered ceiling and a truss roof; an arch leads into a square presbytery with a cruise vault. The facade is simple, with tympanum and entrance surmounted by a window. The church has been re-configured during the Baroque period. Today the liturgical space is used as civic museum.

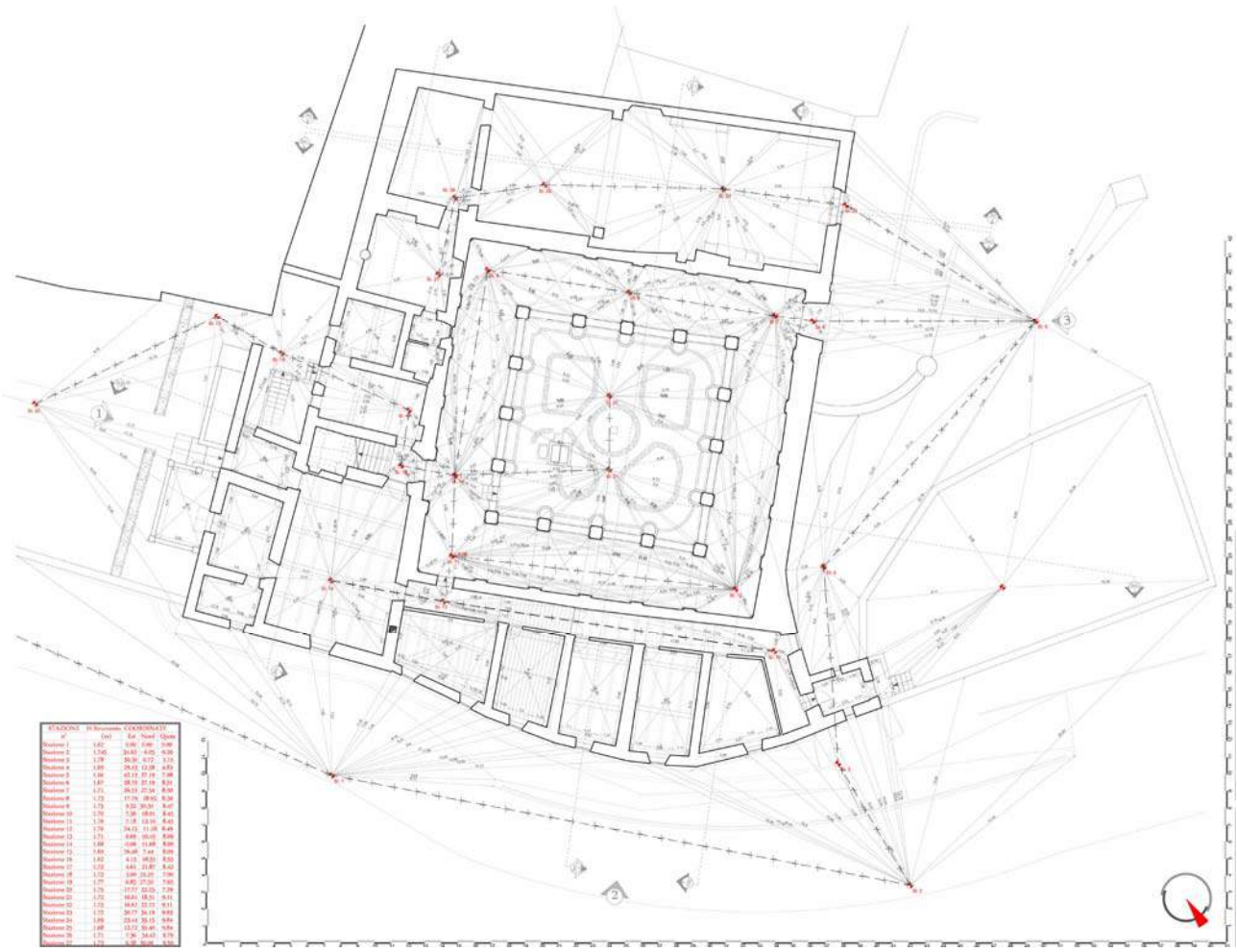

Fig. 1: Architectural surveying of the Convent. Ground floor.

Over the years, the convent has undergone several transformations: the first covers the years prior to 1377, the second the years between 1377 and 1724, the third between 1724 and 1949, and finally the fourth covers the years from 1949 until now. According to the architectural surveying, to the study of the documentary apparatus and of the constructive systems, the building phases have been supposed: the southern part with the basement floor and the ground floor, included the urban gate with the sighting tower and the first two rooms of the church is due to the first settlement. The second phase is referred to the arrival of the Conventual Friars, with the substantial re-building of the general settlement and of the church. The third phase is about the reconfiguration that leads to the current facies. The final fourth phase, referring to the twentieth century, is characterized by the change of use and destination, with the convent that has become a private residence and consequent interventions with modern techniques: in particular the re-building of parts of the constructive system also with concrete elements and the realization of works for the functional adapting.

Fig. 2 Photogrammetric surveying of the facades.

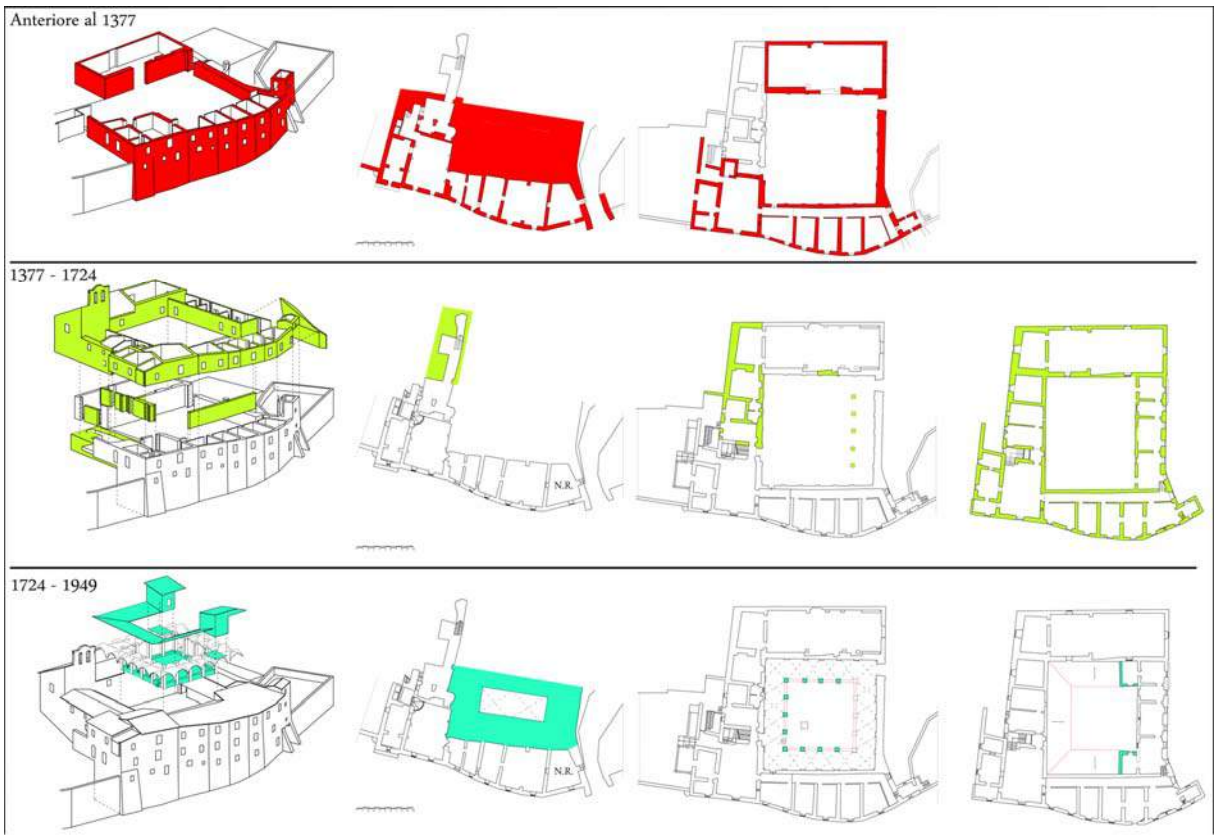

Fig. 3: Main historical realization steps.

2. Architectural Surveying and Analysis

An integrated survey campaign of the convent was done with the aid of a topographic station and digital photogrammetry software. The geometric-dimensional survey was deepened with the architectural survey, the construction systems survey, the analysis of the macroscopic surface degradation, of the structures, of instability.

According to the surveying, a digital 3D model has been built. 3D modeling plays an important role, because it is intended not only as a way of outcomes communication, but it is used as a research tool during the whole process: according to a principle of specularity between surveying and planning, the digital model configures itself as an interpretative model for the historical-critical study and becomes the reference and support for the project. In this way the model is an interoperable instrument for data analysis and elaboration, for architectural characteristic study, for protection, valorization and communication.

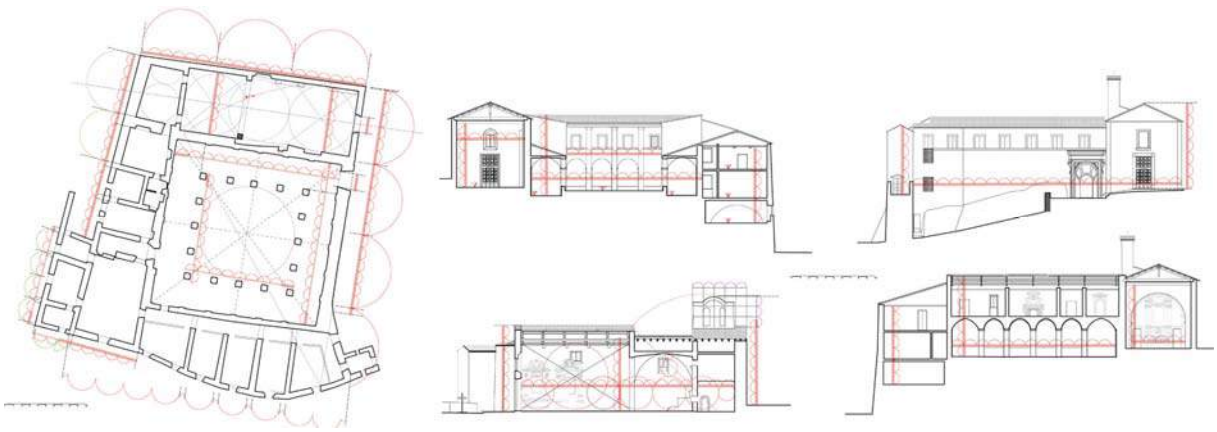

Fig. 4 Metrological and proportional analysis.

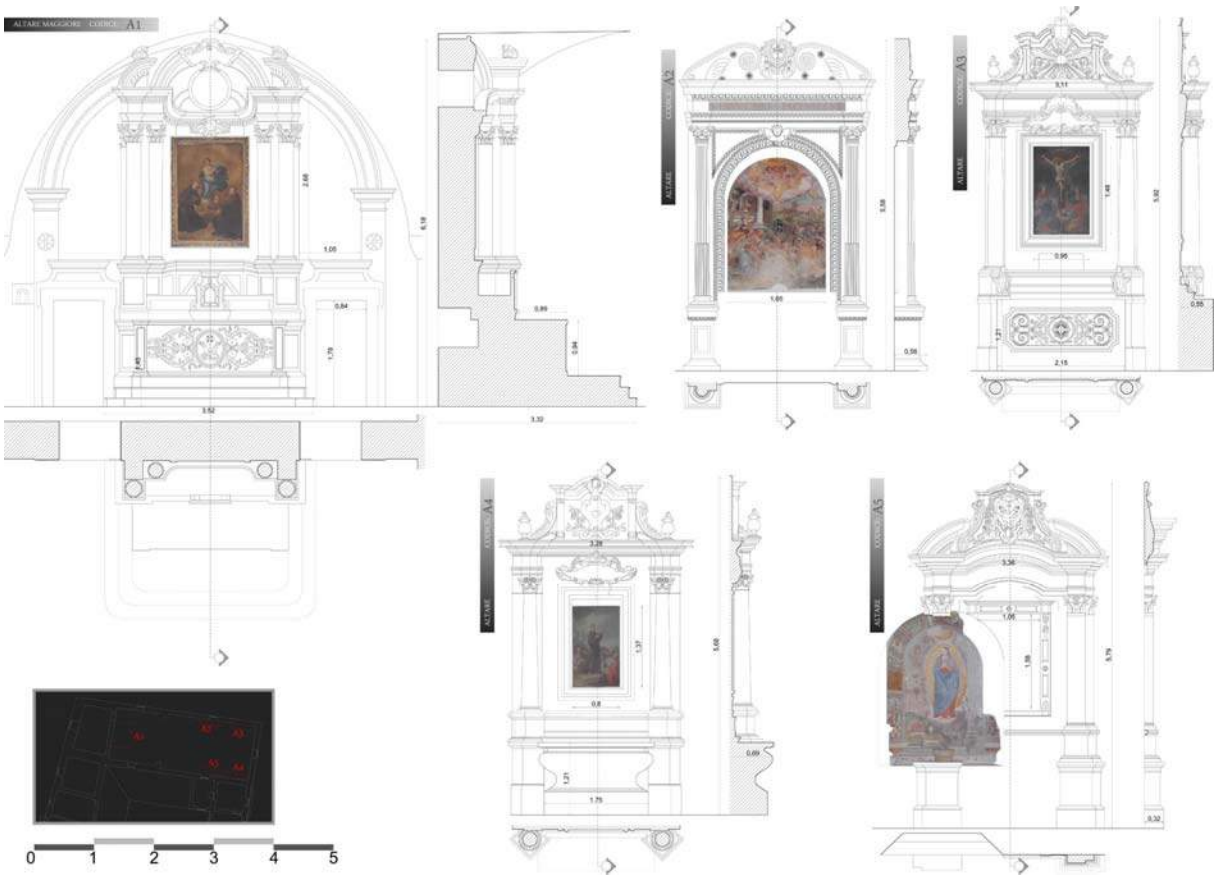

Fig. 5: Architectural surveying of the church's altars.

The metrological analysis identifies the "Roman foot" (0,2979 m) as the main measurement unit used in church and in the convent. This unit was largely used in medieval times.
The proportional analysis shows how the whole complex has a 3/4 ratio between longitudinal and transversal dimensions; the south-west and south-east parts have well-defined proportions, related with the measure of the Roman foot.
The study of masonry's alignments highlights the irregular rectangular shape of the cloister. Irregularities of the settlement are witnesses of historical stratifications and modifications. The southern front, merged with the urban walls, is influenced by the elevation profile of the ground: it has a curvilinear shape and the tower with the entrance gate to the village is rotated by 16 °.
The analysis of the masonry systems made through the compilation of analysis sheets was accompanied by the analysis of mortar samples. The materials are compact calcareous stones, mined in the site; they are very tough and light in color, which varies from creamy white to gray with some pinkish element.

Fig. 6: Survey of the facades' degradation.

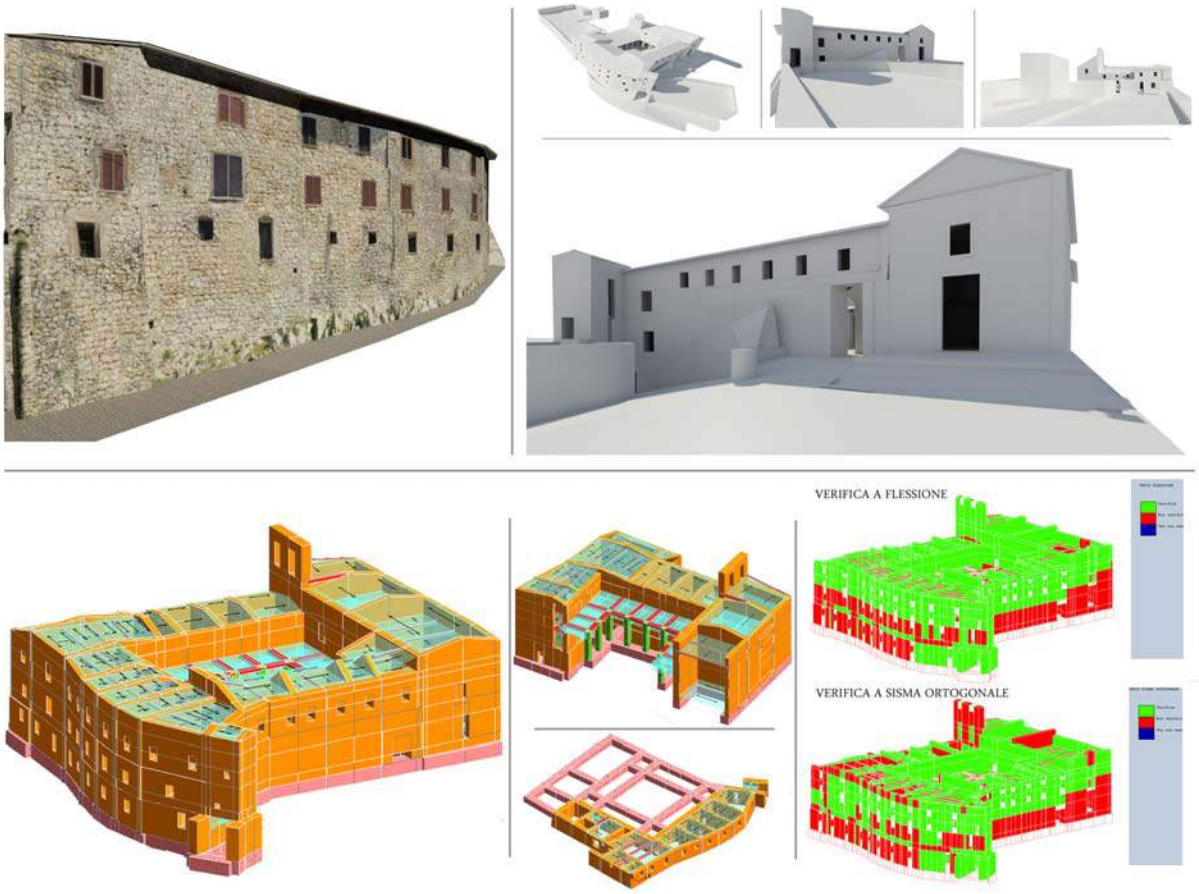

Fig. 7: Architectural model and structural model.

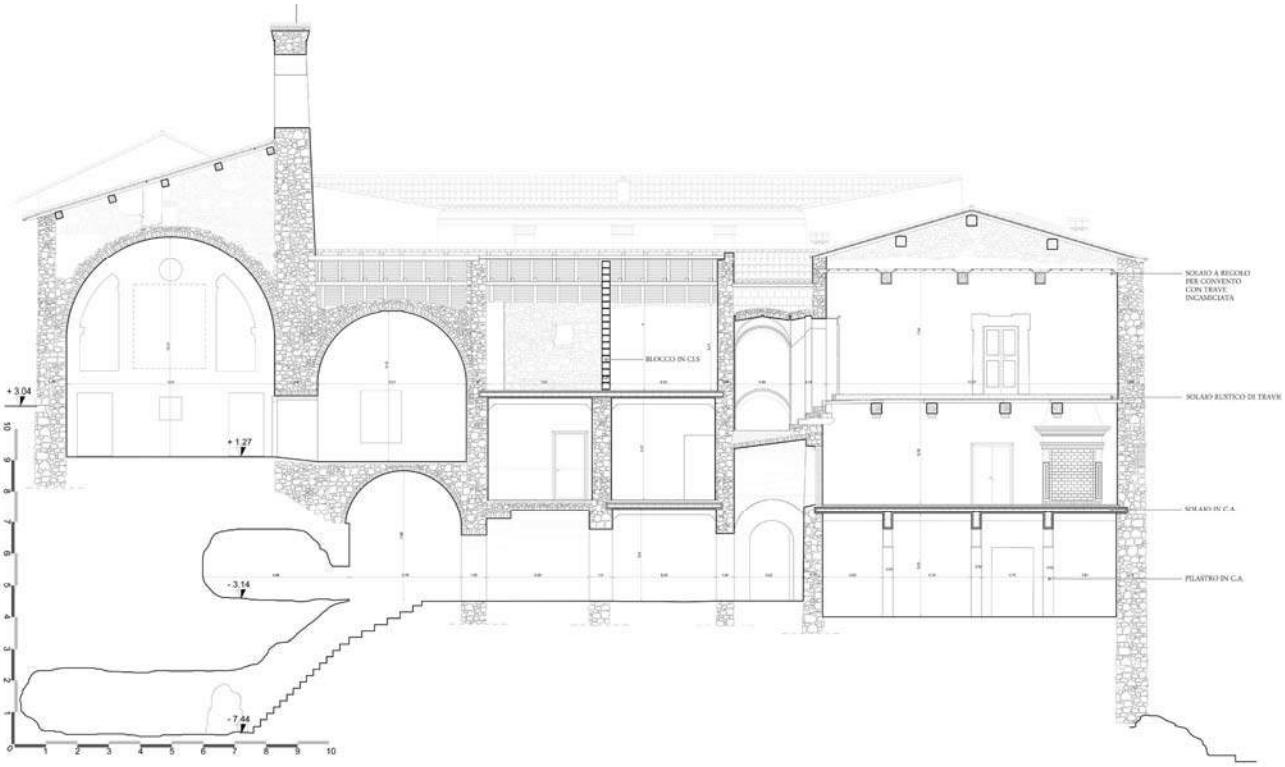

Fig. 8: Section with the representation of the constructive systems.

Fig. 9: Restoration of the main facade: comparison between the current state and the project.

They are shaped as ashlars and irregular draft stones, assembled with irregular courses or undulating and sloping courses. The study of the typologies of masonries shows the poor and local nature that the yard has always had in all its phases. And it is frequent in mendicant orders settlements of Franciscans ones.
The degradation is attributable to the lack of maintenance and to the action of atmospheric agents. The loss of binding capacity of mortars and the mediocre characteristics of masonries determined the reduction of walls' resistance and, somewhere, even the formation of considerable lacunas in the hangings.
Important incongruous modifications are primarily related to a non-compatible use of the complex.
The general static system of the complex is compromised by some local buckling phenomena, affecting mainly the thrusting structures and slender elements. A framework of diffuse lesions has a negative influence on the mechanical behavior of structures, and it is worsened, inter alia, by the degradation processes which have progressively reduced the bearing capacity of masonry walls.

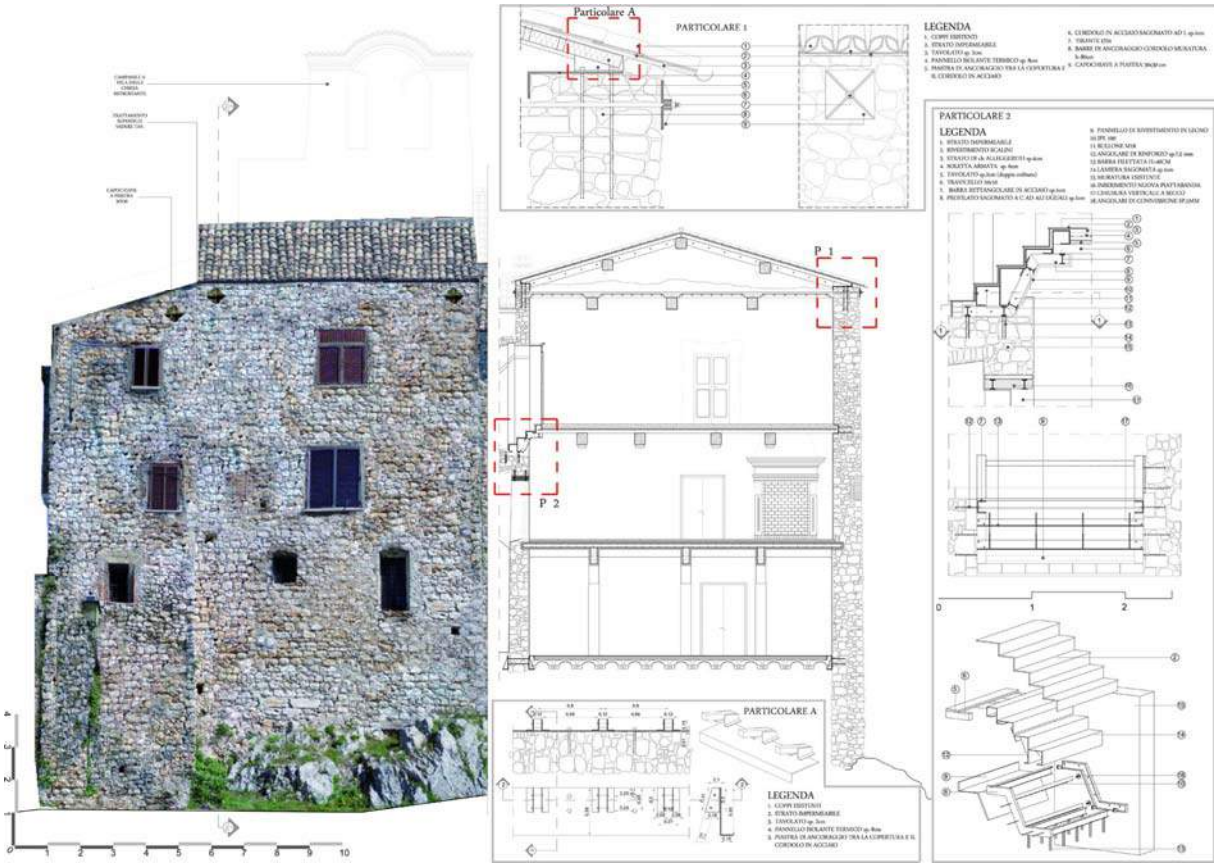

Fig. 1□: The restoration project: design of south-west elevation, section and details.

Fig. 11: Restoration of the south-west facade: comparison between the current state and the project.

The study of cracking phenomena has been conducted in relation to: the geometric and constructive characteristics, quality and state of preservation of materials, the transformation phases of the building. In particular: the plan accretions led to discontinuity situations between walls; the elevations have induced an increase of stress and a shift upward of the center of gravity of the masses; the realization over time of vaults and recently of some concrete horizontal structures and roofs on ancient structures produces forces on not adequately dimensioned masonries.
The recovery efficiency of the structural system is of vital importance for maintaining the monument and to ensure a higher security level. At the same time, structural interventions have be related with the issues of re-functioning of the complex and with the historical and architectural values.
The study is founded on an approach based on macro-elements, i.e. according to the division of the complex into finished elementary architectural elements, characterized by a substantial structural behavior independent from that of the rest of the construction, each one made using local models. These architectural elements are the subject of qualitative analysis, focused on damage interpreting, according to lesions' shape and distribution: in fact, they provide valuable suggestions for understanding the mechanisms of local collapses that is the mechanisms according to which answer the structure when stressed with greater intensity and identify the specific vulnerabilities of each maco-element. The understanding of the kinematic mechanisms potentially activated by earthquakes or horizontal and axial thrust efforts allows the better static restoration project, with interventions aimed at correcting structural deficiencies of the complex.
Based on the survey of instability and collapses, a preliminary assessment of the severity of the damage phenomena was formulated, and the portions of the building suffering the most troubling diseases have been identified.

3. The Restoration

The definition of the project is conducted in order to reconcile the historical and aesthetic instances and the complex needs related to the conservation, re-use and structural safety.

With regard to the main façade, it is designed the restoration of plasters and of the degraded color. About the façade merged with by the urban walls, small and specific interventions are planned to eliminate incongruous elements and compensate lacunas, at the same time to keep historicized figurative values.
The checks carried out for the calculation of the failure mechanisms show that the structures are triggered by a deficiency of the mechanical properties of the masonry and by little efficacy of horizontal connections. Therefore the structural restoration project provides for the reinforcement of the masonries and the replacement of some horizontal elements, ever using the traditional material, to while ensuring security and continuity over time, according to a logic of minimum intervention.
For those floors of particular historical value, the replacement of deteriorated beams is provided. To give continuity to the masonry piers, niches are closed with traditional techniques. The doorways are hooped by metal profiles, docked with anchor-bolts. Moreover the insertion of metal rods is designed.
With regard to the improvement of the characteristics of wooden horizontal structures, it is provided the densification of the main beams, thus making them more rigid in their plans. Furthermore it is provided the insertion of a steel bead to anchor the new wood roof and to connect masonries.
The new uses are developed with reference to the typological characteristics of the complex. Consistent standard compliance interventions are provided.
For the re-functionalization of the convent, a receptive use as Bed Breakfast has been planned. Therefore in each monastic cell, a bathroom block made with plasterboard walls is inserted. In the cellar a wine bar is planned.

Fig. 12: The reuse: comparison between photos of the current state and renderings to pre-view design hypothesis.

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Industrial Heritage's Role within the Future of Portuguese Territorial Planning

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Abstract
In recent years and in the particular case of Portugal, the role of heritage has been considered relevant to solve territorial issues, such as population density asymmetries. However, this remains to be established; not only due to its, still, traditional legal and national definition and consequent tools; but also to the need of operative methodologies that can convey a new paradigm of territorial planning, with emphasis on inter disciplinary and prospective views regarding heritage.
In this scope, industrial heritage specifically, is still expectant of a full recognition of its territorial role, due to the fact that it implies, frequently and inherently, a recent and difficult memory as well as a state of accelerated degradation.
The proposal of "Cultural Landscape of Alentejo Pyrite", regarding the mining sites of Lousal, Aljustrel and S.Domingos/Pomarão within the Iberian Pyrite Belt, present a methodology consolidated by morphology analysis that can be of service not only to these cases, individually and jointly, but also as exemplificative of new operative views regarding other national and international industrial sites and its place within the Portuguese territorial planning system.

Keywords: industrial landscapes, mining heritage, territorial planning

1. Introduction
Over the years, the concept of heritage has been broadened regarding issues such as its significance and in the specific case of industrial heritage with a framework of its own [1]. However and previously, to this (important) type of document with an international scope of particular recognition, there are examples of territorial projects that revitalized degraded industrial areas, signaled from the decade of 1970s (Lanark, Scotland, or National Coal Park, USA) followed by others that from the 1980s, are defined as patrimonial parks [2]. Sabaté [2] also affirmed that these cases of "cultural landscapes" – that evoke the definition of Sauer [3] not the politicized by UNESCO [4] – supported the idea of a planning paradigm shift supported by the presence of both nature and culture as a needed project binomial. This binomial also represents a planning vision of conservation as well as prospective character.
In the Portuguese scope, the National Program for the Territorial Organization Policy [5, 6] recognizes heritage, landscape and architecture as planning and organizational tendencies and also as a possible solution for questions, such as territorial fragmentation or asymmetries. However and in the same document, the intervention regarding heritage is described as still circumscribed to monuments or urban sites rather than for instance vernacular architecture in rural areas [6]. The heritage law yet reflects this traditional vision in its categorization [7, 8]. It is recited within the scope of "environmental and landscape quality" the need to "adopt measures that rehabilitate and increment areas value, historic centers and other urban sites, historical villages, landscapes, parks, gardens and other natural, architectonic and industrial elements integrated in the landscape" [7]. Although it is implied a territorial approach, in practical terms of intervention or consequent safeguards plans are confined to action perimeter that surrounds a classified property.

And even though, the classification of three Portuguese cultural landscapes by UNESCO – Sintra, High Douro and Pico Island Vineyard – their implicit idea of heritage with a vast territorial dimension is relegated to a condition of omission within the law, as another "World Heritage" and not as a category of its own (that would opened the possibility for the classified integration of other cases of cultural landscapes of "lesser" relevance than an universal one).
Regarding the existent planning framework, there is the need of "innovative conceptualizations and corresponding methodologies" for a national policy of architecture and landscape [9], that the PhD research of first author (2008-2014) which bases this paper, addressed. Also and according to Ferrão [10] the specific issues within the Portuguese planning system regarding heritage protection are caused by the disciplinary fragmentation and the absence of a culture of cooperation. This statement implies that any given conceptualization or methodology, have to simultaneously, provide for the dialogue between the participant disciplines with the contribution of its own disciplinary view.

2. Portuguese Industrial Heritage: mining in particular

The valorization of industrial heritage is relatively recent and it is due mainly to the development of industrial archeology discipline in the 1980s. Historically and in comparison with other industrialized countries such as the United Kingdom or France, the expression of the extractive industry is so residual and fragmented as the majority of the remaining testimonial elements. However, and in some cases, the completion of these vestiges is revealed above all, through the identity survival (despite the frequent memory of a hardship life) and particular morphological expressions.
In a Portuguese scale of importance [11] the classified inventories focus mainly in the nomination of singular buildings (textile, and others). Also the designated workers neighborhoods are located in the national capital, consequence of unequivocal architectural quality criteria. In the particular case of mining, one of the most poignant issues it is the elevated grade of degradation and vandalism in a rural context (many in isolated places) and also, as the difficulty of the research proved, by the lack of data for analysis or of its completion in some regards of the proposed analysis that will be explained in the next point.
Therefore, it is not surprising that the reminiscent heritage elements of this particular activity are integrated in preservation models that focus on the geological resource in itself; exemplified by the Arouca GeoPark [12] or through recent proposals of geological based routes as the national range, Mines and Mining Sites of Particular Interest in Portugal Route [13] and regional, the Pyrite Route (related to the case studies of the proposal) [14] or the Wolfram Route (in execution) [15]. According to an interdisciplinary point of view, the interpretative analysis takes the proper outlines of industrial archeology or as a tool for geological mapping and these sites' rehabilitation, but have, essentially, an environmental premise.
Other issue is the absence of an extended interpretation of the mining sites. In the particular cases that integrated the proposal – Lousal, Aljustrel and S.Domingos/Pomarão – there are recent records of inventory [16], Lousal as of valued typological site (in 2006), S. Domingos as a site of Public Interest (2013), and incipient in the cases of Aljustrel and Pomarão. The exception of S. Domingos proves the rule of not recognizing interests of the morphology of these sites, in particular. Globally there is also the absence of a systemic proposal duly sustained, which the proposal of "Cultural Landscape of the Alentejo Pyrite" aimed to convey: "The existing researches and respective approaches related to these mining sites (as isolate entities) are mainly from other fields of knowledge, which are not suitable to construct and convey a common syntax defining a territorial system, from local to regional, based upon the morphological elements observed thus abridged and classified.
This is particular relevant as it is considered necessary simultaneously to address interdisciplinary issues as well as provide a methodology that has an effective expression in the territory. The previous analytical synthesizes assert that, beyond their particularities, there are spatial similarities that allow a common classification of the existing structuring spaces of each site, thus supporting and establishing the whole contexture as a "Cultural Landscape of the Alentejo Pyrite".
More importantly, it also provides the grounds for a proposed methodology for the design of "cultural landscapes" beyond UNESCO and biding to the expectancy of valorization and enhancement of ordinary territories." [17].

3. Proposal of "Cultural Landscape of Alentejo Pyrite": an implicit methodology

Lousal, Aljustrel and S. Domingos/Pomarão have a common geological origin, the Iberian Pyrite Belt (see figure 1) which has an extension of 250 km and approximately 30 to 60 km wide, from the north of Grândola (Portugal) until the nearby Seville (Spain). Despite the existence of this common geological "cord" – which was defined as "non-apparent structured area" [18] related to natural conditioning elements, that as the name indicates, are not visible to the naked eye and yet influenced the design, amongst others, of different types of territorial proposals as studied – there are other common factors between the mining sites such as their collective memory and identity or the toponymy.

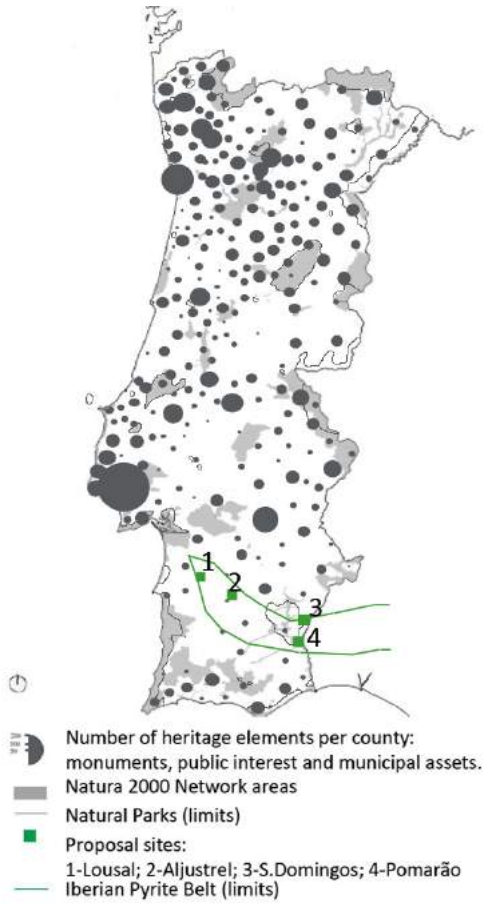

Fig. 1: Classified continental Portuguese Heritage (built and natural) and location of the cultural landscape proposal, including mining sites. Author: M.D. Oliveira from [6, 19].

For the conception of the Cultural Landscape of Alentejo Pyrite were considered the following methodological items:

- Cultural Landscape conceptualization and the definition of mining landscape, in particular, which is focused on typological characterization rather than focused on theme. Most definitions of cultural landscapes and even when subcategorized are lacking of an operative dimension [20]. It was considered that this phase must precede the territorial reading and analysis as it establish and convey the common ground to both interdisciplinary and cooperation between the municipalities that integrate the proposal – Grândola, Aljustrel and Mértola, or others that will integrate their own cultural landscapes proposals.
- Scope/morphogenesis definition derived from the territorial reading and classification as a "non-apparent structured area" that provides the general delimitation of the proposal as a consequence of the geological infrastructure. This assessment is just a preamble as it is only justified and/or reaffirmed by the morphological analysis;
- Design of the proposal physical structure: system definition as multinuclear that derive from a particular "*chrono/topos/logos*" [21] of the mining landscape, obtained by:
  - Historical documentation and respective chronology of events of each of the sites that allows not only identify their origins and evolution context, but also eventual parallelisms on more current events mainly local concerns regarding rehabilitation;
  - From the existing iconographic and graphic data (some unprecedented and or recovered for the research purposes) it was established the morphological and structural base of each site allowing an interpretative synthesis and above all of common morphological elements and events, integrating the narrative and contexture of this particular territory. In this sense, it distinguishes itself from a more traditional inventory – although it is a consequence of an inventory – constituting a unitary catalogue/cartography.
  - Regarding the proposal, there was a restatement of sites that had a geographic expression from the get go. The research also allows the definition of criteria for the inclusion of other sites from the Iberian Pyrite Belt (thus providing for the potential proposal's international dimension) as it was systematized for current sites;

- Concerning the narrative construct, associate the assessed interpretative elements resulting from the morphological approach to the Pyrite Route [14] which resumes a geological heritage approach, as well as the sociological one and the existing interpretative centers. This kind of route constitutes the backbone of a cultural tourism initiative in which the incorporation of the architectural input could only increase. Its interpretation should also be based on present resources:
  - Existing infrastructures as the mining railways or "reference-elements" as designed by the research of each site, the water deposits and fountains (Lousal), windmills (Aljustrel) and collective ovens (S. Domingos/Pomarão). Despite the fact that these elements have not a particular industrial nature, they constitute the permanence elements in the respective evolutional analysis. In the case of their association with "belvedere spaces", it is important to clarify if they are intern/extern to sites;
  - The public space expression as systemized as public spaces and semi-publics and private/cellular present on these 30 neighborhoods. In the case of public spaces besides the already mentioned classification, it was identified particular character spaces according to typological criteria (associated with reference buildings or its particular position within the site) and social-historic criteria (associated with collective rites and signs);
  - Regarding paths it was distinguished between the ones with historical character, remnant or allusive from the others, due to the verified informality within the sites;
  - Isolated elements and/or with interpretative possibility as viewpoints (such as the hermitage of Santa Teresa in Pomarão) and if they are intern/external to the sites;
  - Rites or other tangible or intangible elements of collectiveness.

The designation of "Cultural Landscape of the Alentejo Pyrite" has the agenda of territorial characterization and valorization under a global image that has the reflexive contribute provided by the research the ultimate goal a prospective image (from analysis to an operative image of the whole). Still regarding the product/global image it is considered that color provides and identity reference element, the consensus between external walls solely or predominantly white (as verified at S. Domingos – fig. 2) or with yellow trims (associated with the Alentejo region) or blue trims (associated with mining housing), combinations visible in Lousal, Aljustrel and Pomarão (figs. 3, 4 and 5, respectively). It is essential for a clear identification of the proposal sites as proved by the example of the UNESCO Pico Island Vineyard [21].

Fig. 2: S.Domingos view. Author: M.D. Oliveira.

Fig. 3: Lousal: Santiago neighbourhood (former mining workers dwellings). Author: M.D. Oliveira.

Fig. 4: Aljustrel. Author: M.D. Oliveira.

Fig. 5: Pomarão. Author: M.D. Oliveira.

Equally, the designation provides the general theme of the proposal, however it can integrate sub-themes considered of the same nature or complementary (as analyzed on other Portuguese proposals). This distinction is a key to the proposal integrity and respective interpretation. In the case of sites that already integrate the proposal, for instance, there is a sub-theme of similar nature with the recent classification of S. Domingos/Pomarão as a part of a Public Interest Ensemble [22].
Therefore the theme/project units are:

a) Lousal (1900): from topographic particularity. It is thus enhance the fact that the workers are implanted on higher ground opposite of what it is common on industrial settlements. The Oliveiras neighborhood “belvedere space” provides an additional aspect of composition;
b) Aljustrel (1867): The continuities within the ever-changing territory. It was considered that the site is not functionally closed as the mines are still active but the existing neighborhood provide as permanence events (see [23]) although they are not of particular excellency;
c) S. Domingos/Pomarão (1858): From the mine to the Guadiana River. It is thus reinterpreted the already mentioned classification as a Public Interest Ensemble introducing these sites on a more late territorial narrative;

Nevertheless the found common traced elements, each site represents in itself a specific spatial composition: Lousal, linear and dispersive; Aljustrel combined (linear and polarized, aggregated by an existing site prior to the mine settlement); S. Domingos combined (linear and with three internal nucleus beyond the intrinsic polarity of the mine pit) and Pomarão, linear due to its fluvial port characteristics.
Each of the four sites has local rehabilitation initiatives that the proposal aims to elevate to the regional level. The research work provides the basis for a plan, in this case an inter-municipality plan which is the Portuguese planning frame more suited (though there are only two existing examples in Portugal, being one related do the Cultural Landscape of High Douro [24]).

4. Conclusions and contributions for the future

The results obtained by the proposal, both concept (intended for interdisciplinary debate and usage) and methodology, imply that it is needed a (re)framework of the existing Portuguese base laws, related to heritage and territorial planning and organization. Not only supports the idea of a possible category of “cultural landscapes” and “heritage parks” but also that territorial significance must be revised, in particular, for industrial sites. “Ordinary” as demonstrated by the proposal analysis does not imply irrelevance just a specific approach and proposal, based on a system with a corresponding contexture. This vision ally preservation and prospective intents that is imperative for a smart planning of an ever-changing territory in Portugal or elsewhere.

Despite the many difficulties that are inevitable in store for the future, the established work and local contacts provide for a hopeful base-net of both, international cooperation within the Iberian Pyrite Belt or with other mining sites.
The question of what it is the place of Industrial Heritage was recently and interdisciplinary debated, the participant argument of the present research is that demonstrating with a territorial proposal based on industrial resources [25], it has been proven that its (still) vacant strategy can become manifest from latent.

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Visualising the research on visual landscapes. Graph representation and network analysis of international bibliography on landscape

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Abstract
Perception, visualisation and their relationships with cognitive processes have been in last years among the most discussed issues in research on landscape. The space can not be taken as an absolute element, since it is experienced and perceived differently by individuals according to subjective, social and cultural factors. Through cognitive processes, space and its representations is internalized in mental images that affect decisions, actions and behaviours. Scholars are increasingly focusing on the exploration of landscape perception, in order to investigate their visualisation aimed to the choice of sustainable design scenarios in relation to the views and to the aesthetic preferences of the publics. Several methodologies, indicators, procedures and applications about representation and perception analysis were proposed, highlighting how the variability of individual experiences, cultural, social, economic aspects, makes difficult to define and measure the perception components.
In this paper it has been applied the network analysis approach to the most relevant studies focused on the landscape perception and visualisation carried out by international scientific community. It has been built a network of 29470 citations between 19658 articles in order to discuss which are considered the most influent scientific papers on landscape perception and landscape visualisation and which are the mainstream research areas.

Keywords: perception, visualisation, landscape, network analysis, graphs.

1. Landscape perception and visualisation
The landscape is a complex phenomenon whose evolution continues in time and space, reflecting the changes of society [14]. As such, it is the main topic of many disciplines with different approaches and aims.
The European Landscape Convention has highlighted the importance of visualisation and of perception in the analysis of the landscape, introducing officially these topics in the policies for safeguarding and for enhancing the landscape as the conclusion of a process of awareness raising started in the Seventies of the last century [19].
Landscape represents the space within which local societies experience their daily life; the setting to which they refer the multitude of their actions and of interactions. Landscape and local societies are linked by a mutual relationship in which the one modifies the other according to a reciprocal shaping process that evolves continuously [27].

The relationship between populations and landscape is close and complex, consisting of semanticisation and renovation processes, as well as of recontextualization, appropriation and re-appropriation of the landscape [27], [12]. According to this, the landscape does not coincide with the material reality (hence with the territory). It is rather an interpretation, the result of the elaboration of objective character of the environment (natural or anthropic) on the basis of socio-cultural mediators linked to the sense of identity recognized by a society on a certain type of environment. Therefore, it depends on subjectivity of the observer.
Since the concept of landscape has evolved towards a subjective dimension, it has incorporated issues concerning the representation, the perception, the aesthetic and a wider existential meaning [1]. In this sense, the landscape is the peculiar physiognomy of a territory resulting from the juxtaposition of physical, anthropic, biological, and environmental elements. Indeed, it is unavoidably linked to the observer and to the way it perceives and lives.
Perception is a process of organizing and processing information obtained through the sense that fits between the subject and the place [16]. S. Kaplan [15] defines information as the key to survival, essential for the construction of the meaning of the place. Perception can be considered as an orientation tool with which responding to the environment [14]. It is adaptive, selective, dynamic, interactive and individual [18], because there are relations of mutual influence between a person and his physical environment. Perception plays an essential role in their understanding [10], [28], [25]. The terms and the timing of perception are influenced by previous individual experiences, by cultural, social and economic aspects, and by the characteristics and by the complexity of the subject that has to be perceived [17].
Therefore, perception is not the result of a predominance of external reality that imposes forms and structures to our senses and to our cognitive apparatus, but it contributes actively to the definition of these forms and structures. In this sense, first of all the perception is the result of a series of processes of mediation between the physical object and phenomenal object, in which the function of the parts is determined by the organization of the whole and vice versa [22]. Consequently, the exploration of perception is a research subject as complex as useful to guide planning decisions on urban and regional intervention.
In recent years it has increased the attention of scholars through this research area after a certain period of abandonment, linked also to its debut in the field cognitive psychology. However, it still remains an interesting issue to investigate in referring to the methods and the outcomes related to them. Then, it becomes significant to reconstruct the framework of the relevant scientific literature through the literature review of the most significant works produced in this research area. This paper reconstructs and analyses the network of citations between indexed articles present on the main reference database dealing with the issue of perception.
Therefore, it becomes relevant discuss the scientific literature through the bibliographic analysis of the most significant works produced in this research area. This paper investigates the network of citations between indexed articles on landscape perception from the main reference database.
The informatisation of citation data within the last decade has made the citation analysis an increasingly used and widely accepted approach for assessing the performance of individual scholars and their institutions as well as the reputation of the scholarly publications to which they contribute.

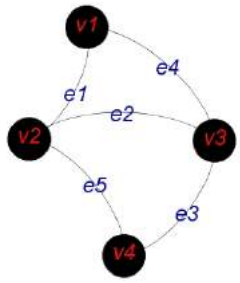
2. The bibliographic analysis techniques

The use of automated systems for support to knowledge were introduced by Eugene Garfield [11] to reconstruct and analyse the progress and the evolution of research in human genetics after the discovery of DNA [3], [5]. Since then, the techniques of analysis of scientific networks have evolved considerably and have been applied in many research areas such as the development of R&D Network-Research and Development Network [13].
The number of citations of a scientific paper is the factor that determines the permanence or the transience of a publication in the visibility window of a citation network. Indeed, since the pioneering works of the 70's, within the scientific cyberspace it was possible to identify frequently recurring structures of citations as based on works with high numbers of citations. Other papers, instead, tend to be marginal and to have a transitory nature in the scientific landscape [21]. The more the scientific community consider important an article, the more is the number of citations it receives. Consequently, these become more visible within the database, increasing the chances of being read and cited, and triggering a process known in sociological disciplines as "snowball effect ".
Nevertheless, in particular research areas like physics or genetics, these processes can be interrupted abruptly by creating sudden and significant changes in the citation network as a result of important scientific discoveries, or of external causes that seriously affect on future development [8].
The concept of "network bibliography" is derived from the use of the graph theory for the analysis of citations between articles, authors and keywords to understand how the authors and their papers influence each other [6], [13], [9], [24]. A bibliographic network is a system that can be represented

and analysed through abstract mathematical structures called graphs, composed of nodes and arcs [7]. In mathematical language a graph G is a triple consisting of a non-empty set of vertices V (G) (also called nodes), a set of arcs E (G) disjoint from the set V (G) and a relation of incidence ψ, which associates each arc in a pair of vertices, said arc extremes [7].
A graph can be described in three different ways: a) through its mathematical formalisation; b) through its graphical representation; c) through its representation in matrix form, namely through its adjacency matrix A (G) and its incidence matrix M (G) that are binary structures that respectively represent the absence or presence of an arc between the vertices v (G) in the first case, and the incidence of the arcs and (G) on the vertices v (G) in the second case (Fig.1) .

G={V(G); E(G); ψ(G)}

V(G)={v_1;v_2;v_3;v_4}
E(G)={e_1;e_2;e_3;e_4;e_5} con
ψ(G)={$\psi_G(e_1)$= v_1,v_2; $\psi_G(e_2)$= v_1,v_3; $\psi_G(e_3)$= v_2,v_3; $\psi_G(e_4)$= v_2,v_4; $\psi_G(e_5)$= v_3,v_4}



	e1	e2	e3	e4	e5
v1	1	0	0	1	0
v2	1	1	0	0	1
v3	0	1	1	1	0
v4	0	0	1	0	1

Mathematical representation | Graphic representation | Representation by incidence matrix

Fig. 1: the tree mainly graph rappresentation

A graph can be defined in geographic terms if the nodes are georeferenced; otherwise it is a topological graph. A graph can be oriented if there are obligations or rules that determines the direction of an arc (as in the one-way street). A graph can be weighed if it is possible to assign different importance to the arcs [7].

3. Data and Method

The methodology can be summarized in three steps: a) construction of the entire data base containing all the information that can be used (authors, title, keywords, journal, year of publication, references, etc.); b) extracting information for analysis and their reconstruction by means of graphs; c) analysis of graph properties.
The data collection has been initiated by selecting a small number of publications (Alfa paper) considered significant by the scientific community operating in the research area of perception and representation (Tab.1).

Alfa paper	**Google Scholar (G); Web of Science (TR) citations**
Kaplan, Stephen (1979). "Perception and landscape: conceptions and misconceptions"	221 G; - TR
Scott, M. J., & Canter, D. V. (1997). Picture or place? A multiple sorting study of landscape. Journal of environmental psychology, 17(4), 263-281.	140 G; 57 TR
Carles, J. L., Barrio, I. L., & de Lucio, J. V. (1999). Sound influence on landscape values. Landscape and urban planning, 43(4), 191-200.	233 G; 65 TR
Bishop, I. D., & Rohrmann, B. E. R. N. D. (2003). Subjective responses to simulated and real environments: a comparison. Landscape and urban planning, 65(4), 261-277.	130 G; 48 TR
Tveit, M., Ode, Å., & Fry, G. (2006). Key concepts in a framework for analysing visual landscape character. Landscape research, 31(3), 229-255.	226 G; 99 TR
Van den Berg, A. E., & Koole, S. L. (2006). New wilderness in the Netherlands: An investigation of visual preferences for nature development landscapes. Landscape and Urban Planning, 78(4), 362-372.	135 G; 74 TR
Dramstad, W. E., Tveit, M. S., Fjellstad, W. J., & Fry, G. L. (2006). Relationships between visual landscape preferences and map-based indicators of landscape structure. Landscape and urban planning, 78(4), 465-474.	226 G; 111 TR
Natori, Y., & Chenoweth, R. (2008). Differences in rural landscape perceptions and preferences between farmers and naturalists. Journal of Environmental Psychology, 28(3), 250-267.	53 G; 23 TR

Buijs, A. E., Elands, B. H., & Langers, F. (2009). No wilderness for immigrants: Cultural differences in images of nature and landscape preferences. Landscape and Urban Planning, 91(3), 113-123.	121 G; 55 TR
Swanwick, C. (2009). Society's attitudes to and preferences for land and landscape. Land Use Policy, 26, S62-S75.	89 G; 25 TR
Hofmann, M., Westermann, J. R., Kowarik, I., & van der Meer, E. (2012). Perceptions of parks and urban derelict land by landscape planners and residents. Urban Forestry & Urban Greening, 11(3), 303-312.	38 G; 23 TR
Soini, K., Vaarala, H., & Pouta, E. (2012). Residents' sense of place and landscape perceptions at the rural–urban interface. Landscape and Urban Planning, 104(1), 124-134.	50 G; 18 TR
Cain, R., Jennings, P., & Poxon, J. (2013). The development and application of the emotional dimensions of a soundscape. Applied Acoustics, 74(2), 232-239.	35 G; 11 TR
Liu, J., Kang, J., Behm, H., & Luo, T. (2014). Effects of landscape on soundscape perception: Soundwalks in city parks. Landscape and Urban Planning, 123, 30-40.	16; 8 TR

Tab. 1: Alfa papers

Successively, for each of the Alfa articles has been identified the cited articles (A.Cit) and the papers that mention them (B.Cit). The research has been extended cascading identifying the papers cited by A.Cit (C.Cit) and the papers mentioning the B.Cit (D.Cit) (Fig2-3). In this way, it has been defined a chronological structure of citations between documents containing 518 publications. The data collection has been completed by identifying for each document previously selected the corresponding ISI.file within the ISI Web of Knowledge portal owned by Thomson Reuters that contains all information related to an article (authors, title, keywords, bibliography, abstract , year, magazine, etc.) coded by identification tag within the standard electronic structures. The second step has been the extraction of data from ISI.file and the subsequent reconstruction of the related network with the identification of the entire system of relations between all of the documents identified in the previous phase.
This automated procedure has been supported by the Sci2Tool platform, made by the Cyber-infrastructure for the Network Science Center - Indiana University (USA). From the previous network of 518 ISI.file, thanks to the list of references contained in each ISI.file, it has been possible to create a new network containing 19,658 publications and 29,470 links of mutual citations.
The SCI2 Tool platform allows creating many types of bibliography networks such as citation networks between articles, authors and keywords; or by crossing these categories it allows to identify the keywords most used by an author or in a magazine.
In this paper the data on publications and keywords have been extracts, getting the corresponding citation networks between articles of keywords contained in the articles.
The third phase - the most complex - has been the analysis on the networks, executed using the graph theory. The graphs obtained differ in characteristics and in investigative. Consequently, they also diverge for the tools used in the analysis (Tab. 2). Specifically, for both networks it has been executed an analysis on the degree of the node (Degk). It has also executed the Community Detection (CD) in the network of articles. This analysis were executed with the support of the software Ghepi [2].

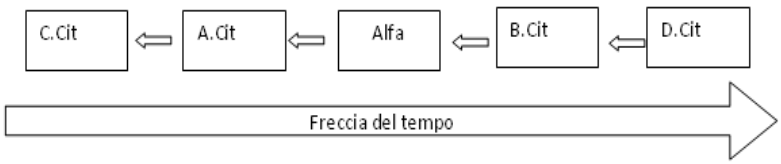


Fig. 2: Building first network model from Afla papers

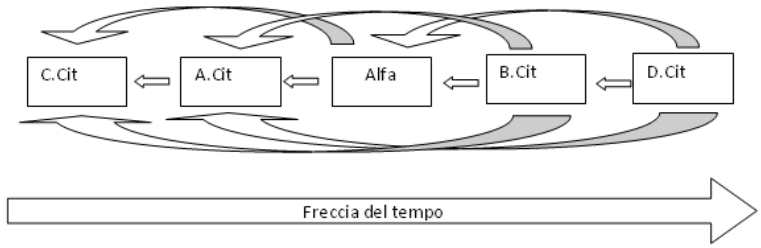


Fig. 3: Final network building model

Network	Investigation question	Type of graph (G) used			Analysis	
					Deg	CD
Papers network	Which are the most influent works?	G. Topologic	Oriented	Not weigh	yes	yes
Keywords networks	Which are the main areas of research?	G. Topologic	Not Oriented	weigh	yes	NO

Tab. 2 : Networks constructed for analysis: graph types and tools used

4. Analysis

Both of the graphs are topological, since it would not make sense to assign geographical information to the nodes. The capability of influence of an article can be quantified by calculating the degree of DegKi of vi(G) as the number of connections e (G) to it connected [7].

$$k_i = \sum_{j=1,n} a_{ij}.$$

The network of articles has been processed using an oriented graph, because it occurs the condition aij ≠ aji. In other words, if the item "A" cites to the article "B", it is impossible that it is also verified the opposite condition, i.e. the paper "B" cites the paper "A". Hence, the previous indicator will separate into "incoming degree" (**Deg**K_i^{in}) and into "outgoing degree" (**Deg**K_i^{out}) where the first indicates the number of papers cited in the examined article, the second is the number of citations received by the other works. Therefore, it is valid the rule that [7]:

DegK_i^{TOT}**= Deg**K_i^{in} **+ Deg**K_i^{out}

Hence, the total degree of a node is equal to the sum of the citations that are made and received. Finally, the graph is not weighted, so the citations are of equal importance. A future development could associate weights to particular categories of items or topics.
The graph of the keywords quantifies the rate at which two key words appear together on the same document; in this case, so it is bi-directional relationship $a_{ij}=a_{ji}$. However, this structure differs from the first to the weight of the arcs $e(G)^w$. Finally for the graph of the papers it was executed the analysis of the Community Detection (CD) using the algorithm Louviain [4]. This procedure creates clusters (Communities) of articles on the basis of different density of citations in the graph. Therefore, it creates the Communities where it is maximum the density of citations between articles and where it is simultaneously minimum the number of citations between articles from different Communities.

5. Results

The analysis of the network of articles, composed of 19658 nodes and 29470 arcs, has provided two types of information.
On the one hand, it has identified the papers that most influence the scientific landscape, highlighting the emerging of new articles even more relevant than those chosen during the initial stages, i.e. Alfa articles.
On the other hand, it has confirmed the initial choice of some of the articles, based on the opinion of experts in the field. It can be observed that 4 Alfa articles in the 14 firstly chosen are among the top 10 most cited in a network of nearly 20,000 publications. Furthermore, as it was expected, it is possible to

highlight a discrepancy between the number of quotes provided by Google and Thomson Reuters systems and the results of our network. It is possible to explain this fact in two different ways. Firstly Google Scholar uses many databases, also not indexed. Secondly the construction of the network is based on the information provided by 518 ISI.file considered as "active" documents, that is which produce information, while the remaining nodes are derived from the first. For this reason, deficiencies can be produced. The following table will indicate the 10 most cited articles (Tab3).

Most cited articles (Odrder by DegK_i^{out})	**DegK_i^{in}**	**DegK_i^{out}**	**DegK_i^{TOT}**
Daniel T.C, 2001, "Whither scenic beauty? Visual landscape quality assessment in the 21st century", *Landscape and □rban Planning*, Vol. 54,	113	154	267
Kaplan R, 1989, *The Experience of Nature*	0	100	100
Dramstad W.E., 2006, "Relationships between visual landscape preferences and map-based indicators of landscape structure". *Landscape and □rban Planning*, Vol. 78, (Alfa paper)	61	93	154
Daniel T.C., Meitner M.M., 2001, "Representational validity of landscape visualizations: the effects of graphical realism on perceived scenic beauty of forest vistas", *□ournal of Environmental Psychology*, Volume 21, Issue 1.	47	87	134
Arriaza M, 2004, "Assessing the visual quality of rural landscapes", *Landscape and □rban Planning*, Vol. 69.	0	68	68
Van Den Berg Ae, 2006, "New wilderness in the Netherlands: An investigation of visual preferences for nature development landscapes", Landscape and Urban Planning, Vol. 78, (Alfa paper)	56	64	120
Carles J.I., 1999, "Sound influence on landscape values", Landscape and Urban Planning,, Vol. 43, (Alfa paper)	25	59	84
Gobster PH, Nassauer JI, Daniel TC, Fry G., 2007, "The shared landscape: what does aesthetics have to do with ecology?", Landscape Ecology, Vol. 22,	18	56	74
Scott Mj, 1997, "Picture or place? a multiple sorting study of landscape", Journal of Environmental Psychology, Vol. 17, (Alfa paper)	46	52	98
Appleton J., 1975, *The Experience of Landscape*	0	46	46

Tab. 3 : Most cited articles

The subsequent CD analysis has identified groups of papers that tend to be cited more frequently with each other, providing an early indication on the main themes of the scientific research on landscape. The analysis has identified 14 Community composed of a different number of articles (TAB. 4). The specific indicator of Modularity [4], equal to 0.646, expresses the goodness of the clustering of the graph.

Community	**Nodes**	**Arcs**	**% Nodes**	**%Arcs**	**Main topics**
1	6975	11107	35,48	37,69	Visual Scenic; Landscape Evaluation; Preferences
12	3434	4109	17,47	13,94	Urban green space; Human well-being
7	2160	2866	10,99	9,73	Public Space Project, Urban Forest
11	2036	2208	10,36	7,49	Sound Landscape; Preferences System; Assessment
4	1162	1341	5,91	4,55	Risk Perception; Urban neighbours
Resto	3891	7839	19,79	26,60	Not Defined
Tot	19658	29470	100	100	

Tab. 4 : Main Communities and their main research topic

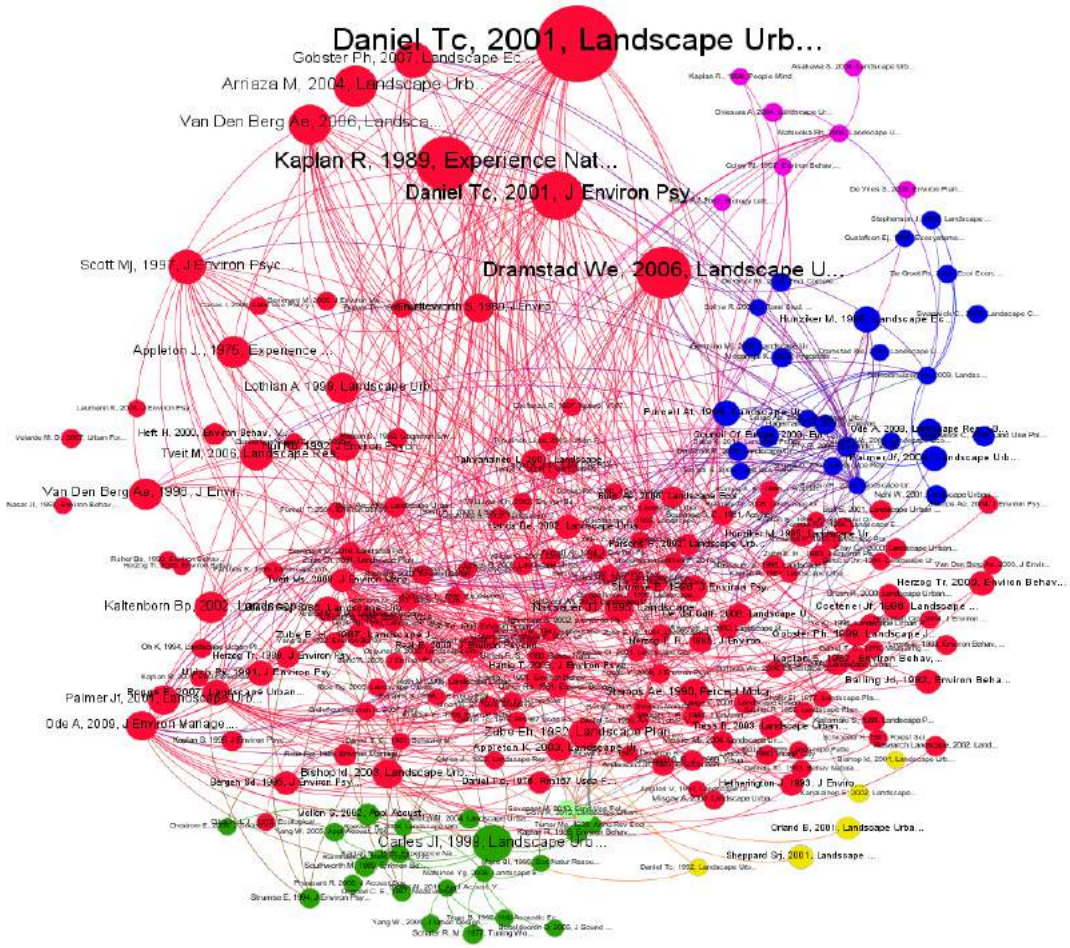


Fig. 4: Network of articles with at least 10 citations in the main 5 Communities distinguished by colours. The dimension of the nodes is proportional to the number of citations

The deepening of the analysis on the key Communities by the reading of their main articles has identified the most significant research topics, as the individual and collective visual preferences, the aesthetic and the visual assessment. The dominance of the visual aspect confirms the Porteous studies [20], in which the visual perception has been considered the medium through which the environment is perceived. The wellbeing related to green spaces and the broader issue of Ecosystem Services are equally relevant, as well as the soundscapes and the risk perception. The remaining Communities consist of items too heterogeneous to be able to extract homogenous information about their content.

The analysis of the graph of keywords confirms these indications. Overall, the graph consists of 1614 nodes and among these it can be counted 5362 arcs. By analysing the graph, it emerges a lack of connection between the words: “landscape preferences” (most frequent keyword), “landscape change”, “ecosystem service” (second keyword by frequency), “perception”, “biodiversity”. Furthermore, it seems to be relevant the scientific attention towards the issues of perception, landscape quality and sustainability in landscape planning. In fact, there is another strong relationship between words: “landscape planning”, “landscape perception”, “GIS” “landscape assessment”, “scenic beauty”. Perceptive aspects obviously concern the quality and the beauty of the landscape, as confirmed in the triangulation between words “scenic beauty”, “landscape assessment”; and “landscape” with “aesthetics” and "visualisation". In the graph of keywords (Fig. 5) the size of a node is proportional to the frequency of the word; the arc width is proportional to the frequency with which the connected nodes appear together on the same article.

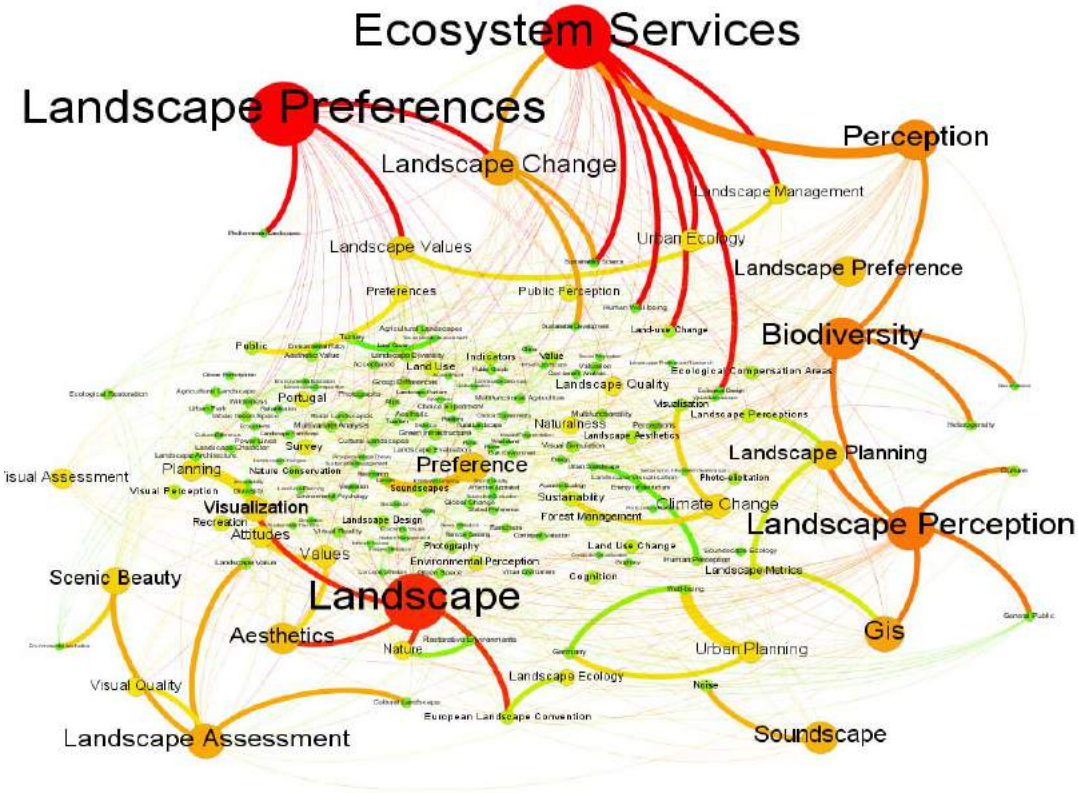


Fig. 5: Graph of the keywords

Keyword	Frequency
Landscape Preferences	161
Ecosystem Services	110
Landscape	97
Landscape Perception	74
Biodiversity	71
Perception	68
Landscape Change	60
Gis	60
Landscape Assessment	58
Soundscape	54
Aesthetics	52
Preference	50

Tab. 5 : Main key words

6. Conclusions

This paper, based on quantitative analysis of the bibliography, has allowed obtaining a framework of the main themes of research in the scientific panorama of the landscape perception and of the landscape visualisation, as the predominance of the visual perception and of the preferences for green spaces, in reference to their contribution to the psycho-physical wellness.
The initial selection of articles was made on the basis of the subjective opinion of experts of the sector, and it has led to the identification of numerous other different articles that have proved to be even

more relevant and influential in the search compared to those firstly chosen. This result confirms the validity of the research method. Indeed, in analysing networks such extensive and complex as bibliographic networks, the initial choice of articles seems not to be so determinant for results.

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The transitional semi-open spaces in public British colonial architecture of Cyprus: a socio-environmental approach

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Abstract
During the British rule in Cyprus (1878–1960), the colonial administration commissioned many public and bureaucratic buildings, the vast majority of which incorporate semi-open spaces – a major spatial component of the material culture of the island. Semi-open spaces acquired new typologies and forms, inspired by the colonial style, modernist vocabulary and historic-revival styles. In parallel, re-interpretations of local solutions —constituting a diachronic characteristic of the architecture of Cyprus— were developed in an effort to integrate the semi-open space design into the historical, cultural and climatic context of the island. Under these conditions, "hybrid" semi-open forms emerged giving new social meanings and environmental dimensions to the urban realm. This paper presents the main findings of a study on the various semi-open spaces in British colonial buildings in Cyprus from 1878 to the interwar period. It examines how the identified architectural styles of semi-open spaces —including spatial configuration, form, typology and morphological features— correlate with microclimate dynamics and social behaviour. The aim is to highlight the significance of the semi-open spaces of these buildings in sustaining the community, culture and environment.

Keywords: semi-open spaces; British colonial architecture; socio-environmental design; classification; Mediterranean region; Cyprus

1. Introduction

Throughout the centuries, semi-open spaces constituted significant elements in the Mediterranean culture. Historically, their presence can be traced back to antiquity. These spaces originate in the ancient Greek civilization, and were extensively developed during the Classical and Hellenistic periods [1] in the form of *stoa* i.e. a free standing colonnade, *prop□lon*, i.e. entrance porch and *h□post□le hall*, i.e. a system of free standing columns. Numerous as their types, these spaces developed over the centuries into various typologies to meet different cultural, climatic and social demands. Sinou (2007) [2] notes that the South Europeans' Mediterranean mentality favours the use of outdoor spaces and the outdoor performance of many everyday life tasks on a regular basis, in contrast to Northern Europeans who use open environments less frequently. According to the author, this behavioural pattern would probably result in the more frequent use of semi-open spaces in Southern European cultures as opposed to Northern European ones.
The climate of Cyprus with its generally mild winters and hot summers, as well as the temperament of people, who perform many aspects of their life outdoors, favoured the wide use of semi-open spaces. The evolution of these distinctive architectural elements can be traced in the ancient remnants of the Roman gymnasiums, fora, temples and villas, as well as in the rich medieval past of the island, in the Byzantine ecclesiastical buildings, in Latin (Frankish and Venetian) cathedrals, markets, loggias and palazzi, and in Ottoman inns, mosques and mansions. During the British rule (1878–1960), this long tradition of semi-open spaces continues and is reflected in administrative, cultural, educational buildings and health centres, as well as in residential complexes. Nevertheless, from mid-20th century onwards, these special spaces are scarcely included in the architectural and urban planning agendas, while, at the same time, the existing semi-open spaces are neglected and underused.

Many scholars highlight the social benefits of such public semi-open spaces, including markets, traditional covered passages, and arcades [3, 4]. These places provide spaces for social interaction and exchanges, enable social diversity and support community spirit. In environmental terms, the positive thermal effects of semi-open spaces are widely acknowledged from vernacular architecture [5, 6]. Such effects include microclimate control through shading, appropriate orientation and high level of enclosure. Despite the increasing scientific interest on the social and environmental qualities of semi-open spaces, the studies of these two variables are commonly separated not allowing an integrated approach that could provide insight to both aspects. Bay et al (2006) [7] and Wang Bay (2008) [8] underline that there is a necessity to focus on both the social and environmental variables and investigate the way in which they are dialectically interrelated in a particular local context, in an effort to advance contemporary debates on sustainability in the built environment.

In an attempt to provide a more holistic approach, this study focuses on both the social and environmental aspects of semi-open spaces in public British colonial buildings in Cyprus from 1878 to the interwar period. Specifically, it investigates the correlation between environmental performance and social behaviour of semi-open typologies with the architectural design. The aim of this research is to contribute towards the protection and appropriate conservation of semi-open spaces, to re-establish their significance in urban planning and building design agendas in order to achieve a more thermally comfortable occupancy and form a basis for design guidelines which would bring together three major concerns in public space design: sustaining community, culture and environment.

2. Methods

Only a limited number of studies on semi-open spaces is available for the Cyprus context [9, 10, 11] and these mainly focus on vernacular residential buildings incorporating semi-open spaces. However, there is a lack in studies on semi-open spaces in non-residential historical buildings which could expand our understanding on the diversity, character, benefits and weaknesses of such spaces and could provide useful knowledge for contemporary design applications in the public space. Since numerous semi-open forms are identified in British colonial buildings in Cyprus, such buildings provide appropriate examples for the study of semi-open spaces. In the framework of this research, ten representative British colonial buildings, from all-over Cyprus, namely from the major cities and urban areas, were selected based on a set of criteria covering the variety of their architectural styles, their public use and the existence of authentic semi-open spaces (Table 1 2). The study identifies the various semi-open typologies in the buildings under study and correlates them with local, historic revival, colonial bungalow and modernist influences. These different architectural styles are considered to be the most common ones in the semi-open space design and also the most relevant to the architecture of the island during this period.

Table 1: British colonial buildings under examination

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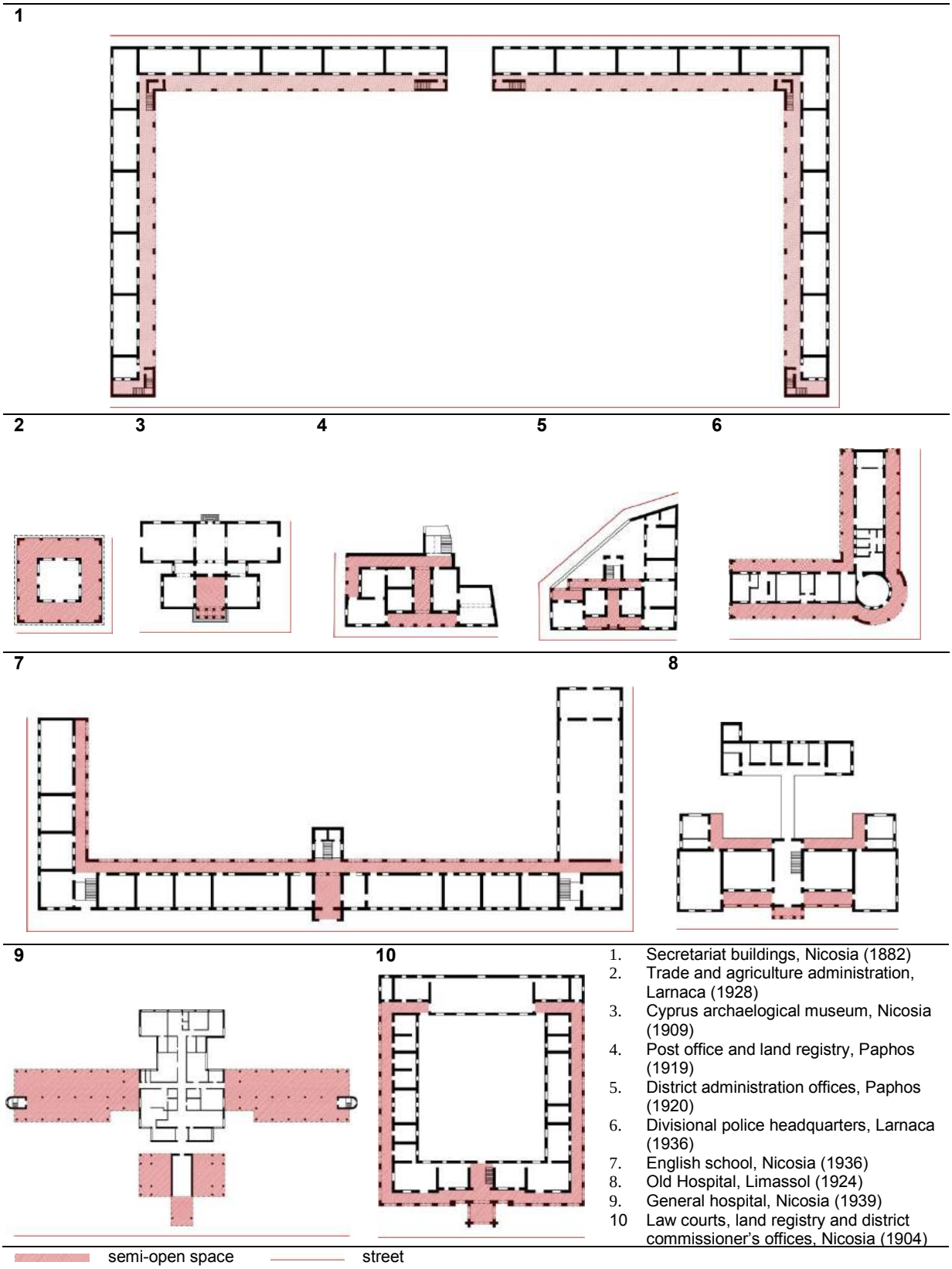
1. Secretariat buildings, Nicosia (1882)
2. Trade and agriculture administration, Larnaca (1928)
3. Cyprus archaelogical museum, Nicosia (1909)
4. Post office and land registry, Paphos (1919)
5. District administration offices, Paphos (1920)
6. Divisional police headquarters, Larnaca (1936)
7. English school, Nicosia (1936)
8. Old Hospital, Limassol (1924) (PIO Archives)
9. General hospital, Nicosia (1939) (PIO Archives)
10. Law courts, land registry and district commissioner's offices, Nicosia (1904) (PIO Archives)

Table 2: Architectural plans of the British colonial buildings under examination



The proposed methodology is based on a qualitative socio-environmental analysis through an examination of aspects related to architectural design, i.e. architectural typology, morphological elements and spatial configuration. The study of the architectural design of the semi-open spaces was carried out through photographic documentation, examination of architectural drawings and archival photo material, as well as, through a review of the relevant literature on the British colonial architecture in Cyprus. The literature review helped the typological classification of semi-open spaces recorded in British colonial buildings. The classification allowed the correlation of the architectural design of semi-open spaces with environmental aspects, such as protection from intense insolation, natural

ventilation, exploitation of solar radiation, protection from cold winds, and with aspects related to human behaviour, i.e. transitional and social activities that take place, level of public character and pedestrian interaction with indoor and outdoor space. An evaluation of the identified semi-open typologies, in terms of their adaptability to local culture, climate and way of life, followed the analysis for a more detailed exploration of the findings. In addition, for a better understanding on how architectural design regulates human behaviour, Rapoport's (1990) [12] pedestrian activity classification for the identified semi-open typologies in British colonial buildings was also employed. More specifically, Rapoport classifies pedestrian activities into two major groups: (a) dynamic (*movement spaces*) and (b) static (*rest spaces*). He argues that *movement spaces* tend to be linear, narrow and of high complexity so that they entice with hidden views, encouraging walking, strolling and sauntering. *Rest spaces* tend to be wider, frequently contain greenery and require seating facilities.

3. Socio-environmental response of semi-open spaces

During the British rule in the island, remarkable transformations were carried out in the building design and urban planning level due to the progressive social changes, the economic development, as well as to the technological advances of the 20th century. These new realities had, inevitably, a significant impact on the spatial, typological and morphological development of semi-open spaces giving new and multiple cultural, social and environmental dimensions.

Semi-open spaces in the British colonial buildings under study can be found in an I-shaped, L-shaped, U-shaped or H-shaped form, or alternatively they surround the entire building perimeter (Table 2). Entrance to the indoor space is achieved exclusively through these semi-open spaces. Even if the building is configured by long building elevations not attached to semi open spaces, these intentionally remain without any entry access (e.g. Secretariat buildings, Nicosia; Law courts, land registry and district commissioner's offices, Nicosia; English school). In these cases, semi-open spaces become a distinctive device for interaction between indoor and outdoor spaces, enabling social interaction and collective use to take place. In terms of prevalent orientation, it has been observed that the advantageous southern orientation is partly applied. It is evident that the orientation was often dictated by parameters not related to environmental criteria but on the plot size and shape, location of roads etc.

The sections below present the different typologies of the semi-open spaces identified in the British colonial buildings under study and an evaluation with respect to their environmental and social implications.

3.1 Local *iliakos* semi-open typology

The long tradition and extensive integration of semi-open spaces in public and residential buildings throughout the centuries in the island may explain the wide application of these spaces in British colonial buildings. It is evident that the colonizers adopted some local spatial, typological and morphological features of semi-open spaces in their public buildings in Cyprus providing direct references to the local vernacular architecture.

Semi-open spaces in the form of a covered enlarged corridor, defined by a series of pointed arches, became widespread during the Frankish and Venetian rule in the island (1192–1571) in the religious (e.g. cathedrals, monasteries' cloisters), secular (e.g. administrative buildings, open arched loggias in the main squares) and residential architecture. Such spaces remained a fundamental feature of the architecture of the Ottomans (1571–1878) in mosques, inns and mansions, and continued to act as a vital element in the traditional architecture in Cyprus until the early 20th century [13]. This distinctive traditional semi-open space, known as *ilia□os*, i.e. sunspace, is based on a linear compact design and an introverted space organization, i.e. facing an internal courtyard (Table 3).

The configuration of *ilia□os* was adapted by the British colonizers in several of their buildings in the island (e.g. Secretariat Buildings, Nicosia; English School, Nicosia) [14, 15]. The analysis of the ten case study buildings indicates that the early colonial (e.g. Secretariat Buildings, Nicosia) and educational buildings (e.g. English School, Nicosia) preserved the traditional introverted space organization of the arched *ilia□os*, in the form of an L or U shape peristyle. However, instead of using the conventional pointed arches, the British colonizers often applied the low-sprung pointed arches, a design solution unknown to local builders (e.g. Secretariat Buildings, Nicosia) [16]. The low-sprung arches were to be found in British colonial buildings up to the 1930s. The width of *ilia□os* in the examined buildings ranges between 2–3 m (Table 1 □ 2).

Facing the internal courtyard, this semi-open space type (peristyle) generally enjoyed more controlled microclimatic conditions than those of the outside building, i.e. protection from intense solar radiation and cold winds (Table 3). Its arched façade also offered additional shading and filtered daylight penetration. In parallel, due to its introverted design, it created a semi-public filter providing security

and control over social interaction. Its long and linear configuration encouraged walking and circulation activities and its width was adequate, in some occasions, to create a place for leisure, relaxing, sitting and gatherings as well as a space that was dialectically interrelated with the natural environment, i.e. the planted courtyard. Wang Bay (2008) [8] note that a semi-open space width greater than 3.1 m can provide a good place for social (e.g. leisure) activities while, at the same time, allowing circulation. Nevertheless, the modernization and westernization processes of the time, the general feeling of security, the changing lifestyles and influences by other imported architectural styles led to spatial transformations of the traditional *ilia os*. The street facades acquired more importance than internal elevations and thus, *ilia os* opened up to street life shifting into an extroverted design concept, while preserving its distinctive arched facades. In some cases, the linear *ilia os* appeared in both the internal and external elevation of the building, embodying both the local traditional and modern values (e.g. Divisional Police Head Quarters, Larnaca).
From an environmental perspective, the *ilia os*, when placed on the external elevations, was no longer protected by the controlled microclimatic conditions of the internal courtyard. In parallel, its configuration on the building façade allowed an airy space during summer. In social terms, the extroverted design concept implemented on *ilia os* design eliminated the visual and physical interaction with the courtyard. Thus, the relationship of the occupant with the green space, i.e. the courtyard, which contributes to psychological well-being, was disrupted. On the other hand, the extroverted semi-open space organization enhanced the public identity and interaction with the street life, while preserving the role of the semi-open environment as a distinctive device for interaction between indoor and outdoor spaces (Table 1). Its long, linear development encouraged transitional activities, i.e. circulation, walking or entrance to the building interiors. Its plan was, in some cases, wide enough to allow further activities such as sitting, resting, relaxing or social gatherings which encouraged interaction and created a sense of belonging.

3.2 *Veranda* semi-open typology

Another very common semi-open space configuration which is found in public colonial buildings in Cyprus is the one that surrounds the perimeter of the building on 3 or even 4 sides. This type of semi-open space is associated to the traditional Indian bungalow-type building, extensively applied by the British colonizers in Cyprus, as well as in many of their colonies located in the tropics. This building type provided an affordable model for building design and responded well to hot and humid climates (e.g. Law courts, land registry and district commissioner's offices, Nicosia; Trade and Agricultural Pavilion, Larnaca). The traditional bungalow-type building has distinct characteristics related to the design of semi-open spaces —namely a steep roof, a *veranda*, (2–4 m wide in the semi-open spaces under study) i.e. a projecting covered semi-open space open on three sides, and a raised base platform [17]. The British developed further the Indian bungalow-type building so as to better serve the needs of the users, offering, at the same time, architectural diversity. Specifically, in some cases the *veranda* was expanded to encircle the building and was, often, partly covered with permeable mat, brick walls, rolled or fixed shades [17]. Although such shading devices are seldom applied in the buildings under examination (e.g. Law courts, land registry and district commissioner's offices, Nicosia), they can be found in other examples of British colonial buildings in Cyprus (e.g. Old government house, Nicosia; Customs house, Larnaca).
From an environmental perspective, the bungalow-type building —as it originates from the Bengal region, India— is specifically designed to offer thermal adaptability to tropical climates where protection against rain, humidity and solar radiation form a priority. The *veranda*, with its steep roof, provides an airy and shady space, while its elevation from the ground level protects semi-open spaces and building interiors from flooding. Projecting out of the main building volume, the veranda is exposed on three sides allowing enhanced air movement which increases the cooling effect of the space (Table 3). The supplementary shading devices, applied on elevations, filter intense daylight, provide additional shade and preserve adequate air movement. Focusing on the social implications of the *veranda*, it is observed that its openness on three sides provides open visibility and physical interaction with the public space, while its linear configuration favours activities related to transition, i.e. circulation, walking or entrance. Depending on its width, it may allow activities such as sitting, resting, relaxing and can provide gathering opportunities. The *veranda*, surrounding the outer perimeter of the building, reflects the changing lifestyles of the Cypriots and marks the departure from the traditional private-based development of semi-open spaces, towards a more public-based one, as stressed in the previous section.

3.3 *Propylon* semi-open typology

A different typology of semi-open space that appears in the British colonial buildings is the *prop lon*, which forms a rather limited projection of the main façade of the building. *Prop lon*, i.e. an entrance

porch, is a neo-classical element inspired by the ancient Greek civilization. The neo-classical style became popular in the island in the early 20th century in schools and town villas in particular, and developed interactively with the local architecture. This style was associated with the principles of symmetry, balance and monumental appearance. Being largely developed in the island's ancient civilization, the neo-classical semi-open typologies reflected the essence of the Cypriot way of life and culture. In this framework, neo-classical features were incorporated in the design of Cyprus's archaeological museum in Nicosia. These features *provided a symbolic reference to the island's historic origin* [15] (Table 1 □ 2). Nevertheless, the British colonial administration only used the neo-classical style in the case of the Cyprus archaeological museum, since this style represented a close connection with the Greek-Cypriot aspirations for union with Greece and was thus directed towards a very specific expression of ideology [16]. The Cyprus archaeological museum consists of a full-height, deep shady Ionic *prop□lon* in Pentelic marble (5.3 m width, 7.7 m depth), based on the prototype of Athena Niki temple of classical Athens [13]. It is a tetrastyle Ionic porch open only on one side.
Investigating the effect of architectural design of the *prop□lon* on microclimatic conditions, it is clear that its wide, spacious plan layout and high level of enclosure can provide sufficient protection from intense insolation and mitigation of temperatures during the summer (Table 3). Due to its high floor-to-ceiling height, the *prop□lon* allows thermal stratification and decreases the transfer of heat gains through the ceiling. The cooling effect of the room height is greater in spaces with high ceilings where stratification of the air allows occupants to inhabit the lower space. Due to its large depth, some limitations occur with respect to solar penetration during winter. With respect to the effect of the *prop□lon* design on human behaviour patterns, it is argued that its spacious plan layout and its high level of enclosure allow the formation of seating areas, encouraging social interaction and provide a waiting, gathering area, meeting-place and a place for pause. For example, the available seats placed on either side of the *prop□lon* in the Cyprus archaeological museum create more opportunities "for staying" and invite visitors to linger.

3.4 *One* or two-storey *loggia* and *central hall* semi-open typology

In a number of British colonial buildings, new types of semi-open spaces unknown to local culture are observed, including (a) the *loggia* placed in a recess at the main façade (open on one side) in front of building entrances and (b) the two-storey *loggia* , i.e. placed in two recesses at the ground and first floor. The two-storey loggia is often defined by round arches (arcaded) at the ground level and a row of columns at the upper level (colonnaded). These semi-open space typologies were often defined by stone balustrades at ground and upper level, while their width ranged between 2 to 3 m (Table 1 □ 2). These are considered as imported features to the island and were found in buildings with evident neo-renaissance influences (e.g. District administration Offices, Paphos; Post office and land registry, Paphos; Old hospital, Limassol). The British colonizers established neo-renaissance features on a number of buildings in Cyprus, since much experimentation in revival styles took place in their mother land. Another interesting configuration, found in the cases of the District Administration Offices, as well as of the Post Office and Land Registry in Paphos, is the connection of the ground floor *loggias* with a deep central semi-open hall, open at its two opposite ends, as well as with a rear semi-open space. The configuration of a *central hall* and a rear semi-open space resembles traditional urban residential semi-open models found in local architecture, as well as semi-open forms incorporated in school buildings built in early 20th century.
The environmental qualities of the *loggia* are largely affected by the fact that this space is open on one side. As a result, the air movement is single-sided and offers additional protection from undesirable cold winter winds and summer intense insolation compared to projecting semi-open typologies exposed on three sides (e.g. the verandas of bungalow-type buildings) (Table 3). However, this configuration prevents the summer breezes which improve users' thermal sensation. On the other hand, the semi-open central hall is a distinctive environmental feature of the building. Its openings at the opposite ends, and its deep plan, favour effective cross-ventilation (breezeways) during the hot, summer period while its rather narrow open sides produce a cooling effect by wind acceleration. The social dimensions of the *loggia* relate to the sense of enclosure created, which provides an ambiance for sitting, resting and relaxing when the space is wide enough. The balustrades, often defining *loggias*, produce a visual, physical and psychological barrier between the street and the semi-open space forming a semi-public filter. On the other hand, located at the heart of the building, the *central hall* serves circulation and functions as a place for various social activities.

3.5 *Pilotis* semi-open typology

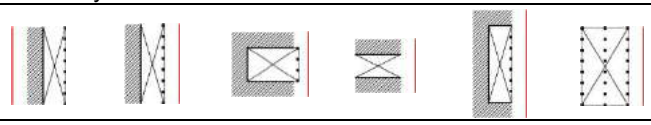
Pilotis, a system of free-standing columns (open on four sides) forming the ground level of a building, constitutes a new type of semi-open space that belongs to modernism's international aesthetic which was introduced in the island in the early 1930s [18]. It became accessible to cars, allowing pedestrian

movement at the same time. The idea of *pilotis* was applied in public buildings in Cyprus commissioned by the British colonial administration (e.g. Nicosia General Hospital) and later became more widely used in residential architecture (Table 1 □ 2).

The microclimatic analysis indicates that *pilotis* allows unobstructed air movement due to its exposure on all four sides, which may create pleasant summer breezes and thus improves thermal comfort conditions [2]. In addition, this space, located beneath the upper storey, is thermally insulated by the building itself (Table 3). Although offering the potential for a cool and breezy semi-open space during the summer period, *pilotis* may adversely affect the thermal performance of indoor spaces since it does not serve as a shading feature on the buildings' elevations. In terms of social qualities, the *pilotis* benefits from the free movement of the pedestrians at ground level. Its spacious proportions allow various social activities to take place, even though its large depth could diminish the visual and physical interaction with street life. □et, one important point to consider is that the *pilotis* typology lost

Table 3: Correlation of architectural design with aspects of human behaviour and environmental design in the varied semi-open typologies in the British colonial buildings under study

street



	Ilia□os	*Veran.*	*Prop.*	*C. □all*	*Loggia*	*Pilot.*
Environmental Aspects						
Protection from intense insolation □shading □ temperature mitigation□						
high level of enclosure (open on one or two sides)	•		•	•	•	
introversion	•					
compactness	•		•	•		
deep plan			•	•		•
under upper storey room				•	•	•
arches	•				•	
fixed or rolled shades		•				
steep roof		•				
high floor-to-ceiling-height			•			
Natural ventilation □cool breezes□						
high level of exposure (open on three or more sides)		•				•
extroversion		•	•		•	•
open at its opposite ends/narrow open ends				•		
Exploitation of solar radiation □solar passive heating□						
high level of exposure (open on three or more sides)		•				•
extroversion		•	•		•	•
shallow or wide plan	•	•			•	
Protection from cold winds □wind barrier□						
high level of enclosure (open on one or two sides)	•		•	•	•	
introversion	•					
compactness	•		•	•		
Aspects of human behaviour						
Transitional activities □circulation, entrance to the building□						
long and linear plan	•	•				•
pedestrian-only route	•	•	•	•	•	
Social activities □sitting, gathering, resting, relaxing, chatting, waiting, pause□						
wide plan			•	•		•
high level of enclosure (open on one or two sides)	•		•	•	•	
sizeable/spacious			•			•
pedestrian-only route	•	•	•	•	•	
Public character						
same level to street	•		•			•
without balustrade	•	•	•	•		•
high level of exposure (open on three or more sides)		•				•
interaction with street		•	•	•	•	•
Interaction with indoors, semi-outdoors and outdoors						
interaction with indoors	•	•	•	•	•	
interaction with outdoors (street)		•	•	•	•	•
interaction with semi-outdoors				•		
interaction with outdoors (natural environment)	•					

its function as a transitional space between indoors and outdoors and its quality as pedestrian-only route. Due to its isolation, in many cases, it ended up as a parking space weakening its potential to support a significant social role.

4. Discussion and conclusions

The variety of semi-open typologies (*ilia os, veranda, loggia, central hall, prop lon* and *pilotis*) in British colonial architecture in the island, carries the footprints of the modernist, local vernacular, historic revival and colonial style vocabulary. These styles were often combined together, embodying and interlocking social, cultural, aesthetic and environmental concerns, as well as, symbolic meanings and modern trends. For instance, the colonial bungalow encircling *veranda* with its steep roof was often combined with the pointed arches extensively applied in local vernacular architecture (e.g. Trade and Agricultural Pavilion, Larnaca). In other cases, the *loggia* was combined with a semi-open *central hall* or a *central hall* was configured along an introverted type traditional *ilia os* (e.g. English school, Nicosia). This blend of architectural expressions, and the different types of semi-open types, generated "hybrid" forms producing microclimatic diversity, multiple levels of social interaction and filters of public or semi-public identity.

The British revolutionized the traditional introverted semi-open typology, by introducing an extroverted design concept which allowed visual and physical connection of semi-open spaces with street life. The extroverted design model, which reflected the westernization processes and the changing lifestyles of the period, gradually changed the introverted character of semi-open design and strengthened its public identity. However, the extroverted design model prevented the interaction of semi-open environments with the internal courtyard which offered microclimatic and psychological advantages.

The direct references to vernacular architecture, reflected in the use of traditional morphological features, typological elements and spatial configurations, such as the *ilia os* typology and the peristyle courtyard type of building, reveal more prominently an intention to incorporate the semi-open design into the historical, climatic, social and cultural context of the island. In addition, some semi-open models, although imported, were clearly highly connected to the social and climatic context of the island as well. More specifically, the *verandas* of the bungalow-type building enabled climatic adaptation and expressed the identity of the locals, very closely related to semi-open environments. Furthermore, the concept of the semi-open central hall embodied practical, environmental and social values which reflected the local traditions and culture. In other cases, the semi-open space design was principally employed to show monumentality, to highlight the building's entrance, to enhance aesthetic value, to create rhythm and to give a decorative effect, as seen in the concept of the two-storey *loggia* and neo-classical *prop lon*. In these cases, functional, social and environmental requirements took a secondary role. Whereas the two-storey *loggia* of the façade displayed mainly stylistic concerns, the use of the neo-classical *prop lon* provided direct reference to the island's past, communicating symbolic meanings. Still, other typologies, such as the *pilotis*, mainly represented the fascination for the new world of automobiles which led to a car-oriented design of semi-open spaces and reflected an international aesthetic — not necessarily tied to the local culture, way of life and climate.

In the framework of this analysis, it becomes evident that the different types of semi-open spaces identified in British colonial buildings could meet diverse social and environmental needs. The variety of pedestrian activities and the level of climatic response are in fact determined, to a great extent, by the typology, spatial configuration and morphological features of semi-open spaces. More specifically, spaces that have an increased exposure, i.e. are exposed on three or four sides, have a linear, long, narrow plan layout and are described by extroversion, they enjoy a high public character and principally allow transitional activities, such as circulation, walking and entrance to the building. If these linear structures are wide enough, they further form spaces of social activities, i.e. sitting, resting, relaxing, leisure areas, gathering areas etc. Semi-open spaces that are largely enclosed, i.e. are only exposed on one side and are wide enough, they obtain a rather semi-public identity providing principally areas for pause or meeting and gathering places or waiting areas. This latter configuration strengthens the social role of semi-open environments by providing more opportunities for social interaction. It is evident that the various semi-open space designs may be inhabited and used differently, while they may influence the way of public social life. These interpretations are in line with Rapoport's ideas regarding the way in which architectural design regulates pedestrian activity. Based on his classification, *prop lon* and *loggia* can be regarded as *rest spaces* which encourage static activities, while *central hall*, *ilia os*, *veranda* and *pilotis* —depending on their width— can be considered as both *rest* and *movement spaces* which allow both static and dynamic activities.

The analysis of microclimate dynamics in this study indicates that the spaces that are more enclosed, introverted and compact with substantial width, maximize the potential for shading, protection against cold winds and thermal stability, whereas spaces that are more exposed and extroverted, with shallow plans, maximize natural ventilation and solar penetration. In these conditions, semi-open spaces with

varying geometrical features can provide environmental diversity allowing a more comfortable and longer occupancy in the public domain. It is thus demonstrated that even if semi-open spaces occupy a small area of the urban outdoor space, they can act as climatic moderators contributing to thermally comfortable environments.
Overall, it may be argued that there is a strong correlation between architectural design of semi-open spaces and socio-environmental behaviour. Thus, the process of critical re-establishment of semi-open forms in building and urban planning design agendas is of particular importance since it could provide a better synergy between climate-responsive, socially-conscious and culture-based architecture.

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THE SUBURB WILL SAVE BEAUTY
From unvolumetric architecture to undervolumetric architecture

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Abstract
The idea of perfection and circularity contained in the etymology of the word *periferia* (suburb) is the foundation of the latest trends in the field of urban regeneration: where the role of positive energy reservoir capable of rising up to new aesthetic values is conferred upon the suburb.
It is in the will to recognise the seed of beauty hidden in the newer parts of the building and amplify the not only symbolic charge, but also social and economic one, which has its roots in the *Pro□ect for beaut*□ that the entrepreneur Brunello Cucinelli is implementing in Umbria at the foot of the village of Solomeo, where □he has enacted a fantasy of beneficent feudalism□(so as noted by *The New □or□er*).
The idea is as simple as it is effective: an area of about 11 hectares, compromised from a landscape point of view because occupied by six major industrial warehouses of a mediocre nature (for a total of 240,000 cubic metres), was purchased by the □Brunello and Federica Cucinelli Foundation□in order to restore to the territory its identity by demolishing the industrial buildings that have fallen into disuse and will leave space for a system of three urban parks aimed at restoring a *green belt* suited to clearly mark the insurmountable barrier between the city (where one can build on existing buildings) and countryside (where a natural landscape can be reconstructed).
This article aims to investigate the case study of Solomeo, putting this business operation in the context of theories on urban regeneration with zero volume by recognising the utility of demolition / reconstruction work: an urban regeneration strategy condemned by negative judgments with which historical criticism, perhaps too hastily, censured the interventions of rarefaction building perpetrated during the Fascist period.

Keywords: suburb, identity, beauty, demolition, urban regeneration

□A complete confusion of ideas reigns over the demolition of Rome. Sixty years too late (...) if you wish to mimic Haussmann: in this, the cultural backwardness of the Fascist era is far more serious than that of the previous decade.□[1, p. VII-VIII]

The judgment without appeal with which Antonio Cederna dismisses the □demolition delirium□ practiced during the Fascist administration in the historic centre of Rome (when the tracking of new thoroughfares, aimed at the celebration of a greater representation of space and the magnification of some selected monuments, hit deep into the Medieval urban fabric erasing its volumetric presence and, with it, the complex and layered memory) has long conditioned the opinion of architects, depriving them of a strategy that, on closer inspection, is not in itself negative but must be assessed one case at a time in relation to the occasional specific nature of the regeneration undertaken. On the other hand, while □the urban and Italian architectural culture has always regarded the practice of demolition with suspicion□ [2, p. 21], the subtraction strategy should not be removed from the disciplinary repertoire. As history teaches us.
Unknown to the ancient city that expanded upon itself with successive layers based on addition-juxtaposition-overlapping processes [3], the subtraction is an urban regeneration strategy that comes hand in hand with the birth of suburbs, where its constitutive roots sink into the first examples of urban

planning in the great nineteenth-century European industrial capital cities, when sudden overcrowding on the city□s doorstep, forced governments to deal with the extreme, as well as unbearable, living conditions of the working class. A solution was found by applying drastic upgrading measures for the city to meet the new demands of its people, not only through the implementation of basic infrastructure and regeneration of unhealthy neighborhoods, but also through the demolition of walls and the repair or extension of roadways. Appealing to the restoration of excellent hygienic conditions, the cities were reorganized on the whole: Paris, Vienna, London, Florence, in line with the respective roles of a capital, redefined and updated its image, preparing to welcome a new economic and social era. As an ongoing concern, at least at the level of communication, with the aim of improving the city□s health (in reality, often taken as an excuse to significantly redesign the urban form), the Fascist □healing pickaxe□ (or, using a neologism, sFascista (break everything) [4]) continuously and extensively implemented a controlled demolition policy which did not fail to arouse fierce criticism and which, precisely because of its imposing nature, would be classified in the future as an abominable practice. Up to the point of generating and nourishing over time the disciplinary node for the protection and preservation of historic centres, which thanks to Gustavo Giovannoni would uncover an initial attempt to reconcile the reasons behind a modern transformation and those behind the protection of historical buildings (transforming the violent definition of □gutting□ into the milder one of □thinning□) and which would be fully formulated in the second half of the twentieth century on the occasion of the two disciplinary Eugubine comparisons in the 1960s (*Salvaguardia e risanamento dei centri storico-artistici* □ Preservation and restoration of historical and artistic centres) and 1970s (*Per una revisione critica del problema dei centri storici* □ For a critical review of the problem of city centres) [5, p. 68].
However, some questions arise spontaneously. For example: what is the role of subtraction strategy in the construction of a modern city□ And yet more: can the strategy of subtraction be an applicable model in any urban context□ But above all: is the subtraction strategy a sophisticated one or a cheap ploy□
Precisely the direct consequences of industrialization, introducing a consolidated use of modern day materials (first and foremost reinforced concrete, currently designed to last for 50 years) and inaugurating the era of building work with a limited duration (which sowed the seed for the development of an ephemeral reality of architecture *tableau* [6], with no aspiration toward concreteness), ignited the historiographic debate from several angles, posing doubts about the future of post-industrial constructions. This, together with the negative meaning of the term □suburb□, whose shared image today is still widely linked to degradation and the absence of aesthetic values, represented and still represents a crucial question as far as urban regeneration is concerned. It is no coincidence that the design research of the G124 group coordinated by Renzo Piano (recently appointed Senator of the Italian Republic) precisely identifies this environment as a □fragile part of cities□ from which to start pinpointing (and guaranteeing) a future existence. □I think the great project of our country is that of the suburbs. (□) Turning them into cheerful, productive places is the design I have in mind. This is the urban challenge for the coming decades □[7, p. 12]. To this effect, Piano lists twenty themes which can be used as the basis for urban regeneration and include as warnings the need to □build on built work to mend the suburbs□ and the need to track down □the identity of the suburbs: so often neglected, forgotten, transformed into places without any identity□[8, p. 109]. In this sense, it is thanks to the revaluation of the deep meaning of the word *periferia* (suburb), that contains in its etymology the concepts of perfection and circularity, that the most advanced trends in the field of urban regeneration are set in motion: where the suburb is granted the role of vital centre of the city and one with a positive energy store capable of meeting a new aesthetic value [9; 10; 11].
Within these trends, ascertained as the possibility of a social identity function for city dwellers residing in public spaces, that of the AZC (zero volume architecture or *unvolumetric* architecture) now appears to have been widely obtained: contemporary public spaces are increasingly characterized by the flexible organization of spaces and activities around incorporeal and versatile architecture, without traditionally regarded volumetry, each time interpreted according to the needs as they arise [12]. But the emerging strategic line goes even further, starting by observing that □even where the restoration of buildings and urban centres has succeeded, in fact, precisely where it has been most successful, even more corrosive processes for the replacement of housing have begun to affect the integrity of these places: inhabitants abandoning the places, accompanied by degradation, or worse, by the invasion of snatcher-tourists from commercial monoculture, in a few words taken from Disneyfication, by the transformation of entire cities into theme parks□[13, p. 37]. So, overcoming the sterile battles for preservation at all costs and bringing to the extreme, the essentiality paradigm embodied in Mies□ motto *less is more*, the most innovative urban regeneration work introduces the theme of *negative* architecture, which fits into the problematic contexts where this volume by subtracting, thanks to its under-utilized nature, represents an obstacle to the full enjoyment of a place. On the other hand, the most critical aspects of urban suburbs lurk in the *brownfields*, that is to say, on those sites resulting from the previous use of a piece of land, which are currently in a state of abandonment or not fully utilized: it is once again Renzo Piano who lays the path for the regeneration of these grey areas; it

consists of reversing the bankruptcy route undertaken so far and transforming *brownfields* into *greenfields*. And not the opposite as it has done up until now [8, p. 109].
Furthermore, an effective urban regeneration process derives increasingly less frequently from higher-level choices, and instead comes up from below, inevitably through participatory processes: many European slums have rebuilt their own, new identity both through practice of self-reconstruction as well as the fulfillment of the *u unftswer statt* (Factories of the future). Certainly the residential function, and more specifically the declination of *social housing*, is one of the key issues on which the redevelopment of urban suburbs pivots, often entrusted to the definition of unusual ways of settlement that combine high flexibility, excellent *mi it*, measured density, and subsequently determine a new quality of living [14, p. 36]. But the real news, which comes to light because densification is opposed by deconstruction [15, p. 31-32], however, is the filling in of this vacuum, implemented through the cancellation of pre-existing bulk and the recomposition of the urban space. The action of using the rubber and not the pencil [16, p. 9] thus becomes an opportunity to redesign the city starting with the recognition and the exaltation of the beauty [17] that lurks in places all but forgotten today and which are raised on the flywheel of regeneration.
Some recent business operations, even in Italy, are heading in this direction, confirming a design approach aimed at volumetric subtraction: it is not accidental that the Municipality of Prato has launched an international competition in two stages for the design of a large *central Par* in place of the old hospital, relocated to a recently built structure, which will be demolished [18; 19].
Just the will to recognize the seed of beauty hidden in the newer parts of buildings and the will to amplify the charge not only symbolically, but also socially and economically, has its roots in the *Progetto per la bellezza* (Project for beauty) that the entrepreneur from Perugia, Brunello Cucinelli is implementing in Umbria at the foot of the small village of Solomeo, where he has enacted a fantasy of beneficent feudalism (as noted by the weekly *The New or er*), chiefly in the neighborhood of his home production, which is increasingly taking shape as a truly creative, educational and cultural powerhouse. The idea is simple but effective: an area of about 11 hectares, compromised from a landscape point of view because occupied by six major industrial warehouses of a mediocre nature (for a total of 240,000 cubic meters), was purchased by Brunello Cucinelli Foundation and Federica in order to restore to the territory its identity, by demolishing the industrial buildings that have fallen into disuse and will leave space for a system of three urban parks (The Industry Park, Lay Oratory Park and the Agricultural Park), aimed at restoring a green belt suited to clearly marking the insurmountable barrier between the city (where one can build on existing buildings) and the countryside (where a natural landscape can be reconstructed). The project, by architect and landscape designer Massimo de Vico Fallani, aims to fulfill the role of builder, renovator and gardener that Cucinelli has set and which has gradually turned to Solomeo since the mid-eighties of the twentieth century, inspired by that sense of responsibility for the beauty of the world dear to the Emperor Hadrian. The three parks will wind from the top of the Solomeo hill, sloping down towards a gradually more rugged and pristine landscape: the Industry Park, guardian of the dignity of employment, will replace the existing industrial buildings returning the earth itself to its millennial nature; the Lay Oratory Park, a place to care for the future, will host a small, barrier-free stadium dedicated to youth sports and immersed in the countryside; the Agricultural Park, a treasure chest of natural beauty, will house diversified crops (vegetable gardens, vineyards, olive groves and orchards), whose products will be used for local consumption. A brave project, because it goes against the grain but also an innovative one, which is supported by a simple idea, and one that goes beyond *unvolumetric architecture* putting into practice an unusual attitude in our country: *undervolumetric architecture*.

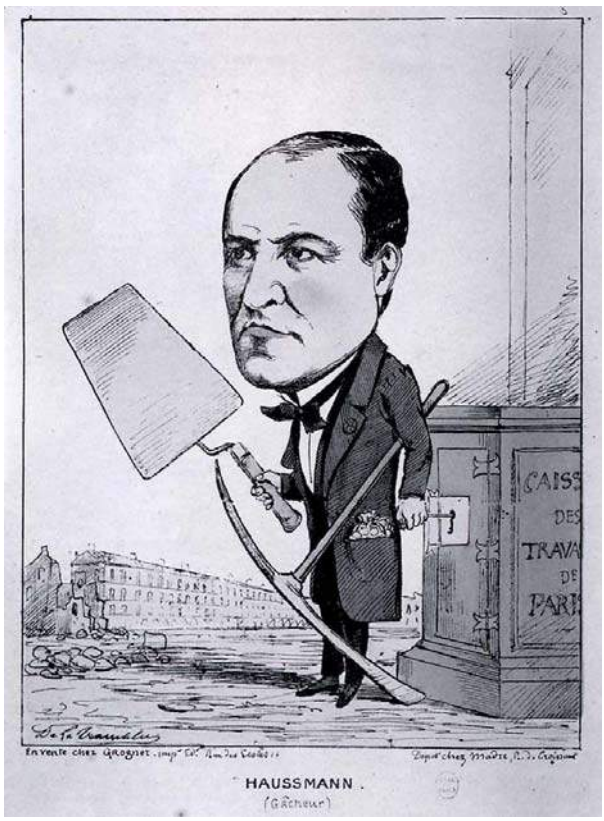

Fig. 1: On the left, the Baron Georges Eug□ne Haussmann portrayed in a satirical vignette; on the right, Benito Mussolini portrayed in a commemorative cover of □La Domenica del Corriere□(March 3, 1935).

Fig. 2: Superstudio, Atti Fondamentali, *Vita Superficie*, 1971 (MAXXI, Roma).

Fig. 3: *De vulgari architectura* (Roberto de Rubertis, 2002).

Fig. 4: *Periferie*, 1, 2014, cover.

Fig. 5: Homepage of the international competition launched by the Municipality of Prato.

Fig. 6: Solomeo (PG), *Progetto per la bellezza* (Project for beauty), view of the model.

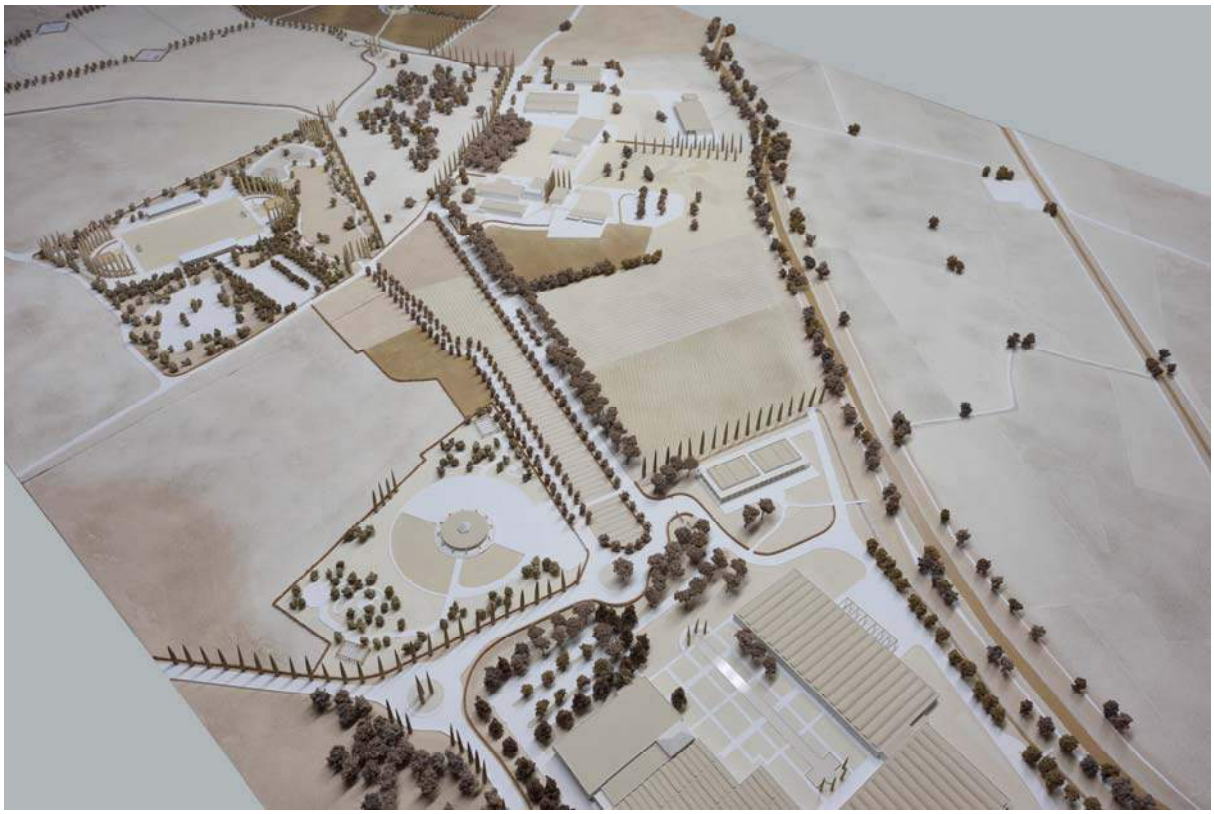

Fig. 7: Solomeo (PG), *Progetto per la bellezza* (Project for beauty), view of the model.

Fig. 8: Solomeo (PG), *Progetto per la bellezza* (Project for beauty), comparison between the current panoramic view and the corresponding infographic simulation.

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Complex System of Estimation of Public Health Risks From Combined Influence of Different Negative Factors

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Abstract
Efficient provision of ecological safety of urban territories may be achieved by taking into account of complex influence of negative factors to the health of population and to environment.
Stages of complex estimation of ecological risk in urban territory are determined.
Complex system of estimation of risks to the human health taking into account the combined impact of physical and chemical factors is suggested.
The informational and analytical programs are developed. The programs are allowing to carry out processing and an assessment of results of measurements of physical and chemical environmental pollution and to carry out calculations of integrated indicators of their combined influence taking into account the synergetic effects exceeding simple summation of influences.
Results of approbation of complex system and program provision for estimation of ecological risks on the example of the territory of Samara region of Russia are described. It is shown that there are the zones of urban territories in which the risk of damage to the health of population is significant.

Keywords: Risks, health, estimation, physical factors, chemical factors

1. Introduction
Modern city is a source of intensive pollution of atmosphere, water and soil. Among of damaging ecological factors are many chemical substances and physical pollutions causing complex negative influence to the man and environment [1-4].
Maximal number of anthropogenic sources of ecological risks is situated in industrial regions including clusters of industrial, domestic and agriculture zones [5, 6].
Efficient provision of ecological safety of urban territories may be achieved by taking into account of complex influence of negative factors to the health of population and to environment. It is evident that for the time being using of complex methodology and software for combined estimation of different risks is necessary for precise estimation.
This paper is devoted to the study and development of new methods and approaches and program provision for the complex estimation of public health risks from combined influence of different negative factors in the conditions of urban territories.

2. Stages of complex estimation of ecological risks
Stages of complex estimation of ecological risks of urban territories (including estimation of the influence of different types of pollution on the health of the population) may be subdivided into the following steps:
- collection and analysis of data about sources, components and conditions of pollution of estimated territory;
- identification of the ecological danger of the sources and objects of urban territory;
- analysis of inhabitant complaints regarding negative pollution disturbance;

- analysis of population sick rate in the database of Russian medical institutions (polyclinics, hospitals, etc) for the certain territories;
- selection of the main chemical substances for research;
- modeling of distribution of main chemical components in environment;
- modeling of propagation of different pollutions in environment;
- development of integral generalized criteria of ecological dander of the objects;
- selection and application of an adequate mathematic-statistical method of analysis and generalization of the experimental data;
- determination of concentrations of chemical pollutions in selected area of estimation;
- estimation of risks during combined and complex impact of factors of different nature;
- inhabitant self-assessment of the health state depending on the conditions of protection from pollution disturbance, etc.

In order to estimate ecological risks of a territory more precisely, it is necessary to develop approaches and program provisions for the estimation of ecological risks.

It is necessary to use the methodology of solution of system tasks with consideration of the main peculiarities of medical-biological information, which is an adequate means of generalization and structuring of medical information in the applied medical-biological researches.

Statistical concept, including successive application of factor methods, canonical, correlation, cluster and component analysis allow to synthesize the criteria and algorithms of decisions making during the estimation of functional state of man in the applied medical-biological researches. Criteria and algorithms of the estimation of the functional state of man allow carrying out the estimation of the degree of effort associated with the mechanisms of adaptation of organism to the factors of vital activity.

3. Complex system and program provisions for the estimation of ecological risks

It is necessary to point out that the combined impact of different factors may cause different effect on the man's organism. Damaging impact may be summated, attenuated or amplified, as well as may cause variation of the character of influence [1, 3-6]. Therefore, for the adequate estimation of the effects of negative impact of damaging environmental factors it is necessary to carry out the analysis and account of different situations of impact of different combinations of ecological factors.

During estimation of ecological risks it is also necessary to consider the effect of summation (addition of small quantities of different damaging substances). Such quantities of substances separately may do not cause any problems for health or the ecosystem, but in sum they become dangerous due to the mutual amplification of effects (synergetic impact) [1, 2, 6].

It is important to note that it is also possible to use summation principle during calculation of complex impact of polluting substances on the man, penetrating into man's organism with air, water and food.

Program provisions for the estimation of ecological risks have been developed. It allows carrying out complex estimation of risks and estimating joint impact of main chemical and physical factors on the human organism taking to account possible toxic effects. Program provision also allows carrying out automatic processing and estimation of results of measurements of different physical and chemical pollutions and making calculations of integral values of impact of factors of different nature.

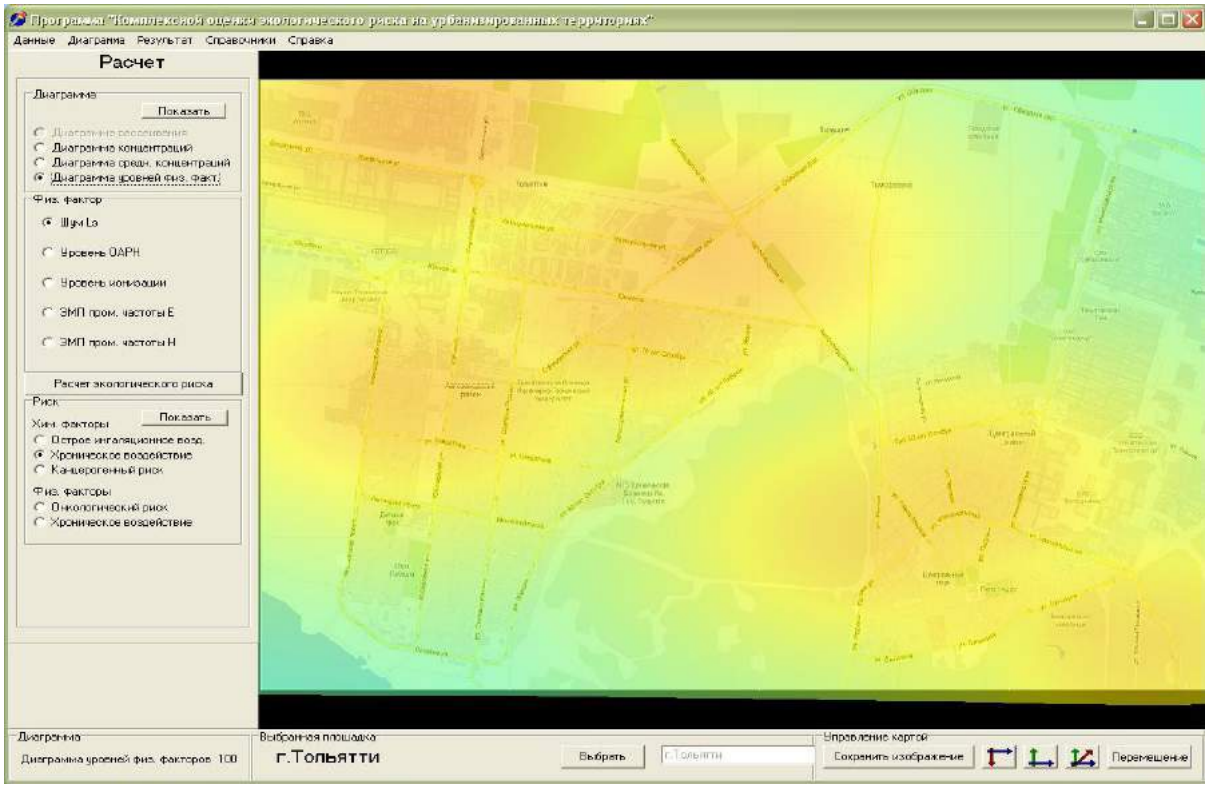
Program provision “Integrated monitoring of physical and chemical pollutions” (IMCF) consists of 3 main blocks integrated with other modules of the automated working place “Complex City Test” [6].

The informational and analytical programs are developed. The programs are allowing to carry out processing and an assessment of results of measurements of physical and chemical environmental pollution and to carry out calculations of integrated indicators of their combined influence taking into account the synergetic effects exceeding simple summation of influences.

The developed program provision allows not only to receive the data about the probability of the development of different illnesses from the main chemical, physical and biological factors, but also to estimate their integral impact taking to account synergism effects.

New method and program provision have been approbated for the complex research and estimation of ecological risk in conditions of Samara Region. The following components were determined as the main pollutants: formaldehyde, dioxide of nitrogen, dioxide of sulfur, oxide of carbon, methane, acetone, sterol, benzopyrene. Together with the estimation of chemical pollution, the analysis of influence of the following physical factors was carried out: noise, vibration, ionizing radiations, electromagnetic fields of industrial and radio frequency range, radon.

a



b

Fig. 1: Example of calculation of probabilistic development of different illnesses depending on the factors of impact. a – acute inhalation impact of chemical substances; b – probability of development of chronic illnesses from noise impact.

Application of the automated system allowed obtaining the data of probabilistic development of different illnesses depending on the factors of impact (Fig. 1 a – chemical factors; b – physical factors) and point them out in the map of the territory.

4. Conclusions.

New methods and approaches to estimation of ecological risks of urban territories are allowing to consider joint impact of physical and chemical pollutions and to determine the most problematic zones of urban territories.

Stages of complex estimation of ecological risk in urban territory are determined.

Complex system of estimation of risks to the human health taking into account the combined impact of physical and chemical factors is suggested.

The informational and analytical programs are developed. The developed program provision allows carrying out not only separate, but also combined estimation of ecological risks of territories and to efficiently forecast the risks of ecologically caused illnesses form complex impact of factors of different nature.

Results of approbation of complex system and program provision for estimation of ecological risks on the example of the territory of Samara region of Russia are described. It is shown that there are the zones of urban territories in which the risk of damage to the health of population is significant.

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Classification and Reduction of Negative Impact of Waste of Oil Gas Industry

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Abstract
Negative impact of waste of oil-gas industry to the human's health and to environment may be especially dangerous due to the high toxicity. Kinds of negative impact of waste of oil-gas industry are considered. Analysis of existing criteria and approaches to classification of waste of oil-gas industry and of secondary products of oil processing has been carried out. Existing literature sources devoted to this problem are considered. Systematization of kinds of classification of oily waste according to the different classification principles has been developed. Approaches to reduction of negative impact of waste of oil-gas industry to the human's health and to environment are suggested. The results of reduction of negative impact of waste of oil-gas industry in conditions of Samara region of Russia are described.

Keywords: Waste, oil gas industry, classification, reduction

1. Introduction
Waste negative impact in urban territories is constantly growing [1, 3, 4, 6-9]. Presently the problem of waste negative influence reduction may be considered as one of the most important problems in all industrial countries of the world. Waste number is growing every year. In Russian Federation annually more than 7 billion tons of different kind of waste is forming, and only 7 billion tons of waste is using again after utilization.
Constant growth of volumes of oily waste in result of industrial activity of oil production enterprises causes necessity of search of new and of optimization of existing technologies of efficient utilization of such kind of waste. Presently it is one of the most urgent tasks in the field of environmental protection [2, 6].
Waste may cause complex negative impact to the landscapes of territories, to biosphere and to the human health. Waste may cause negative influence to the human's health both in industry and in domestic conditions. Negative impact of waste of oil-gas industry to the human's health and to environment may be especially dangerous due to the high toxicity [2-4, 6, 7]. Toxic waste of oil-gas industry may cause different negative impact to the humans leading to the damage of cardiovascular and respiratory systems, skin damage, toxicity poisoning and other negative sequences.
Thus, it is necessary to develop the systematization of kinds of classification of oily waste according to the different classification principles and to suggest approaches to reduction of negative impact of waste of oil-gas industry to the human's health and to environment.
This paper is devoted to development of classification and reduction of negative impact of waste of oil gas industry to the human's health and to environment in urban territories and to it approbation in conditions of Samara Region of Russia.

2. Kinds of negative impact of waste of oil gas industry
Kinds of negative impact of oil gas industry to the human's health and to environment may be subdivided as following.

1. Global changes, variation of conditions of existence of animals and plants.
- dysfunction of exchange in the system “atmosphere-ocean”;
- mutations apparition etc.
2. Pollution of water and grounds by toxic substances:
- chronic pollution by heavy metals (mercury, cadmium, lead, arsenic, zink etc.) presenting in drilling fluids and sludges;
- penetration into the water of oil and oil fractions, high toxins, mutagenic and cancerogenic polyaromatic hydrocarbons and organic acids;
- formation of radioactive sludges by radionuclides penetrating with formation waters.
3. Threat to life activity of living substances:
-death of species;
- the emergence of pathological signs and histological disturbances in organism;
- accumulation of oil hydrocarbons in organs and tissues of plants and animals;
- great loss in the quantity of fish catch;
- decreasing of life period.
4. Destruction of structure of ecosystems:
- total disappearance of some species;
- change of dominating and sub-dominating species;
- degradation of production-destruction processes in ecosystem.
- soil damage during impat of oil contaning waste;
- death of fish etc.
It is necessary to point out that the combined impact of different oil gas components may cause different effect on the man's organism. Damaging impact may be summated, attenuated or amplified, as well as may cause variation of the character of influence [4, 5, 9].

3. Approaches to classification of waste of oil gas industry and of secondary products of oil processing

Consideration of existing classifications of waste of enterprises of chemical, oil-chemical and oil extracting industry is allowing to conclude about the efficiency of only such approaches to classification wchich are coherent with technologies of utilization of waste and a rest of extraction and processing of natural raw. In such cases main classification feature (or features) is suitability of waste to processing using certain technology. Usually the boundaries of such suitability are determined by combination of physical, chemical or other properties of waste.
Waste of oil and secondary products of oil processing, as a rule are different complex multycomponent mixtures of substancies having different chemicasl, component, phase structure, physical-mechanical and physical-chemical properties [1, 6]. It explanes the difficulty of development of classification of such kind of waste.
Analysis of existing criteria and approaches to classification of waste of oil gas industry and of secondary products of oil processing is carried out by author. A number of authors have achieved the results of systematization of information about the classification of oil gas waste and of secondary products of oil processing: D.E. Bykov [1], joint group of authors of Institute of problems of oil and gas of Russian academy of science, «Gasprom VNIIGAZ» company etc. Detailed system of classification, including different issues of waste management is contains in State cadastre of waste. Cadastre is a collection of data about waste of production and consumption, including information about waste (origin, quantity, composition, properties, level of impact to environment, conditions of displacement, technologies of using and treatment) on the level of Russian Federation, subjects of Russian Federation and enterprises working in the field of waste management.
Cadastre is consist of three independent parts:
– catalogue of waste composed according to Federal classification catalogue;
– register of objects of waste displacement;
- database of waste and technologies of waste using and treatment.
Development and supporting of State register of objects of waste disposal including passportization of objects of waste disposal, classification of objects of waste disposal and giving a code to the objects of waste disposal according to the type of object of waste disposal and category of it ecological safety.
Database of waste and of technologies of waste using and treatment is allowing to carry out systematic accounting of collection, accumulation, disposal, using and displacement of waste, forming in the territory of Russian Federation, registration of existing technologies of using and (or) treatment of waste, classification and assignment code of technology of waste application or neutralization.
Main anvantage of cadastre of waste as a source of information together with systematic of data is it authenticity. Compositions and properties of waste which are included to Cadastre, determined in accreditated laboratories and verifyed by specialists oif specially empowered public authorities in the field of environmental protection. Technologies in database of waste and technologies before the inclusion to Cadastre are subjected to state ecological assessment. Cadastre of waste is the main

informational source in the field of waste management in Russian Federation.
Classification database described above is the most perfect because in it all “living cycle” of waste is covered. In literature information about numerical approaches to classification of oily waste according to the different featrures is described [1, 2, 4, 6, 7]. As a rule, necessity of it establishment is caused by necessity of selection borders of composition and properties of waste for which technology of utilization is developed.
In technical conditions of TatNIPIneft TU 0258-085-00147585-2003 for different marks of oil sludges in dependence from composition and technological accessory recommended ways of using are given (table 1).

Table 1

Classification of oil-containing waste and of methods of processing

Mark of oil sludge	Technological prosess of formation of oil sludge	Recommended ways of using
Mark A	Sediments of oil tanks	Obtaining of hydrocarbons, lubrication of chains mechanisms, forms during manufacturing of concrete slabs in house-building factories etc.
Mark B-1	used drilling fluid	Using in productioin of brick
Марка B-2		Using in production of claydite
Mark C	Oil sludges forming during repair of wells and accidents on oil pipelines	After processing for production of construction bitumen, asphalt concrete mix or after solidification for using during roads construction, sprincles ise, manufacturing of finishing agents for different repositories
Mark G-1	Oil sludges of oil processing industry	Obtainment of bitumen
Mark G-2		Obtainment of sulphur dioxide, ammoniun sulphate and high-sulphur coke
Mark D	Oil sludges forming in process of washing of pipes in pipes centers	Obtainment of paraffin

Composition of oil sludges is presented by wide list of ratio of components. Analysis of literature sources about previous investigations of oil containing waste of different regions of Russia is showing that waste materials are chracterised by wide range of composition but are having general tendency of physical-chemical characteristic of layerwise components of storages of oil containing waste.
In result of joint efforts of scientific, project organizations and specially assigned public authorities in the field of environmental protection in year of 1997 in Russia was founded Federal classification catalogue of waste. In 2014 this classification of waste was modified, some kinds of waste were combined in more large groups, and some others are separated to more detailed taxons. It should be noted that Federal classification catalogue of waste is not giving the “key” to completed decision of the problem of utilization of waste of oil gas industry of complicated composition. Such waste are differs by special danger due to high concentrations of toxic organic and non-organic substancies, non-uniform phase structure, what is significantly making difficult search of ways of protection of bisphere from it impact.
Systematization of kinds of classsification of oil containing waste according to the different classification features developed by author is given in table 2.

Table 2

Systematization of kinds of classification on oil cintaning waste according to the different classification features

1. According to conditions of formation
- discharges during cleaning of oil reservoirs; - accidental spills during oil extraction and transportation; - barn oils; - ground oil slugdes; - bottom oil sludges; - oil sludges of resrvoir type; - waste from repair; - oil ground;

- asphalt maloperation deposits; - waste of reagentless processing of oil containing waste water; - waste are generated in result of reagent treatment of oil containing waste waters; - mixed waste of difficult separated oil containing materials (synthetic surfactants, the flotation concentrates etc.); - used lubricants, products of oil tanks cleaning; - bottom waste which are forming on the bottom of different water reservoirs after spill oil; - waste after well drilling; - waste formed in the process of oil extraction in the processs of cleansing oil; - waste forming during oil storage and transporting in tanks etc.
2. According to aggregate state
- liquid oil contaning waste; - solid and high-viscosity oil containing waste; - ground waste as a product of junctuion of soil and spilled oil; - surplus activated sludge etc.
3. According to physical-chemical prorerties
- physical properties; - chemical composition; - presence of mechanical additives etc.
4. According to the degree of ecological danger
- class of danger of waste; - degree of toxicity of waste; - field of potential ecological impact (soil, water reservoirs, ground waters, spacially protected natural territories etc.).
5. According to the type of technological process of oil sludge formation
- oil sludges are generated during repair of well and accidents with oil pipelines; - oil sludges of oil treatment industry; - oil sludges are generated in the process of washing of pipes in pipe storage etc.
6. According to the methods of processing
Thermal methods - Incineration in open storehouses; - burning in ovens of diffrent types and constructions; - thermal drying; - pyrolyse etc. **Physical methods** - gravitational sedimentation; - separation in centrifugal field; - filtering etc. **Physical-chemical methods** - solidification by dispersion with hydrophobic reagents; - neutralization; - oxidation; - electrophysical methods; - flotation; - coagulation; - sorption; - extraction etc. **Biological methods** - treatment by active sludge; - anaerobic fermentation; - biothermal composting; - phytocide etc.
7. According to the possibility of using
- waste to be subject of secondary using; - waste to be subject of disposal; - waste to be subject of destruction (burning etc.).
8. According to the field of application
- obtainment of hydrocarbons; - lubrication of mechanisms of chains; - obtainment of forms during manufacturing of concrete slabs in house-building factories etc.; - using as prophylactic agents for prevention of freezing together of coal and for prevention from wind erosion during it transportation;

- burning as oven fuel;
- using in production of bricks;
- using in production of keramzit;
- obtainment of bitumen;
- obtainment of sulphur dioxide, ammonium sulphate and high-sulphur coke;
- obtainment of paraffin etc.

4. Development of approaches to reduction of negative impact of waste of oil gas industry and approbation in conditions of Samara Region of Russia

Generally it is possible to subdivide main approaches and steps to reduction of negative impact of waste of oil gas industry used in Russia:
- collection, transportation, utilization of waste polluted by oily products;
- displacement of waste polluted by oily products in special sites;
- monitoring of degree of pollution of waste by oily products;
- using of technical solutions and technologies for waste and biosphere components treatment from oily products;
- ecological education, organization of efficient system of teaching of specialists in the field of waste management;
- enlightenment and upbringing of population in the field of waste management;
- improvement of legal and normative documentation in the field of waste management;
- informational provision degree of pollution of soil etc.
- Initiation of fundamental research of different stages of soil treatment from oily products;
- Development of logistics of soil treatment from oily products;
- Optimization of regional normative-legal base for reaching of strategic purpose «zero of waste».

It is necessary to point out that also monitoring of waste and biosphere components pollution is very important for efficient soil treatment. In Russia there is a system of waste monitoring including observation, control and collection of information at different levels:
- monitoring of impact to environment;
- monitoring of waste displacement etc.

Monitoring of environmental impact assessment provides for control of the following parameters: object of control, methods of research, frequency of measurements, methods and equipment of control, periodicity of measurements data processing and analysis, methods of estimation of environmental impact assessment, methods of estimation of environmental damage. In result it is necessary to implement the measures allowing to reduce the exceeding values of oily waste negative impact and to arrange control measurements.

In Samara region of Russia there is a good experience of oily waste negtive impact reduction. Regional and municipal legislative base of Samara region in the field of waste management is continuously improving. In this case much importance is attached to the development of system of waste management in the big towns of Samara region: Samara, Togliatti, Syzran, Zhigulevsk.

Oil-slimes are 3-phase systems, composition and properties of which are varying in wide ranges in dependence of place and of method of it generation. Variation of composition of such complex multi-component dispersion systems in time is significantly difficulty for development of universal methods of it utilization.

Presently different technologies of utilization of oily waste are using. Mainly they are basing on the processes of separation of water and organic phases like sedimentation, filtering, burning. For oil contaminated soils the most propagated the method of biological destruction of hydrocarbon component.

It is possible to use of oil-slimes in road construction. With this waste may be used without treatment for the purposes of fortification of earthen cloth, send underlayment and macadam base of road.

Thus, analysis of world experience and patent research are showing that there is necessity of development of complex small-waste technology of treatment of oil containing waste with maximal using of it resource potential by receiving of valuable secondary oil products, like hydrocarbons of diesel fraction and road bitumen.

From economical point of view sulphur is especially important as cheap adding to bitumen and filler for asphalt concrete. Pulverized sulphur is a carrier of surface-active characteristic of oil and oil products, therefore it is used as adding for creation of optimal structure of bitumen. Influence of sulphur during it inputing to the bitumen during the temperature 180-200°C is the same as action of oxygen during oxidation.

Influence of sulphur to the properties of oil bitumen is determined by the following factors: temperature and time of interaction, concentration of sulphur, type of bitumen structure and quality of primarily raw and technology of it production.

Table 3

Results of physical-mechanical testing of secondary bitumen

Value	Standard bitumen according to EN 12591-2010	Bitumen with adding of sulphur in quality:				Method of testing
	250/330	5%	10%	15%	20%	
Depth of penetration spine during 25°C, 0,1 mm	250-300	303	261	246	181	EN 1426
Depth of penetration spine during 15°C, 0,1 mm	70-130	102	91	62	51	
Temperature of softening according to the method of "ring and sphere", °C	30-38	43	36	41	44	EN 1427
Resistance to solidification:						EN 12607-1
-increasing of temperature of softening, °C	≤ 11	8	7	7	4	
- variation of mass (absolute value), %	≤ 1,0	0,9	0,8	0,8	0,7	
Temperature of flash, °C	≥ 180	240	238	235	233	EN ISO 2592
Solubility, %	≥ 99,0	99,0	99,0	99,0	99,0	EN 12592

From the data presented in table 3 it is evident that during adding of 5, 15 and 20 % of sulphur samples are not correspond in total to the standards requirements, which is not allowing to use it in road construction. But during mixing with 10 % of sulphur the values are fit to the normative requirements and complexly are fitting to requirement of standard EN 12591-2010. Consequently, secondary bitumen with addition of 10 % mass of sulphur it is possible to use as analogue of bitumen of mark 250/330.

5. Conclusions.

Considering further researches of classification of waste of oil gas industry and secondary products of oil treatment it should be noted the necessity of creation of normative-technical base of kinds of oil containing waste and approaches of it estimation, including special gededic surveys and inspections, determination of negative factors, estimation and forecast, prevention and elimination of negative processes during impact to man anf to biosphere. It is necessary to develop in more details a number of necessary parameters and criteria during estimation of negative impact of oil containing waste. For monitoring of land pollution by oily waste it is necessary to use more widely modern methods and technical means of monitoring (including satellite geodesy systems, methods of remote probes, surface express-methods, methods of bioindication, biotesting etc.).

In total it is necessary to create complex classifacatin of waste of oil gas industry and of secondary products of oil treatment on the basis of scientifically stated and proved into practice algorithm of study of resource potential and implementation of technologies of it maximally efficient exploring on the basis of accounting of origin, pohase and chemical composition of waste and of secon dary products of oil gas industry. Due to complication of task and of objects of investingation it is evident that complex classification should be multylevel.

It is possible to conclude that the task of reduction of oily waste negative impact to the population and to environment may be achieved efficiently only by realization of complex approach including waste collection, transportation, disposal, treatment, utilization, education, information of population etc.

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Approaches to Estimation of Resources Potential of Waste of Chemical and Oil Gas Industry

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Abstract
The volume of waste of chemical and oil-gas industry is growing every year. It is necessary to increase resource potential of waste and to extract valuable components for further secondary using. Criteria of estimation of resource potential of waste of chemical and oil-gas industry are suggested. Main of them are historical, chemical, physical, technological, economical criteria. Informational database including data about chemical and oil-gas industry of Samara region of Russia is developed. Using of suggested approaches and criteria, investigation of a number of wastes of chemical and oil-gas industry of Samara region of Russia is carried out. Calculation results of oil-sludge tanks on the territory of Samara region of Russia are described. Variants of transporting are considered. Methods and approaches of estimation of resource potential of waste of chemical and oil-gas industry are allowing also to classify oil-sludge tanks according to the prospects of it treatment and secondary using taking to account such factors as a cost of oil products extracting from waste, economy of ecological payment, prevented damage, cost of oil sludge transporting and treatment etc. It allows to increase resource potential of waste of chemical and oil-gas industry and to reduce costs for it treatment and transporting

Keywords: Waste, oil gas industry, resource potential, estimation

1. Introduction

The volume of waste of chemical and oil-gas industry is growing every year [1-7]. For exhample, in Samara region of Russia more than 15 billions of oil is extracted and ¼ of all Russian oli is processed. Very important task is increasing of resource potential of waste and to extract valuable components for further secondary using.

Thus, it is necessary to develop the criteria of estimation of resource potential of waste of chemical and oil-gas industry and to investigate a number of waste of chemical and oil-gas industry.

This paper is devoted to development of approaches to estimation of resources potential of waste of chemical and oil-gas industry and to it approbation in conditions of Samara Region of Russia.

2. Criteria of estimation of resources potential of waste of chemical and oil gas industry

Analysis of existing classifications of waste of enterprises of chemical, oil chemical and oil extracting industry is allowing to conclude that it is necessary to develop new approaches to classification. For creation of system of estimation and of technolopgies of using of resource potential of waste of enterprises of chemical, oil chemical and oil extracting industry it is necessary to systemize existing information, develop absent components and to test theoretical developments on real waste of oil gas indusry.

Authors are suggesting conception of resource potential of waste which may be determined as a cost of a number of components of waste (secondary product), having such combination of characteristic of composition and properties that determine possibility of using of waste (and/or it components) as a secondary raw (production) with selected technology of extraction of resource potential.

Criteria of estimation of resource potential should include all variety of composition and characterisitics of investigated waste. It may be separated to the several interdependent groups. Main of them are: historical, physical, chemical, technological, economical.
Historical criterion is very important because the history of waste origin (formation) is very significant for waste further investigation and treatment. First step during estimation of resource potential according to historical criterium is study of history of appearance needs of economic in carrying out of one or other process or using of product. As main step of system analysis of waste it is recommended to consider investigation of technological process, setting of technological stages as a sources of waste origing, and also about target product of basic production, raw, used reagents, auxiliary materials etc.
Physical criterion of estimation of resource potential means obtaining of informational data about physical characteristic of waste. It is connected with visual experimental laboratory investigations. Physical and chemical criteria as the most connected may be also united in one criterium – physical-chemical. In result of development of physical criterium it is necessary to receive the information about the following characteristics of waste:
– phase composition and it physical stability (quantity of phases and it aggregate state);
– viscosity;
– temperature of the loss of fluidity;
– temperatures of beginning and the end of boiling;
– temperature of crystallization;
– density;
– volatility.
All above mentioned physical characteristics are determining together with chemical properties technological features of waste.
Integrated approach to consideration of waste characterisitcs as uniform system with multiple internal connections is the basis of correct selection of method and technology of using of resource potential.
Chemical criterion of estimation of resource potential is one of the most important because chemical characteristic of oil gas waste are considered as basic and as physical, as technological characteristic of object of estimation. As a rule, estimation according to this criterion is complicated task.
Let us point out some properties connected with chemical critetium of oil gas waste. Among of them it is necessary to determine the main criteria:
– radioactivity;
– axid-alcaline reaction of medium;
– component chemical composition of each phase;
– dissolubility in water and in organic solvents;
– fire safety (temperature of flash, ignition, self-ignition, concentration explosive limits of vapour of volatile components);
– chemical activity in relation to water, air;
– chemical stability (chemical indifference of waste components relatively to each other);
– corrosion activity in relation to structural and alloy steels.
Technological criterion of estimation of resource potential in composition of set of informational blocks about oil gas waste as about the objects of resources restoration is, from one point of view, stage of target focus combining of results of estimation according to above described criteria, and from the other point of view, is a stage of analysis of specific characteristic of waste having direct relation to creation of technological processes of it treatment.
It is evident that all stages of technology are including operations of waste collection, storage, loading-unload, transporting. Based on this it is possible to formulate main directions of collection of information about characteristics of waste and secondary products of oil gas industry wchich are necessary for estimation of resource potential by technological criterium.
Estimation of resource potential of oil gas waste according to technological criterion in combination with chemical and physical information blocks allows to approaches to development of economical criterion.
Economical criterion of estimation of resource potential is considered with account of innovation part in activity of industrial and domestic waste treatment. For estimation of resource potential according to economical criterion it is possible to determine the following main characteristics:
– volume of generation (accumulation) of wastes of oil gas industry;
– class of danger of waste;
– presence in composition of waste of valuable components, which are may be potentially used as secondary material or energeitc resources;
– ratio of concentrations of valuable components of wastes with it concentrations in natural raw from which it is extracted for main technological purposes of industry;
– value of specific payment for wastes displacement, for discharge with waste waters and for exhaust to atmosphere for every substance including to the composition of industrial waste.

All above mentioned characteristics of oil gas waste and of secondary products are derivatives from conditions of forming of waste in particular industrial enterprise, from it phase and chemical composition, sanitary-hygienic values. Forming of informational block of reliable data about economical criterion of estimation of resource potential of waste and further it analysis are allowing to correctly outline the strategy of carrying out of managing, ecological, technological and economical measures, aimed at organization of waste treatment.

In a number of work connected with estimation of resource potential of waste it is suggested to separate three methodological stages: informational, technological and calculated.

First stage of estimation of resource potential of waste and secondary products of oil gas industry id informational stage. For successful carrying out of search-informational investigations it is necessary to determine:

1. Object of search.
2. Area of search.
3. Sources of information.
4. Creiteria of selection of information.

A number of works of informational level includes development of historical and other issues of object of extraction of resource potential, search of enterprises-consumers or recyclers of wastes, search of existing technologies of treatment of required waste and waste with analogical characteristics. As main characteristics of waste according to which is similarity of objects and the ways of transformation is estimated may be phase and chemical composition, aggregate state, toxicity etc. Analysis and probably further combination of several famous technologies, considering specific characteristics of waste, is the basic of selection as of direction of transformation as a method of treatment.

Important part of the process of collection of necessary data from above mentioned sources id determination of criteria of selection of information. Such criteria should be determined in the very beginning of execution of works on informational stage of estimation of resource potential. Main of them are:

– technical correlation with the object of extraction of resource potential (identity the similarity in the part of some it characteristics with object, description of which is present in informational source);
– ecological validity;
– econimical reasonability.

For development of historical criterion it is enough to use only the first stage, as well as for all the other stages of search it is necessity to take into consideration all criteria in complex.

Information which is corresponding to all criteria of selection is the basis for further process of creation of new of using of the famous methods, technologies and processes.

For selection of the ways of it utilization it is necessary to carry out theoretical analysis of objects of system. As object of analysis it is necessary to separate the object of resources restoration and the way of extraction of resource potential (method of utilization).

The basic of system analysis is development of issues relative to oil containing wastes and secondary projects. Comparison of different issues allows find out internal relationships between characteristics of main process and wastes quality, between components and properties, between composition and dynamic of state etc. Complex analysis of internal interrelations of objects of research is allowing create maximally rational ecologically stated technology of resources restoration.

Stage of technological investigations of resource potential is the main methodological block of estimation of resource potential and consists of the several above mentioned stages. Technological investigations are including:

1. Detailed consideration of technological documentation of equipment (passports, schemes, drawings) using in the process of industrial waste management.
2. Regulation of quantity of wastes depending with conditions of organization of main process and of quality of treated raw. Results of regulation are the basis of primary data for technological design. At every stage of technological processes of chemical, oil-chemical, oil-gas-добывающей and oil treatment industry is occur transformation of material flows. Than at the stages of separation of intermediate or ready products flows are distributed between two directions – main production of industry and wastes. After it the main production is finishing technological cycle at enterprise.
3. Analysis of stages of wastes and secondary products formation, study of conditions of it collection and storage in enterprise-manufacturer. Industrial wastes, on the contrary, are continuing movement in enterprise entering to the next stage of it «life cycle». Thus study of stages of forming of waste it is possible to separate to two stages:

– analysis of transformation of mass and of component composition of raw in technological equipment as sources of waste and secondary products generation in stages of obtaining of the main industrial production;
– analysis of variation of mass, of transformation of component composition and physical-chemical characterisitics of waste in post-production stages.

4. Experimental research of structural organization of waste displacement in environment, composition and characteristics of object of resources regeneration including forecast of directions of transformation of waste components (fig. 1). It allows collect important information for further calculation of resource potential, including:
- geometrical dimentions of object,
- volume of accumulated waste;
- structure of layers of displaced waste;
- information about chemical, phase and group composition, physical characteristics of displaced waste.

3. Investigation of a number of waste of chemical and oil gas industry in Samara Region of Russia

It was concluded by authors that existing technologies of utilization of waste of oil gas industry may be subdivided on methods of treatment with loss of resource potential and methods based on material and energetic resource potential.
First group of methods is including famous destructive methods in which energy of organic phase is inefficiently scatters in environment polluting it by carbon dioxide (methods of biological destruction, fire clearance by combustion etc.).
Second, more safe for environment is group of technology including methods of extraction of organic phase from waste with further it facultative modification in different processes like cracking or pyrolysis, and the methods of direct using of waste in economics, e.g. using of oil sludge for roadbed stabilization and the strengthening of gravel base of automobile roads.

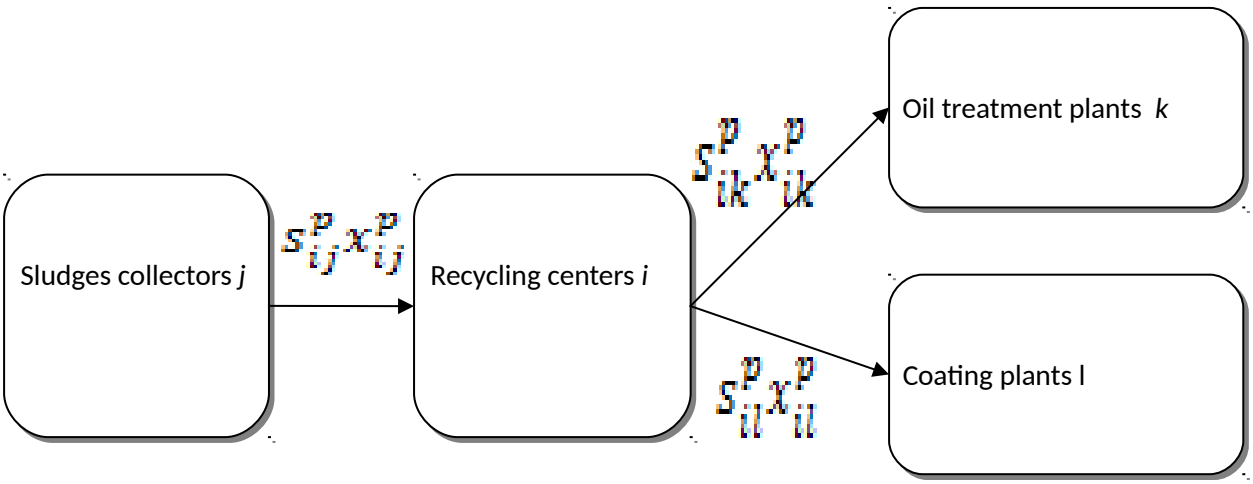

Figure 1. Scheme of transport flows between oil sludge collectors and the recycling centers of waste

Formulated task refers to the class of 3-stage industrial-transport tasks of branch planning because in it is set a goal to determine a plan including three parts: plan of manufacturing of production and a variant of development of enterprise of recycle (its production capacity, central link), plan of transportation of raw, plan of transportation of ready production.
To the basis of numerical; calculation of suggested model approximate algorithm of decision of industrial-transport tasks of D.N. Kazakevich is using, because this algorithm provides a presence of decision and finiteness of calculations for any databases.
Calculation was carried out for 43 the biggest investigated sludge accumulators. For calculations above mentioned oil sludge collectors were grouped according to geographical feature.
The following criteria for selection of possible places of displacement of treatment of oil sludge were determined:
a). Availability of corresponding structure (energy sources – steam, electricity, gas, water etc.);
b). Presence of access roads;
c). Availability of qualificated personnel;
d). Approach to final consumer of secondary resources (oil treatment and asphalt concrete plants).
Following to above mentioned criteria there were determined possible places of displacement of facilities of treatment of oil sludge on the territory of Samara region: towns Otradny, Novokuibyshevsk, Syzran, Neftegorsk.
Calculated cost of transporting is determined on the basis of data of state statistics and is equal to 5,09 rubles · ton/km.

5. Conclusions.

New methods and approaches to estimate resource potential of waste of chemical and oil-gas industry are suggested. Main of suggested criteria are historical, chemical, physical, technological, economical. Method of calculation of resource potential of oil containing waste allow to develop classification of sludge collectors according to the prospect goal of it treatment with accounting of such factors as a cost of oil products from wastes, economy on ecological payments, accounting of prevented damage, costs of transporting and treatment of oil sludge.

Criteria for selection of possible places of displacement of treatment of oil sludge were determined. Following to above mentioned criteria there were determined possible places of displacement of facilities of treatment of oil sludge on the territory of Samara region: towns Otradny, Novokuibyshevsk, Syzran, Neftegorsk.

ACKNOWLEDGMENT

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A Synchronous Architectural Project Contemporary Renovation in the Governor's Palace in Lisbon

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Abstract
This article concerns the contemporary architectural design intervention in the Governor's Palace of the emblematic Belen Tower, in Lisbon. The Palace is an example of the *Portuguese Plain Architecture (*term used by G. Kubler, but first coined by João de Castilho), which dated from the first quarter of the 16th century and the 18th century. The renovation defines what we mean by a *synchronous architectural project*, The restoration and integration of several existing historical strata, from the Roman archaeological remains of *cetariaes* (tanks where sause *garum* was produced), to the Manueline and Baroque periods). In the renovation, adaptation and addition of new structures, both above and below ground, we convert the heritage building into a Boutique Hotel and SPA. We framework the views - towards the City and the Tagus River which merges into the Atlantic, we sought to create inside the building an atmosphere of water and light from the Mediterranean cultures in a contemporary architectural expression. The new renovation extends to the outside gardens, decks, swimming-pools and facades evoking nautical memories concerning to portuguese exploration and discoveries. The renovation promotes an intentional and integrated dialogue between history and contemporary architectural design, using the same existing materials, namely: hard limestone, white plaster and stucco, tiles, pine wood and zinc). The renovation included the restoration of the original baroque chapel, it's original salons, timber ceilings and tiles, and the design and fabrication of a contemporary art installation. The renovation works finished in December 2015.

Keywords: Belen Tower Governor's Palace in Lisbon, Boutique Hotel Spa, Heritage Restoration and Contemporary Architectural Renovation.

1. Conceptual Background

Projecting means *throwing, flinging…* And the action of projecting or aiming - Architectural design is ubiquitous and synchronic, it involves simultaneously the past, present and future. To use an analogy: - that of the archer stretching the bow while the arrow points to the target. The architect, as the archer, concentrates, meditates, feet firmly in place in present moment; one bent arm holding the arrow and other pulling the string back, retreating in the space-time of the past, the historical strata of the building or pre-existing context, the successive memories, archetypes and moments that support and drive the present. The other arm and gaze projecting forward to the future target, by imagining flinging images and anticipating what the project can achieve and be realized by construction work. Projecting matches this synchronic time of present pressure (as with a taut bow and rope) between the past and the future, resulting in material resources and technical means available at present. That timing, encompassing the past and the future in the present to project action, also corresponds to a timing and ubiquity of scales. The project involves a holistic view that encompasses the entire architectural

design in its heuristic aspects: - symbolic, aesthetic, structural, constructive, functional, experiential. Simultaneously it serves various levels of intervention: from the scale of the territory and the city; the framework and landscape design in the context of the place; the general architectural plans; to interior architectural design in progressive scale detail and art installation.

2. Expectations and challenges

Projecting is working on expectations of images we created and which generally are below or beyond future reality. Projecting is not a monologue or an act of free and isolated creation, since it involves meeting the expectations and conditions of numerous other parties: pre-existing, programs, regulations, budgets… and a dialogue with the "other" (client, technical assistants, public authorities, etc). During this process, between the design and the construction, some vicissitudes can generally occur that essentially correspond to external forces, alien to the individual act of projecting and which divert the expectations, either in positive terms, either in negative terms. And what we expect, the projected images are sometimes affected by external factors that in the limits can contribute to the success or failure and the distortion of the final result. Among these external factors we refer to the various stakeholders involved in the process: the client, public authorities (the Urban Town Hall Department, the Heritage Department, The Security and Fire Department, the Tourism Department…). We consulted with colleagues in Town Hall council to fullfil our commitments according to the planning application, whose opinions the project is subject, in order to obtain the building permit, the times of approvals and construction time), the contractor, the work directors, the different workers … and the set of contingencies that may include: archaeological finds, client's capricious changes and financial crises, change of developers, project misunderstandings, omissions, short deadlines, natural disasters...

Fig. 1, 2, 3: Drawing of the Governor's House; Interior before renovation; Courtyard roman ruins excavations.

The site tells stories segmented by absences signs that indicate the original senses and the transformation process over time. *Scooping* is to deepen and enter inside the unconsciousness of the site and the pre-existing building, to reveal their forgotten memories. Layers of archaeological strata are revealed from the mythical depth and historical and prehistoric roots of its origin emerge. Always lingers in some aspects of things, even after the original function is lost. The ruins and the archeological discoveries, as *object trouvé*, acquire museological and aesthetic worth that exceeds its original functional purpose.

Cultural attributes, the heritage worth, and the value of antiquity, are enhanced by time, rarity and the accumulation of successive historical strata that highlight the corresponding cultural presence to the cultural value of architectural work impregnated by attributes and memories. Besides the heritage value and the effect of a presence emanating from the building in its context of the site, various other forces interact in the intensity of this aura between the visible and the invisible: boundaries, materiality, tectonics, memories, *gestalts*, symbols...

Having exhausted the original building's capacity of the original building function, different things can happen: deterioration, ruin… or consequential loss of economic value attached to it and complete disappearance of the original function. The inversion of the function or a new function can be associated with the renovation increasing its economic worth, and breathing new life into the building. This economic value can be even more enhanced if the building has an additional heritage or antique value and whether the project integrates all these values in a comprehensive cultural whole.

While undergoing initial works, ancient ruins were discovered. It was imperative that this be preserved and integrated into the project as a highly-prized component. In the project, the previous imagination is ubiquitous and synchronous. It overtakes the history and the site where is linked rambling by other sites and other times, stimulated by various triggers, which relate to: archetypal image; paradigmatic references from other projects and works; or even the attempt of intentional amnesia by the positive emptiness, receptacle of innovation. The presence of chance, transpositions of experienced sensations, oneiric or consciously imagined images, programmatic and constructive adjustments help to realize the project.

The main challenges in the conversion of Governor's House into a boutique spa hotel were construing on an already existing built heritage and incorporating the archeological ruins. The project was initiated on the 11th September, 2011, the day of the first contact with the former client. Fourteen years has since past, during which time, archeological discoveries, impasses, approvals, changes, slow construction, archeological discovers, impasses approvals, changes, slow construction, interruptions, hurdles, challenges, delays... resulted in numerous imponderables and vicissitudes.

4. Brief description of the site context and the building

The Governor´s House is part of the landscape and historical heritage urban context of the Belem Tower, the iconic military construction, built in 1515-1519, which defended the entrance of the Lisbon Bar. The Belem Tower *Manuelino* style, under the metaphor of a stone caravel, and location on the Tagus River bank, are directly related to the epic of the Portuguese maritime discoveries. In a broader context, this architectural heritage complex includes the Fort and the Bom Sucesso Governor's House, Quinta da Princesa, the Convent of Bom Sucesso and vernacular housing all located along the Belen riverfront, allowing the appreciation of the main monuments: The Belem Tower, Jeronimos Monastery and CCB (*Centro Cultural de Belém*).

Fig. 4, 5, 6: South Baroque portal; Restauration of Baroque Chapel and art installation; Salon Lobby.

The House, its self, dating back to 1517, as a plain expression, according to George Kubler in «Portuguese Plain Arquitecture», after the coined «*Chã*» by Julio de Castilho. It was used by the military and purpose-built for housing the Governor of the Tower of Belem. The House was successively expanded over the until the 18th century, and partially disfigured during the 20th century. The southwest wing, facing the Tagus River, corresponds to the original core of the building. Crowned by prismatic and pyramidal roofs (scissors roof) of various heights, it is underlined by a basement and terrace, and marked by a Baroque portal of bonfires and an outdoor staircase. This gate once corresponded to the main entrance open to the river, as shown in a nineteenth century drawing. The elongated volume, supposedly dates back to the 18th century, is underlined by the basement, and terrace. Although damaged by past uses, these two structures are part of the original design. The spacious interior salons and lounges, which open to the terrace facing the river, are characterized by high timber ceilings and walls wainscoted in bleu tiles.

A baroque chapel, next to the courtyard, occupies a mezzanine space. It is decorated with C.18th tiled panels that featured religious scenes. The altar, once gilded, and balconies were badly damage and fully restored. A large C.18th oil on canvas painting depicting the annunciation of the Virgin once hung above the altar. We strongly advised the former client that this be removed and restored before works commenced. This advise was not followed, and unfortunately it was later stolen. The other support buildings made up a patio courtyard to the main street Rua de Pedrouços. The "U" morphology of the building including the courtyard did not seem to conform to an intentional typological plan. It lacks architectural coherence, was fragmented, had a scale of one and two floors and the character of the different structures, facades and roofs was heterogeneous. In order to accommodate an open

courtyard to the street, a stable building was constructed to enclose the composition. This mean that a desire for a Baroque principle was not completely achievable.
It is important to point out that when the project started, the building had a historical heritage pre-classification by the IPPAR (Portuguese Institute of Architectural Heritage).

Fig. 7, 8: South facade and water feature; Salons lobby

5. The initial project

The original state of the building and site, the state of abandonment and deterioration of the building, the functional program of conversion to a boutique Hotel and spa and the recommendations of the Heritage Department, all established a set of architectural intentions for the new renovation and restoration of the building. The recommendations given by structural surveyors and heritage historians were duly respected and followed. The architectural proposal sought to preserve the footprint of the existing house, while preserving its original features, thus allowing for a clear reading of the various historical strata, facades, interior spaces and its architectural and structural features. Rooms with timber ceilings, wainscoted tiled-walls, stone masonry, etc would greatly enhance the image of the Boutique Hotel.

Fig. 8, 10: South facade and water feature; Bridge over roman cetareas and main entrance.

The new design proposed to build on top of the existing structures and under, that means it included the addition of a new floor of bedrooms in the upper story, forming an attic and expanding the building by excavating three underground floors for the spa, parking and technical areas. Following consultations with structural engineers, it became clear that the existing structures (stone masonry, and *Pombalino's* wooden structures) required additional supports of compositive material (steel, reinforced concrete). Under the new programme, the excavation was very complex, involving shoring, contentions, repressions foundations and new roofing supports. In architectural terms, the proposal reinforces the courtyard "U" shape, unifying its image as a whole. Functionally, the hotel program is organized on levels -2 , - 1, 0, 1 and 2, along the longitudinal axis with the two new perpendicular axes of corridors that correspond to the side wings designed for bedrooms. In the two intersections of these horizontal axes, we designed two vertical circulations formed by staircases, two lifts and two service columns. The main entrance of the hotel is on level 0, accessed across the courtyard that leads to the reception area. Adjacent to this is the double height Baroque chapel decorated with panels of blue and white tiles. In the south wing, a successive of original salons is in *enfilade.* These have been

designated for social use - lobby and bar, and are open to the terraces, with views towards the Belem Tower and the river. At level 1, also comes out at a renovation of the noble function of the building.
The original salons have been converted into the main suites. At the roof level, we created a new floor of bedrooms corresponding to an attic, which intersect the original roof. The new attic is marked by a zinc façade, with beveled vertical windows, creating free rhythms that delineate the difference between the contemporary intervention, and the ancient one. In the lateral facades the vertical windows are intentionally beveled, from the interior of the rooms, opening the views towards the river. Inside, the additional attic, intentionally designed with walls and vaults of intersected geometries, was intended to be originally in wood. As reminiscent of a ship, its use round portholes frame views of the urban landscape, and 25th April Bridge over the Tagus River.

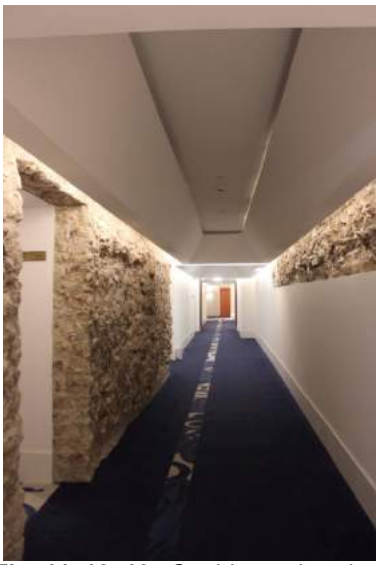


Fig. 11, 12, 13: Corridor and ancient foundations; suite salon and bedroom *enfilade*.

The rooms facing south have two different levels, promoting some surprise effects from the entrance to the bedroom down and the views below framing the river landscape. At the basement level, in the wing facing south, the original walls and brick vaults under the terraces are preserved. This wing serves as bedrooms and the restaurant. We used the Baroque portal as the main exterior entrance to the restaurant, which opens to the south and faces the garden. There the white swimming-pool is placed, surrounded by a wooden deck, and an upper terrace, designed to suggest a sailing vessel, with its round portholes in bronze, salved from an original ship. The elongated basement, which takes advantage of the rhythm of the existing windows, doors and main walls is the bedroom wing, looking an extensive water feature. This reflects the building and provides privacy and serenity for guests, as well as serving as a fire protection tool. Two new excavated floors comprise the spa and services areas that connect directly to the underground car park under the garden.
The spa swimming-pool occupies all the double height space, underneath the palace courtyard, and is extending to another contiguous space of smaller scale. The extensive use of the zenith lighting throughout the interior swimming-pool creates a thermal atmosphere.

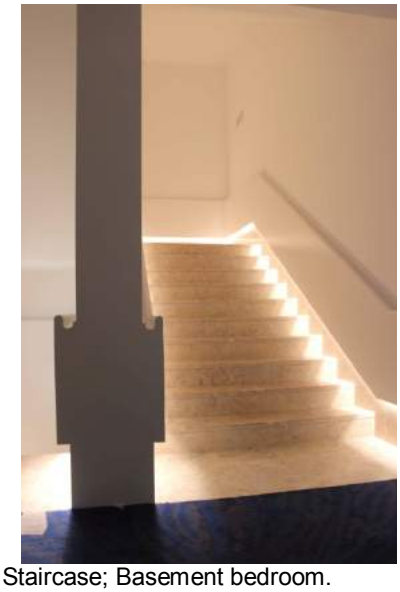


Fig. 14, 15, 16: Main suite bedroom; Staircase; Basement bedroom.

6. From initial works to archeological excavation

The excavation of buried floors involved the installation of micro steel stakes to suspend the building to the shoring and the underpinning of the foundations in reinforced concrete. During the excavation of the courtyard to accommodate the spa, archaeological ruins were discovered. Building works were immediately stopped. The archaeological discovery led to the intervention of IPA (Portuguese Institute of Archaeology); and the archaeological team (ERA) worked on the site for six months caring out excavations and surveying of the Roman structures found. They dated the roman ruins from the 1st to 3rd century A.D., belonging to a fishing industry of the Roman city of *Olissipo*, then renamed *Felicitas Iulia* (Lisbon). The archeological discovery un-earthed a set of *cetariaes* tanks, approximately 1.50m deep used for the production of *garum* - a sauce made with a seafood base that was exported in amphoraes to Rome. The Roman structure, built in *opus quadratum* stereotomy, occupied part of the courtyard extended upwards under the palace basement that had used part of it as foundations, following the pre-existing orthogonal directions. Inside the *cetareas* the archeological team found several Roman amphorae and *garum* remains.

7. The recasting project

Our intention to preserve much of the archaeological finds, integrating them into the work and providing a genuine site of historical interest, led us to a positive reformulation of the courtyard design and the interior spa. In order to safeguard the *cetareas*, it deemed necessary to cover them by a roof, supported by a light-weight metal structure. The patio's iron railing to the street was replaced by a glass curtain that allows public exposure of the Roman tanks. The main access to the hotel across the courtyard is mediated by a bridge over the *cetareas*. Some bedrooms have a view directly towards the Roman ruins. The other side of the Roman structure, once buried, is now revealed inside the spa. The swimming-pool is converted into a larger double-height room that connects with other small-scale room. It is possible to swim through, the two spaces for a total of 25m length, and reach the area of the Turkish bath, sauna, Scottish bath and tropical showers, all located along a longitudinal axis. The swimming-pool is accessed by a rest room and through a porticoed gallery which supports the structure of the large console ceiling and some existing walls of the house. A continuous glass opening separates the patio pavement from the *cetareas* and allows the overhead light entry that pours the reverse of the Roman wall. The dynamic reflections of the light on water, creates an enigmatic thermal atmosphere evoking the Mediterranean traditions. It was initially planned to open up five niches on the background wall to contain the amphorae that had been un-covered, but they were not realized. The spa facility in total occupies an area of approximately 1.300 sqm including all amenities.

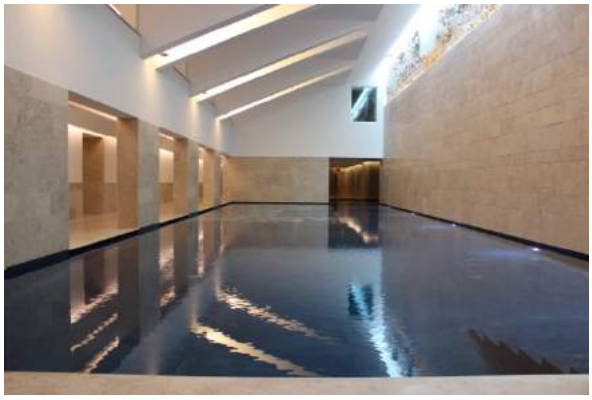


Fig. 17, 18: Spa: swimmingpool; View towards the Roman ruin.

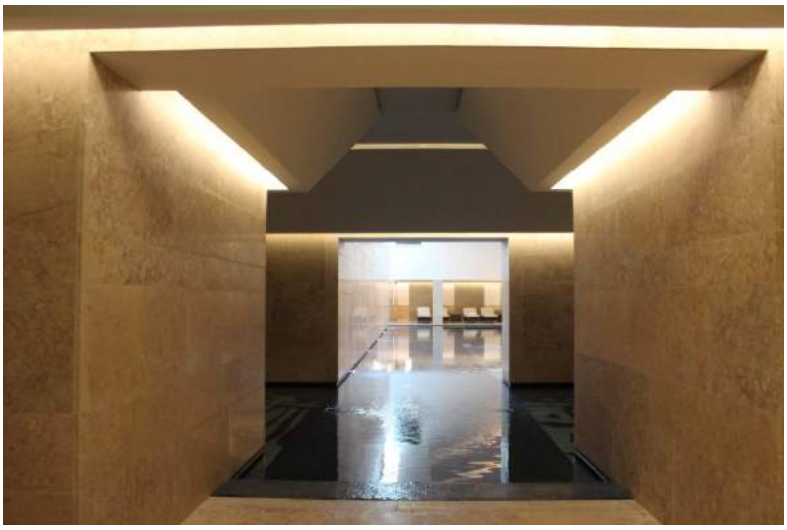
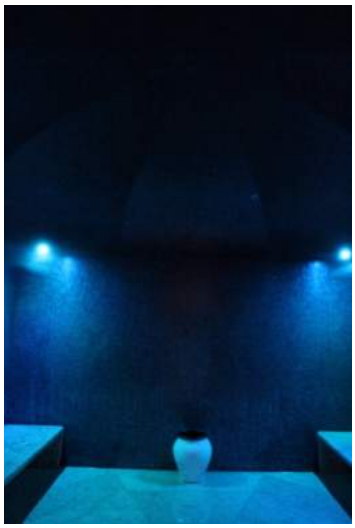



Fig. 19, 20: Interior swimmingpool; Turkish bath.

8. Methodology, levels of intervention and scales of design

The project integrated different methodologies of intervention, from restoration, to recovery, re-adaptation and renovation. Whenever possible the ancient existing architectural components and materials, such as - wooden ceilings, masonry, baroque tiles and fireplaces… - were carefully restored and preserved, while respecting original patterns, and forms. In the case of the Baroque chapel, all the existing bleu/white tiled wall panels were completely restored and gaps filled with replacements to continue the religious figurative narrative. Some of the original wooden trims that were in a good condition were preserved, but the wooden ceiling was extensively damaged. This was therefore rebuilt using the same woodwork and pattern. As the original Baroque altar had disappeared, we introduced a new element inspired by the curved contour or the existing balcony: - a contemporary installation composed by shinning steel tubes – it suggests the once-in-place organ that might occupied this space in the past and reinforces the Baroque liturgical character of the room. Also the original interior and exterior doors and windows had disappeared, which necessitated the design of new doors and windows in a contemporary restrained style.

The original and completed the bleu/white Baroque tile panels were applied in wainscoting the main salons, chapel and bedrooms. In other areas of the hotel old tiles are used in patchwork compositions. Most of the building was restored and adapted to meet current comfort standards. Only the stables structure body on the east wing of the courtyard was demolished and replaced by the block of rooms. Renovation includes a new exterior and interior extensions, such as the attic, the new east wing of the patio, the underground spa, parking and the new garden to the south. All of the interior spaces were carefully designed with attention paid to the constructive detail. New ceilings are inspired by original timber prismatic ceilings, in a contemporary expression of fluctuation. Technical installations are hidden and allowing indirect light, adapted to each room, and conform to the pre-existing exterior openings, creating a variety of new solutions.

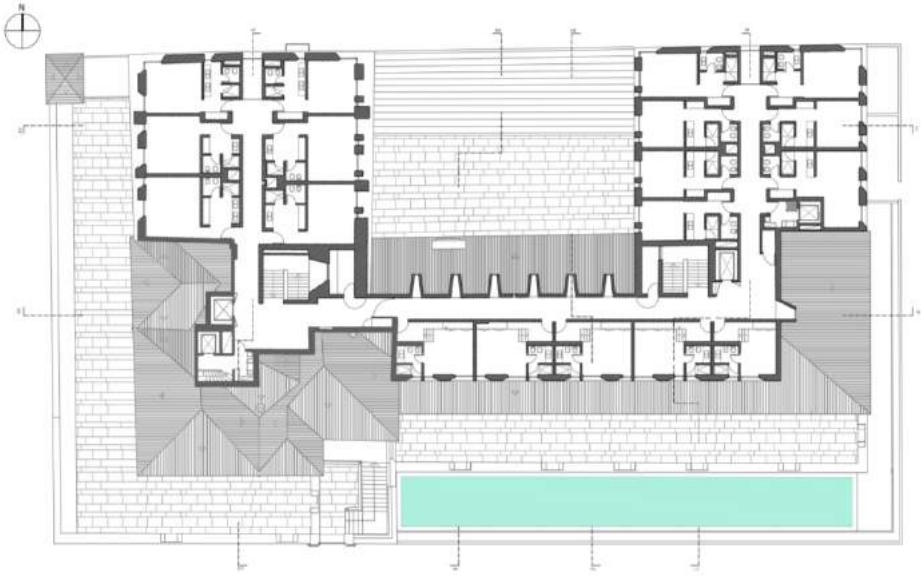
Fig. 21, 22: Main salon lobby; Restaurant.

We defined a reduced palette of materials: the local limestone - applied on exterior pavement, in some interiors and in water areas, - establishing a continuity of pre-existing masonry; white stucco in interior walls in contrast to the blue/white tiles, and white plaster in exteriors; wooden riga planks on the floors, and timber prismatic ceilings; glass panels and zinc coating are the new materials according to the contemporary renovation, reinforcing the differences between the ancient and the current.

9. Other vicissitudes...

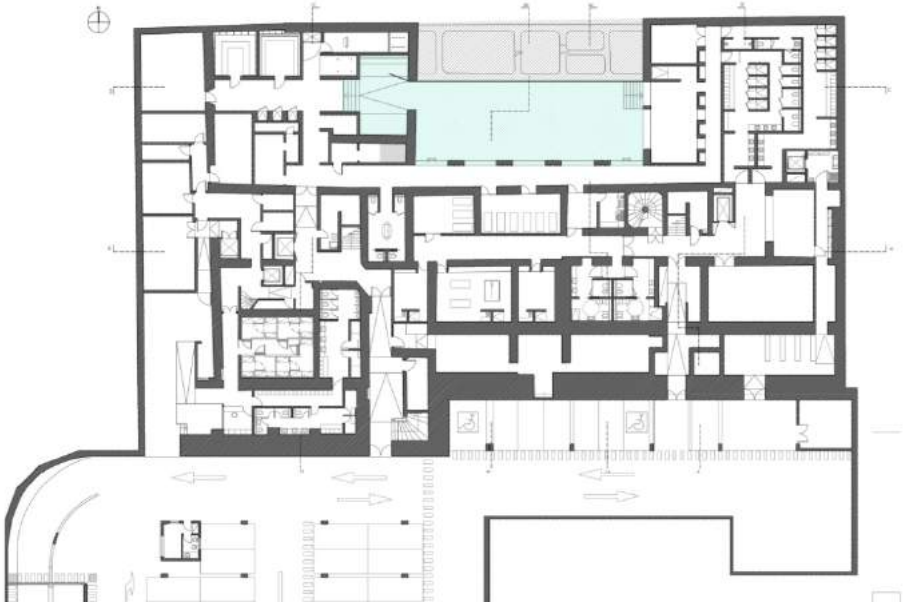
During the first phase of construction, the former client decided to make changes during the execution thereof; without the permission of the authors of the project already approved by the various official institutions. Then he suffered a financial crisis and the suspension ordered by the municipal authorities stopped the works. Just five years later, in 2015 the construction works were resumed. The Town Hall Urban Department fortunately determined that original project designed by the authors be respected. A new client, *Nau Hotels & Resorts*, finished the works, where most part of the original project was respected, except some details, motivated by a lower budget, and the fast of the short deadline imposed.

Fig. 23: Site plan; **Fig. 24, 25, 26:** Plans of levels 2, 0 and -2.

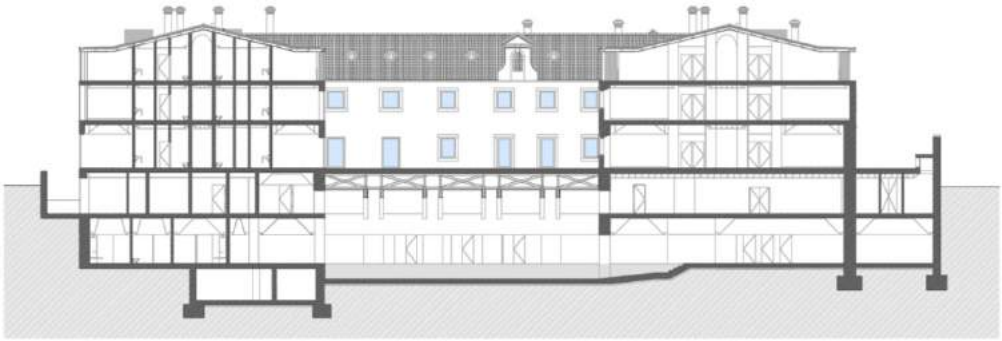


PLANTA PISO 2
JORGE CRUZ PINTO E CRISTINA MANTAS Arquitectos, lda.

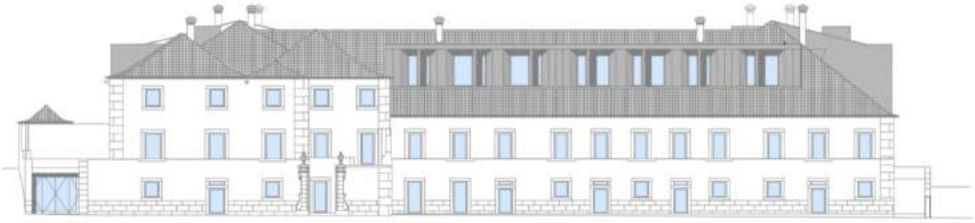
PLANTA PISO 0
JORGE CRUZ PINTO E CRISTINA MANTAS Arquitectos, lda.



CORTE AB



CORTE CD
JORGE CRUZ PINTO E CRISTINA MANTAS Arquitectos, lda.



ALÇADO SUL
JORGE CRUZ PINTO E CRISTINA MANTAS Arquitectos, lda.

ALÇADO NORTE

Fig. 27, 28, 29, 30: Transversal Section; Longitudinal Section; South facade; North facade.

10. Datasheet:

Client: NAU, Hotels & Resorts.
Architectural Design, Art Installation and design: Jorge Cruz Pinto + Cristina Mantas, Architects
Project of Foundations and Structures: A2P, Eng. João Appleton; Projects of Lightning, Electric Network, Telecommunications, Integrated Security, AVAC and energetic certification: OHM-E +LIGH PLAN, Eng. Fernando Silva Gusmão; Project of Water and Sewage: TORÇÃO-E, Eng. Gil Gomes da Silva; Acoustic: Eng. Soheyl Sazedj; Archaeology team: ERA; Contractor: CASAIS,SA; Decoration: Designer Nini Andrade Silva; Photos: Arch. Cristina Mantas.

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The future of caravanserais along the Silk Road in Iran

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Abstract
This paper presents a proposal for the reuse of the caravanserais that are situated on the trait of Iranian Plateau along the Silk Road.
Iran is a country with a rich cultural and material heritage. In this context the caravanserais that dot the ancient routes are architectures, perhaps minor, but rich in meaning.
Moreover Iran today is a country that it's opening itself to the rest of the world and it's opening its borders to tourism; which is both an opportunity and a risk.
Damages caused by a badly managed tourism are well known and increasingly evident.
Starting from this premise, the thesis is that the reuse of these manufactures, which geometrically map the territory of the Iranian plateau, if conceived as elements of a system that can integrate pre-existing historical architecture, landscape, agriculture, roads and water infrastructures (qanat) can be an incisive action to enhance cultural and economic development of the area.
The reuse of caravanserais can thus represents the key element for the definition of a renewed "landscape of exchange and knowledge" and the starting point for a sustainable tourism development.
The work, that is intended to present, has affronted this topic on a double point of view: that of research and that one of design.

Keywords: caravanserais, Iran, reuse, sustainable tourism.

1. The Iranian Plateau an infrastructured territory
For centuries the merchants travelling either, from the Mediterranean to India and China, or from the Persian Gulf to the northern regions have travelled throughout Persia along an elaborate system of itineraries. Pilgrims, Sages and simple travellers used these routes as well by joining with the caravans. This uninterrupted movement of goods and people was based on a complex system of infrastructures and buildings: the communication networks, the bazaars, the marketplaces. The caravanserais, build either at the side of the roads or inside the city walls, form one of the most important territorial and monumental systems of the Islamic world. It is said that, up to 990 caravanserais were built only during the reign of Sahah Abbas, this number is surely exaggerated but it still gives a measure of the importance, not merely symbolic, of this manufactures. J.B. Chardin [1], considered to be reliable source, in his voyage diaries, written in the early sixteenth century, reports the existence in Persia of about 1000 Caravanserais. Moreover a recent mapping has showed with strong evidence the richness and extension of this system.

1.1 The Caravanserais: A perfect mechanism
The “house of caravans” or fonduk, funduq, wakala or khan, depending on the location, has a main typology with a central courtyard and a square plan which is present with continuity in the Islamic world [2], . In this geographic extension the caravanserais demonstrated to be a model that can be adapted and replicated in divers conditions. The basic scheme is

composed by a central court that gives access to small, raised rooms, used by travellers. The spaces positioned at the four angles of the manufacture, bigger for geometrical reasons of the structure, are generally dedicated to common activity. The court hosts both goods and animals. For both defensive and climatic reasons the perimetral walls are completely closed and the access to the structure was possible only throughout a single monumental gate. This basic typology, that can assure a minimum of comfort to travellers, can be subject to a certain degree of variation depending on the period of its realization, on its geographic position or on whether its location is inside or outside the urban fabric. Urban caravanserais are usually built with a second floor where merchants could sleep while goods and animals were located on the ground floor. Isolated caravanserais instead were usually built on a single level, with the exception of the main façade, where in correspondence to the entrance a second level was realized and it was used by the people that lived in the caravanserai. The typologies present in the Iranian plateau are characterized by the presence, on either two or four sides of *iwan*, a typology of space that characterizes the great majority of the architecture in the Iranian area [3]. The structure can thus be a cross or axially symmetrical. In the most complex structures (systems), the spaces for animals are located in a long room that develops along the external perimeter of the building, between the outer wall and the night sleeping areas. In the Iranian territory there can be found, although with minor frequency, other typologies as well. This different typologies have been determinate either be climatic reasons or by the creativity of the constructors, one example can be found in the magnificent circular Caravanserai of Zein o Din. The caravanserai was thus a perfect mechanism, connected with the commercial routes, that answered to precise necessities. This needs remained unvaried from Alexander the Great until the revolution of the means of transport: to protect the goods, to protect travellers, to feed man and animals every night of their voyage[4]. For this reason the caravanserai's network has represented a territorial system of infrastructures that has worked, regardless of political, historical and geographical modifications until recent years. And this was when the needs that were at the base of its existence didn't start to decline because the time needed for travels greatly decreased and the commercial routes have been partially modified. Today the numerous caravanserais of the Iranian plateau are for the great majority abandoned. Only some continue to serve a purpose as resting places for pilgrims, some are used as a shelter for small commercial activities and only very few have been transformed for touristic means.

Fig.1: Iranian caravanserais. In green the Silk Road, in red the selected caravanserais.

1.2 The Reasons to Safeguard

Iran's architectural and cultural patrimony is immense. Persians, Seljuk, Mongols, Arabs, Greeks and Romans have left traces, they have imported and deposited fragments of their culture and of those with whom they have come in contact.

If confronted with other architectures in the Iranian territory caravanserais represent a "minor" patrimony. The richness of the Safavid architecture in Eisfhan, the urban complexity of Yazd and Kerman, the Qajar heritage and the Greek archaeological sites are all so magnificent that the safeguard of this works is a priority, and in a certain way a rather simple one. They represent a universal heritage that has been object of care maintenance over the course of time. They are a superb patrimony while Caravanserais are actually architectures born from necessity. The first will easily gain benefits from an intelligent development of tourism: different is to imagine a possible future for the numerous buildings in stone, brick or adobe that build the network of the caravanserais.

This said there are important reasons for their safeguard, and there are opportunities as well.

The reasons, the motive for their safeguard, is mainly the preservation of the symbolic meaning of this places: not mere strongholds for commercial routes but exchange centres for the transmission of ideas as well as places of truce and pacification. The opportunity lies in the possibility to make Iran a pilot country in the realization of policies that look for innovation and experimentation in the safeguard of a cultural patrimony that can have an active part in a virtuous economic development.

1.3 The Means of Safeguard

The key elements for a requalification project in our opinion must be:

-The individuation of simple activities based on local skills.

-To invest, starting today, on a development of the land that valorises the existing resources.

-To find functions that can take place all year long.

-To consider the reuse of this building as an opportunity to invest in innovative activities

Iran is a country where craftsmanship is vital, and of a very high quality. Agriculture is still an important component of the economy with products famous worldwide and a high presence of small business that farm in a traditional manner. Generally a great part of the productive activities has not been consumed by globalization and industrialization mechanisms. Craftsmanship, agriculture, zootechnics and cultural tourism might be the key elements for the conservation of this network. The aim is to regain its vitality, to develop local economy and to incentivise a different kind of tourism.

Starting from the considerations we have made so far we have developed a series of proposals for the regeneration and reuse of a group of caravanserais along the Silk Road between the cities of Damghan and Semnan. The functions that have been selected have been tested during a workshop conducted by the universities of Rome and Garmsar [5].

2 The proposal: a renewed landscape of exchange and knowledge

The Silk Road before being a real infrastructure is a place for the imaginary. In the segment we have selected, that goes from Garmsar to Rivand, the Silk Road experiments different climatic and geographic conditions, desert zones, mountain passes agricultural areas and small urban centres. The caravanserais that constitute this trait are thus located in different contexts, now urban, now natural.

In Lasjard, Mazinan, Mehr and Rivand where landscape is characterized by the presence of agricultural activities, we thought to locate small centres for research, experimentation and production connected to local cultivations. Ahouvan is located at a high altitude in a desert mountain landscape where during the winters snow blocks the Asian highway we thought of two, different, seasonal, proposals: a receptive use during winters in cases of emergency and a summer school for the restoration of archaeological manufactures in summer time. The school will focuse on the research, to improve the performance of both technology and traditional materials and to form specialized workers. In Miandasht, one of the biggest caravanserai in Iran, located near two protected areas, we thought of a touristic use, for a different and more aware form of tourism, just as in Qousheh. In Mayamey instead, the caravanserai is located in the city centre. The presence of activities connected with the weaving of carpets suggested to us the realization of a production centre and a school of craftsmanship. The functions found, tied with tourism, craftsmanship, agriculture and commerce are all connected to the idea that it is possible to look towards a development of the local economy. To favour the local development means to trigger a virtuous process where the inhabitants are involved in the care and safeguard of the properties.

It is naturally not very realistic to imagine that all the caravanserais that are located in the Iranian trait of the Silk Road can be recuperated in this way or with these functions. The requirement will be to individuate the most important manufactures considering their location as well. We believe that this proposal has an important symbolic value. It is not the single manufacture that must be safeguarded but the whole network of infrastructures that mark the territory.

2.1Lasjard

The caravanserai of Lasjard is raised in the proximity of the city centre. It's one of the few caravanserais that is still in use. Internal spaces are used for selling local handiwork, for storing agricultural products and for the occasional comfort of craftsmen, merchants and pilgrims. In the court there is a small vegetable garden. The requalification project is designed to maintain the actual functions while adding a new use to the building by creating a structure able to coordinate the development of agriculture. A new building in front of the caravanserai will host laboratories and rooms designed for the formation of labourers in the field of experimental crops. Traditional agrarian landscape is characterized by fences, that protect crops and by the alonak, small buildings that offer shelter for peasants and their tools. In the project the same elements have been use to maintain the values of traditional landscape. Every alonak is the cell of a network of experimental orchards that depend on the central building destined to the laboratories and to the caravanserai.

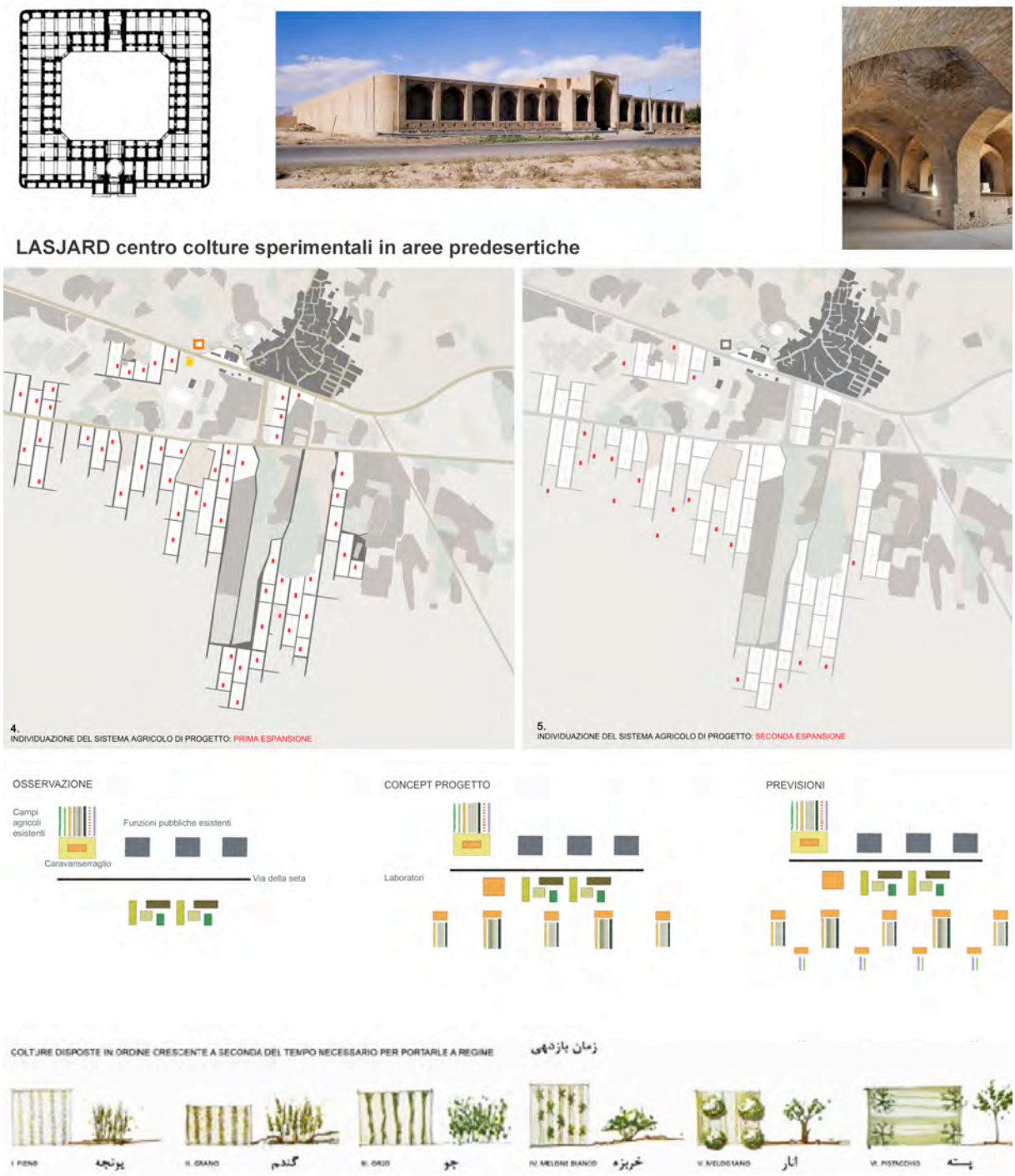

Fig. 2 Centre of experimental crops in pre-desert areas

2.2 Ahouvan

Along the Asian Highway there are two manufactures, located in a beautiful desert zone; one, ruined, in adobe and the other, still in good conditions made of bricks. Climate is hot and dry during the summer season while in becomes very cold during the winter. Nowadays only one distributor serves this zone and it represents a fundamental stop zone for those people travelling east, in the winter this path is particularly difficult. The beauty of the place, the variability of the climate and the necessity to provide the vitality of these manufactures all year long have suggested the idea of a dual use. During the summer the caravanserai will be a school of restoration that will develop the research to better the performances of technologies and traditional materials as well as forming people able to use them. A school that can also be visited by tourist travelling that are interested in learning traditional constructive techniques. Constructive systems and materials - beyond having a high degree of bioclimatic sustainability - are indispensable for the activities of reuse and restoration. In the winter season the activities of the school will have to be partially reduced and some of the residences can be used as accommodation for travellers. It is evident that this proposal is not easily repeatable but it still represents a mixture of functions than can make a yearlong utilization of these manufactures easier.

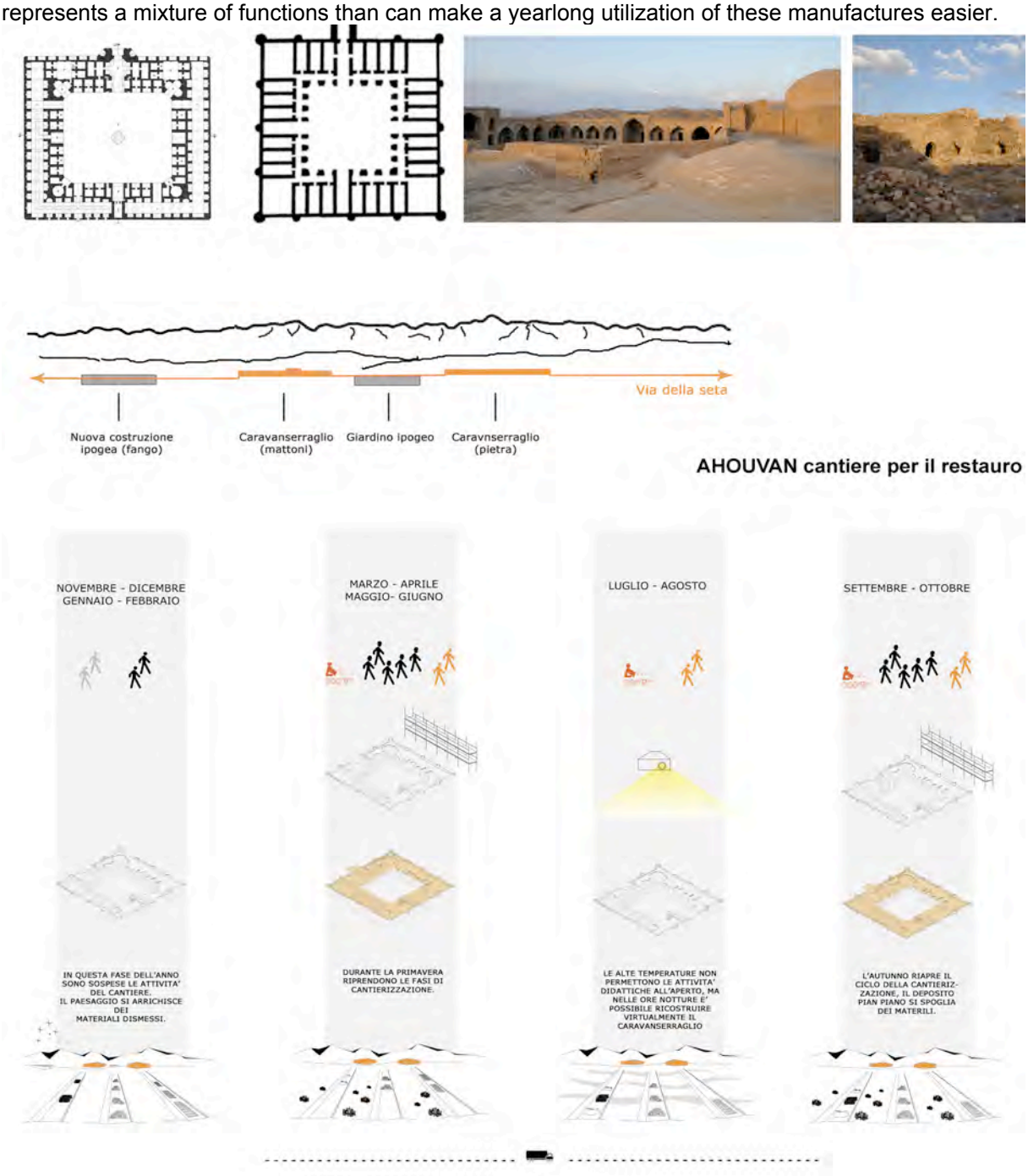

Fig. 3 Construction site for buildings restoration.

2.3 Mayamey

Mayamey's caravanserai does not configure itself, differently from the others, as an isolated structure but it's tightly anchored to the urban centre. The survivor of a craftsmanship based on the weaving of carpets and on ceramic have been the basis for the idea to build a centre for the production and a school of craftsmanship that will also have the role of gathering and eventually selling local family production. It's function is connected to the requalification of the small but lively urban centre. The urban system is kept together by two roads: the Asian Highway and a ring road that meet, in correspondence with the caravanserai, an ancient path that comes down from the mountains following a water road. The process of redefinition of spaces and functions of the city is concentrated on the portion of Mayamey that goes from the caravanserai to the fort, where the pre-existences are more evident and have an urgent need to find new uses. The ancient fort will become a diffused hotel, the caravanserai will again unroll it's old receptive function, but in will mainly host laboratories for the study of new production techniques; in the great open space between the caravanserai and the fort the urban texture will be completed by inserting a small bazaar.

Fig. 4 Centre for handcraft.

2.4 Miandasht

Miandasht caravanserai, according to many world travellers, is one of the most important caravanserais on the Silk Way. It is estimated that each night approximately 20,000 people could stay inside and around Miandasht caravanserai. The large size of the building, the presence of two natural parks and of very small farms, have suggested the possibility to propose a complex with functions connected with the park. We have imagined to realize itineraries, organized by local guides, that can be made both on foot or horseback with the relative structures (such as homing for guides, stables, car rentals).

Moreover we have thought of creating an info point and different kind of accommodations for travellers. To return Miandasht caravanserai back to modern life we have decide to mix different functions and to propose accommodations for three different kinds of tourism: the tourists who stay few hours a day in the complex, those who reside one night and those who stay more than one night.

Fig. 5 The entry of natural protected areas and accommodation for sustainable tourism.

2.5 Mazinan

In Mazinan the caravanserai becomes the central pavilion of a Persian garden surrounded by walls that open at the end of the main road. The caravanserai is redefined and collocated within a system of periferical gardens that contribute to redefine the urban centre's margin.

The strategy is to redefine the margin of the urban centre of Mazinan by creating a big urban garden. The geometrical module is derived by the dimension of the caravanserai which assumes the role of a space measurement element. The square gardens, about 65x65 meters can be also divided in sectors that become basins or flowerbeds bound to receive water and different plants.

The strategies for the research activity consider three systems of structures.

1 Farmer rooms, small houses realized with traditional materials and inspired by the warehouses where Iranian farmers store their tools. They represent a sort of "diffused agritourism" that enables tourists to sojourn in the cultivated camps remaining in a direct contact with the garden and the caravanserai.

2 Farmer rooms are alternated with panoramic platforms, with a height that goes from six to eight meters, and they function as mirador.

3 Within the caravanserai there will be spaces for hosting such as canteen and a guesthouse. There will also be a centre for the research on semi-desert agriculture.

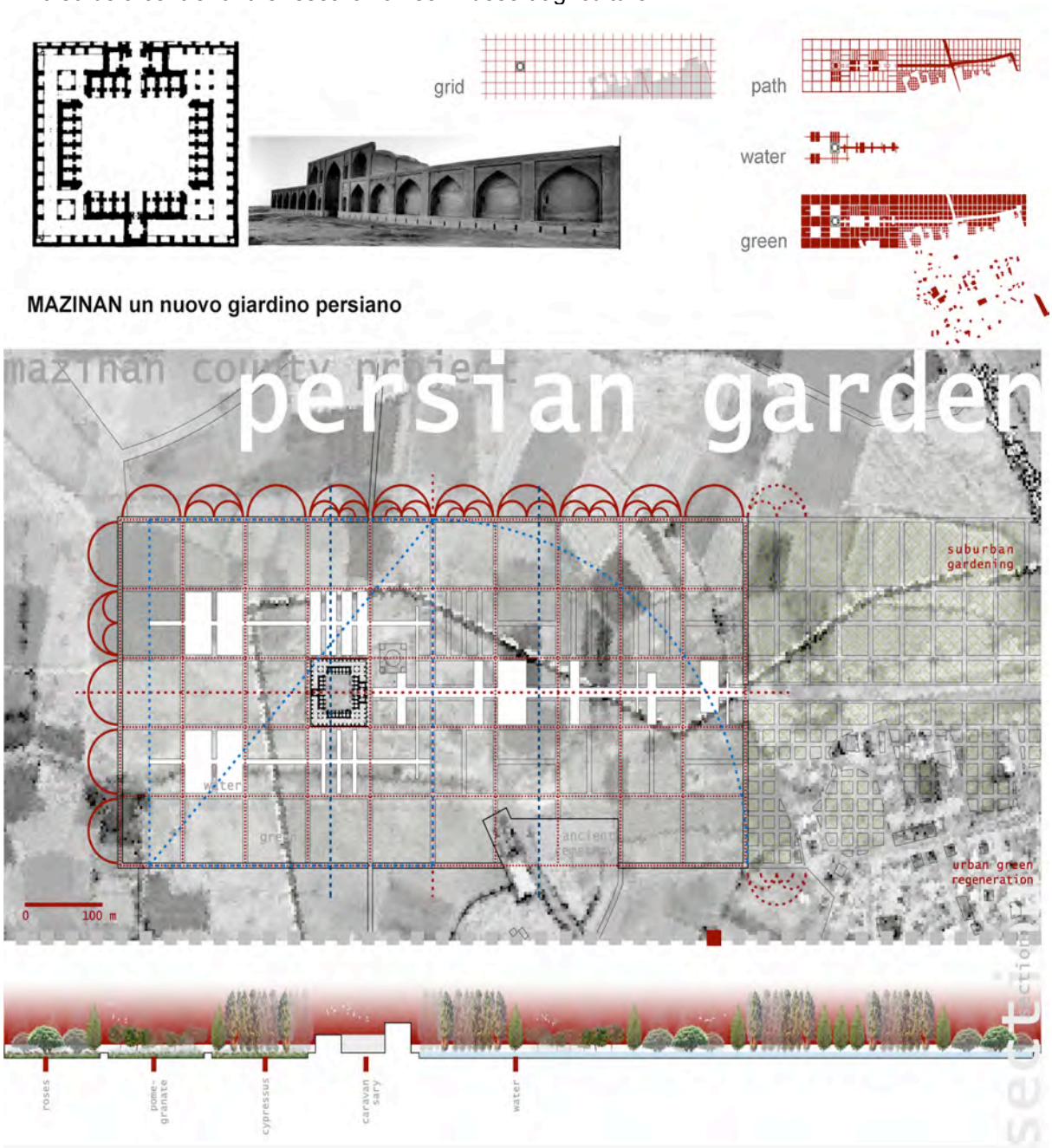

Fig. 6 A new Persian Garden

3 Conclusions

As multiple European experiences have by now clearly demonstrated, with some exceptions that belong to the most important material heritage, the restoration of the manufactures that don't possess a specific function and of those that are not included in economic and cultural context, doesn't work.
Moreover when speaking of caravanserais it's the vitality of the system that has to be recuperated. The single building loses its meaning when it's not placed within a network.
A policy aiming to restore caravanserais if not inserted in a strategy intended to identify new uses for this structures is condemned to failure. It is thus indispensable to recover one or more roles for this manufactures by positioning them in a system. They must be inserted in a local economic network, which is surely the most fitting to this reality.

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The *Ager Calenus* occupation during Roman times: the cisterns of Camigliano CE in the "Colonne Spezzate" locality

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Abstract
The furthest north east point of *Ager Calenus* today is made up of the municipality of Camigliano, an area measuring 6 km^2, the occupation of which during Roman times is attested by means of various archaeological sites, proof of an intensive agricultural use of this area.
Among the archaeological evidence, the best preserved is the complex of cisterns in the "Colonne Spezzate" locality, which is extraordinary proof of the hydraulic system dating back to the Roman period.
The cisterns, which are located along the western side of the road that leads from Camigliano to Giano Vetusto and were built in line with the slopes of Mount Pozzillo, on the banks of the Rio Maltempo river, date back to between the late 2nd and the early 1st century B.C.
The structure has a rectangular plan and is composed of at least eight rooms, aligned along the major axis and connected by arched openings.
All the rooms of the cisterns are fully covered with barrel vaults, and are divided by walls in *opus caementicium* covered with a facing of tufa in *opus incertum*.
The water supply of the cisterns was probably favoured by the water coming from the natural canyons of Mount Pozzillo by means of duct systems through which the water was located in rooms by holes situated along the short-sided walls.
The complex of cisterns, built a short distance from other contemporary sites, included in particular a furnace, as implied by its remarkable capacity, about 1200 m^3, had to be a sort of main tank at the service of these structures.

Keywords: Ager Calenus, Roman period, archaeological sites, cisterns, opus incertum.

1. Introduction
In the northern area of the province of Caserta, to the north of the Volturno river, a vast territorial area stretches out which, during Roman times, known as the *Ager Calenus*, constituted the territory of the Latin colony of *Cales* [1].
The far north-eastern end of the *Ager Calenus* today is constituted by the Municipality of Camigliano, a valley measuring approximately 6 km^2, located at the foot of the south-western foothills of Mount

Maggiore and it is almost entirely surrounded by hills: Mount Pozzillo, Mount Ragazzano and Mount Castellone in the north, the so-called “Colle” (Hill) in the east and the Mount Tutuli in the south (fig. 1). Evidence of the occupation of this area during Roman times is given by several archaeological sites, the widespread distribution of which, gives proof of an intensive agricultural exploitation of the area during this period: among the best-preserved structures, there is a series of cisterns with parallel communicating rooms, located in the north-western area of the Municipality of Camigliano.

Fig. 1: Camigliano. Satellite image of the territory of Camigliano, with location of the site (□ Google Earth 2016).

1.2 The structure

Along the southern side of the road that links Camigliano to Giano Vetusto, at the foot of Mount Pozzillo, a narrow strip of land winds its way which, sloping from north to south, overlooks the course of the Rio Maltempo river, a small river with a limited flow of water, the southern banks of which are provided by the mountain in Pastorano and in the north by a limestone and Campania grey tuff wall on which various plots of land have been developed. On the tuff rock bank on the northern side of the river and in line with the deep gorges of Mount Pozzillo (fig. 1), there is a well-preserved series of cisterns with parallel, communicating rooms [2]; dating back to between the 2nd and 1st century B.C. and which are located beneath ground level, in fact, the structures are almost entirely covered by soil.

The area, originally known as “alle Cisterne” [3], has been known of since the mid-1900s as the “Colonne Spezzate” (Broken Columns) locality, a place name that it was given following the collapse of the first cistern room, the remains of which fell into the Rio Maltempo river, were referred to by local inhabitants as looking like columns (fig. 2).

The preservation of the cisterns, as often happened for this type of underground structure, appears to be generally good; except for the first room (figs. 3-4), which has almost totally collapsed and the short sides of the first four rooms that have been blocked by modern masonry or by blocks of tuff and limestone assembled using the dry stone walling technique [4].

The structure, today used as a depot for agricultural equipment [5], shows numerous signs of tampering pertinent to the stage of de-functionalisation: access to the interior of the cisterns can currently be gained through the modern opening that has been created by widening one of the arches

of the dividing walls between the first and the second room (figs. 3-4); moreover, this latter, on the eastern side, is closed by a wall made of tuff blocks, in phase with a modern tank built inside the same [6].

Fig. 2: Camigliano, the "Colonne Spezzate" locality. Remains of the cistern fell into the Rio Maltempo river.

All the arches in line with the modern entranceway, with the exception of that of the seventh and eighth room, were widened at a later date in order to allow the passage between the compartments so that they could be re-used (fig. 5); finally, modernisation works include the presence of a well created by knocking down the vault and the narrowing of the third room.
The cisterns, situated in an area which provides a sheer drop into the Rio Maltempo river and are mainly buried underground, are between 17,60 and 18 m long, 2,50 m wide, with a maximum detectable depth of approx. 3,50 m and consist of at least 8 rectangular-shaped rooms with an east-west orientation [7] (fig. 12); covered with barrel vaults, these structures are inter-communicating by means of seven arched openings, in line with each other, arranged in the direction of the largest side (figs. 7, 9, 10-12).

Figs. 3-4: Camigliano, the "Colonne Spezzate" locality. The cisterns from the outside.

The walls were created in Roman concrete and consist of limestone and grey tuff waste held together by strong white mortar; the wall face, carried out using the “opus incertum” technique and in certain points it has an almost reticulate structure, it consists of grey tuff blocks that measure 6-17□9-14 cm (fig. 7). The face of the jambs is made of parallelepiped blocks arranged edgewise with well-rounded corners (length: 20-40 cm; height: 12 cm) and 17 proportional radial ashlars (8 on each side with a central keystone), measuring 30-37 cm, as for the vault arches [8] (figs. 5, 10); these arches have a maximum detectable height, due to the cisterns being buried underground, of 1,80 m and a 90 cm centre distance (fig. 11).
The vaults, as can be seen by the section of the collapsed part of the roof of the second room, consist of a double curtain wall (thickness: 40 cm (upper section); 60 cm (lower section) and cast in place, with small and medium-sized limestone and grey tuff waste mixed together with a few ceramic fragments and white-grey mortar including a small amount of limestone. Inside the rooms there is a recess with certain rectangular-shaped negative spaces at the height of the window-shutters and soffits still show the signs of the shoring of a variable number of wooden beams, around 16-17, used for installation (fig. 10).

Figs. 5-6: Camigliano, the cisterns in the "Colonne Spezzate” locality. The sequence of arches and one of the cistern wells.

The walls dividing the rooms are 85-90 cm thick; there are" traces of well-smoothed water lime plaster, present in several places, also on the vaults, suggest that they were originally completely coated by this type of covering (figs. 8, 10); moreover, the walls are characterised by several limestone formations which are up to 18 cm thick and over 1 m high with large roots which have penetrated through the soil above (figs. 8, 10).

Figs. 7-8: Camigliano, the cisterns in the "Colonne Spezzate” locality. The wall face in “opus incertum” technique and the narrow slit “hopper”-style window.

Fig. 9: Camigliano. The cisterns in the "Colonne Spezzate” locality: fourth room.

Fig. 10: Camigliano. The cisterns in the "Colonne Spezzate” locality: fifth room.

All the short sides of the cisterns, both on the eastern and western sides of the structure, are characterised by the presence of narrow slit “hopper”-style windows (height: 78 cm); characterised by an arched profile hollowed out of the vault (fig. 8), with a base plane (45 cm) sloping inwards, which should have been functional as regards the entry and direction of water, as is shown by the substantial erosion that characterises it as well as the mark left on the wall by the continual flow of the water itself [9]. Moreover, the windows are characterised by the jamb facing carried out in the “opus incertum” technique, with parallelepiped tuff blocks at the height of the vault and these are currently blocked on the outside by large limestone blocks.

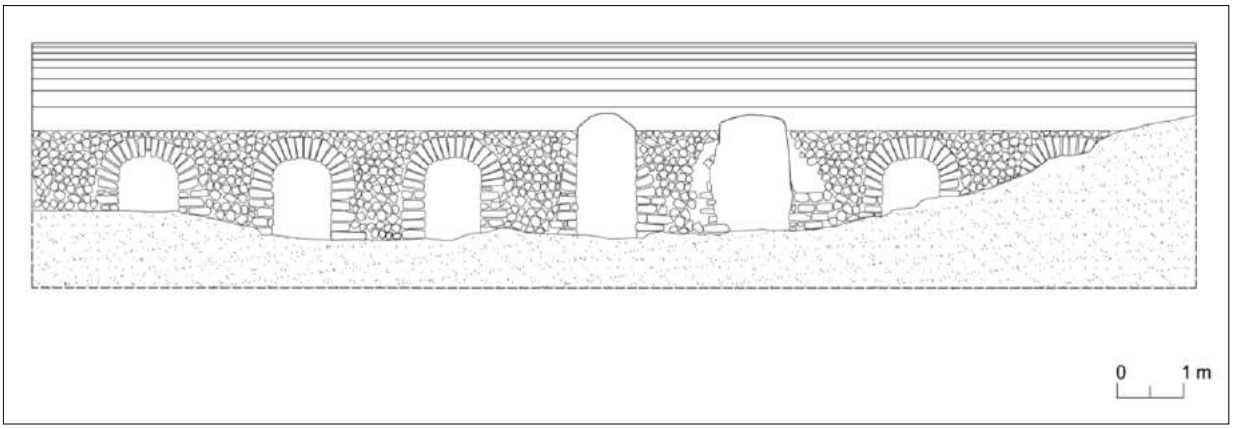

Fig. 11: Camigliano, the cisterns in the "Colonne Spezzate” locality. Northen wall section of the fifth room.

The 50 cm thick walls on the short sides are the only ones that are covered by a thick layer of earthenware-based cementitious material with an extremely fine particle size; this layer, bound by mortar mixed with limestone flakes, is present right up to the height of the window-shutters where the masonry profile consequentially slopes more steeply inwards (fig. 8).
Finally, in the vaults of the second, fourth and seventh room, in a slightly more decentralised position, there are quadrangular openings, probably ventilation or inspection wells (measurement: 80□60 cm; thickness: 40 cm) which are currently closed by well-compacted soil (fig. 6).

1.3 Conclusions

The cisterns were built on a tuffaceous bank which in part had to be levelled out in order to accommodate and perhaps from which to obtain the raw material necessary for their creation; other material, proof of which is given by means of caves that can still be found today in close proximity to the Rio Maltempo river, was probably extracted in the nearby areas.
The location of this structure, built in line with the slope of Mount Pozzillo, suggests that the cisterns were supplied by rainwater that streamed down from the mountain through its gorges that constituted natural canyons [10] (fig. 1).
The water, after being channelled by the mountain, as suggested by the state of wear as well as the degree of inclination of the base planes of the narrow slit “hopper”-style windows (fig. 8), as well as the thick layer of earthenware-based cementitious material with an extremely fine particle size that was used only on the short side walls, was poured inside the structure by means of these inflow holes and from here it was distributed into the various rooms through arched openings in the walls of the major axis, which instead, were covered with a hydraulic lime mortar plastering (fig.13).
There are no elements that make it possible to establish the movement and the possible gradient of the water inside the tank, considering that the bottom planes of the cisterns, except for that of the second room, cannot be measured due to the considerable quantity of debris (figs. 10-12).

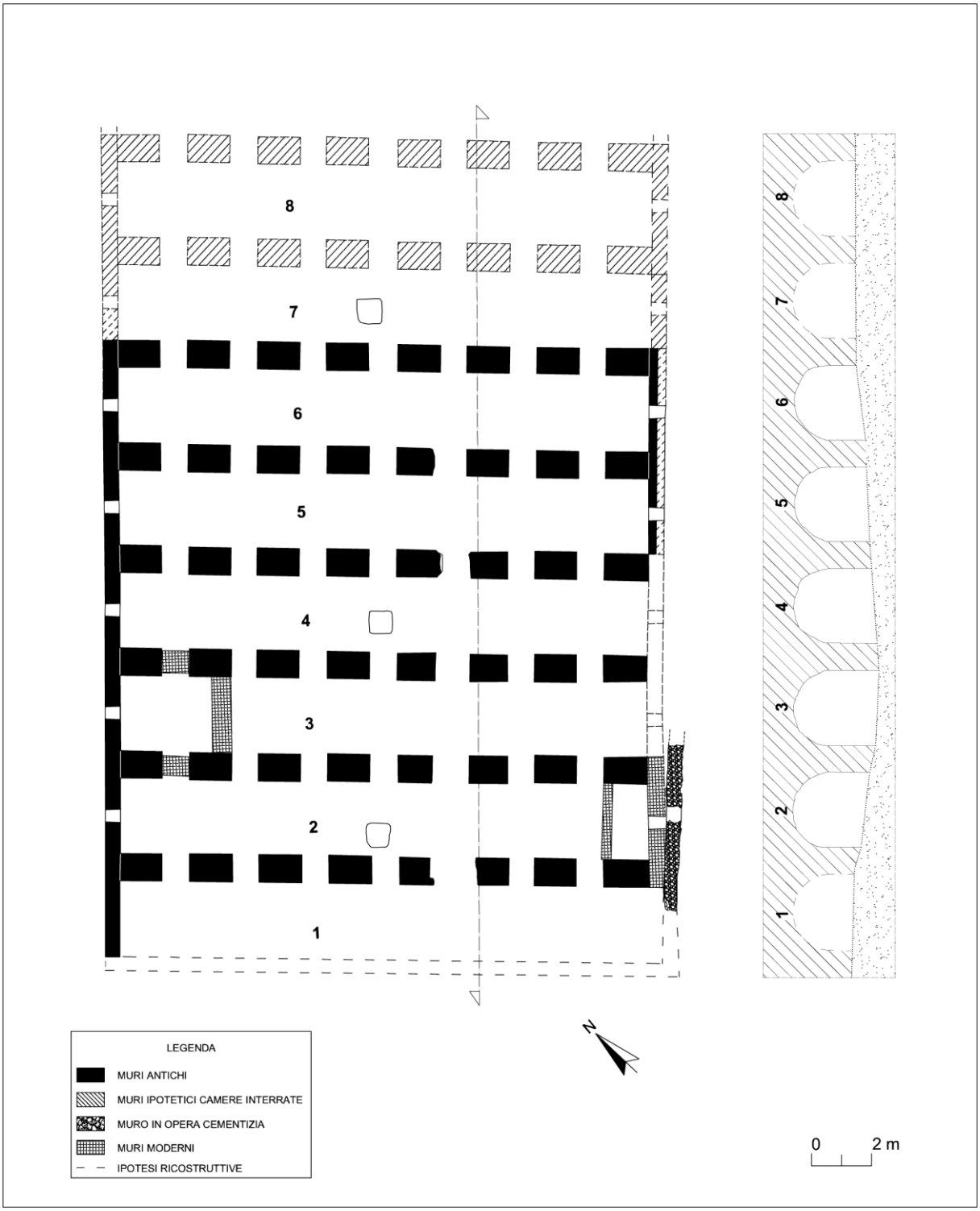

Fig. 12: Camigliano: plan and longitudinal section of the cisterns in the "Colonne Spezzate" locality.

The structure is located in an area that was subject to frequent swamping until only a few years ago, probably due to the considerable amount of water naturally channelled by the mountain; in fact, in order to solve this problem, the road was raised substantially and consequentially its gradient was increased. Based on these findings, perhaps such problem was acknowledged also during Roman times and that the construction of such a detailed complex of cisterns would have provided both the relative solution and, at the same time, a resource: in fact, by creating a system that would channel

rainwater into a tank at the bottom of Mount Pozzillo, it would be possible to guarantee the reclamation of the area damaged by excessive rainfall and to exploit the same for one's own supply needs [11]. The close proximity to the Rio Maltempo river has, on the other hand proved to be functional as regards the emptying/cleaning of the structure and the drainage of the overflow.
The cisterns, characterised by at least 8 rooms, of which there may be a greater number due to the fact that the last two are buried underground, makes it impossible to assess the relative continuation; they should have contained a capacity of at least 1200 m^3 of water, which is not surprising in an area in which the only water supply was provided by a small river with a limited flow of water.

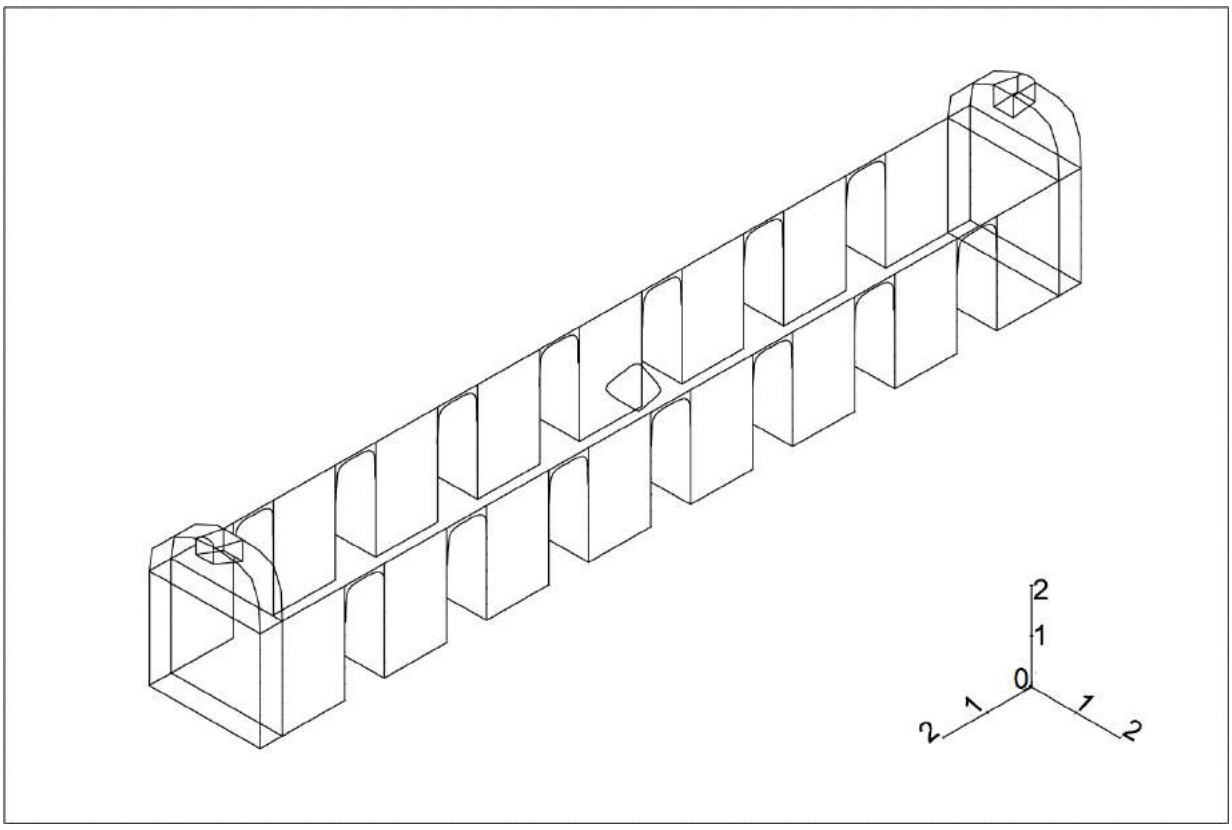

Fig. 13: Camigliano, the cisterns in the "Colonne Spezzate" locality. Axonometry of the fourth room.

During Roman times, this area was characterised by a concentration of ancient remains, as Antonio de Cesare himself recalls that here the "old Camigliano" was located [12].; therefore it seems to suggest that these cisterns, built in a strategic place as regards the collection of water, represented a main tank, serving several structures, by means of a complex system of channels and gradients. Moreover, the probable presence, in the nearby area, of a furnace, must not be underestimated and that, requiring a considerable amount of water, would have been supplied by the cistern tank [13].
There is rather limited information relating to the re-use of the structure during the post-Roman period; however, the presence, inside the structure of a few fragments of medieval pottery suggests its use also during that period of history. In fact, the cisterns, having lost their original intended use and constituting a structure that could be adapted to be used in several ways, underwent a series of modifications, such as the closure of the water supply channels, the broadening of the arches as well as the construction of modern walls which have facilitated their re-use, with a continuity of life reaching right up to the present day.

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[5] The land on which the structure is situated, falling within the area referred to in Cadastral sheet 1, parcels. 50-51 and 5960, currently owned by Mr. Parisi, is subject to archaeological restrictions. To date, there have been no contributions of a scientific nature made with reference to the cisterns, except for preliminary data, provided by Colonna Passaro and subsequently resumed by Stefano De Caro: PASSARO, Colonna. Il sistema di raccolta delle acque nella villa romana di Bellona. In *Uomo, acqua e paesaggio. Atti dell'Incontro di studio sul tema "Irreggimentazione delle ac□ue e trasformazione del paesaggio antico" (Santa Maria Capua Vetere 1996), Atlante Tematico di Topografia Antica* suppl. II, 1997. Roma: □L'Erma□ di Bretschneider, 1997, p. 268;
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[6] The presence of the tank makes it possible to identify the original height of the flooring of this room and consequently the depth of the cisterns which should have been approximately 3,50 m.

[7] It is not possible to define the total number of the rooms due to the fact that they are mainly buried underground; there is a greater presence of soil in those situated upstream that, re-used to a minimum extent, are better preserved than the others. The seventh and eighth rooms are partially accessible by means of a makeshift entrance dug out of the fill soil that, having almost totally blocked these rooms, it is not possible to establish their length; however, the presence of a well in the eighth room, situated in line with the other two, suggests a similar size to that of the others.

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[9] The presence of holes on both the short sides of the rooms can be seen from the fifth and sixth rooms, the enclosure walls of which are well-preserved. As regards comparisons relating to the narrow slit “hopper”-style windows which are functional upon the entry of water, please refer to the cisterns of the first terrace of the Sanctuary of Apollo on the via Appia on the Itri border that, although these are much larger, they have the same morphology: QUILICI, Lorenzo. Il tempio di Apollo ad clivum Fundanum sulla via Appia al valico di Itri. In *Atlante Tematico di Topografia Antica* 12, 2003. Roma: L'Erma di Bretschneider, 2003, pp. 127-163, figs. 13, 21, 46.

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[12] DE CESARE, Antonio. *Notizie istoriche intorno al villaggio di Camigliano,* Camigliano 1778, pp. 11-12.

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New techniques for land surveying, monitoring and environmental diagnosis: a comparative analysis.

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Abstract
The use of GIS allows the analysis, the evaluation and the measurement of the condition of a territory and its sensitivity to specific phenomena, in order to be able to direct programmatic strategies and planning actions in order to address the action of territorial government on the basis of the emerged issues. The greatest efficiency of these systems can be achieved only by using constantly updated data both in the time domain component and in the space domain component. The modern survey techniques made with UAV (Unmanned Aerial Vehicle), better known as Drones, represent the new frontier of the sciences and of the environmental engineering, because they allow high speed and accuracy in the acquisition of information, and they give the possibility to compute, in real time, a wide amount of data. The possibility to obtain 3D high resolution model (HRM) in short time periods, open a new way of considering land survey, by making UAV essential instruments in diagnosis and environmental monitoring. The main objective of this work is to analyze the integration between GIS□ UAV systems through an overview of the most used software, both for the acquisition stage of the primary data and its processing. With this analysis it is possible to highlight the main advantages and disadvantages, by tracking the new analytical skills and environmental monitoring that were made possible thanks to the advent of highly sophisticated but easily accessible instrumentations.

Keywords: GIS, UAV, Real time sensing

1. Introduction
Land information systems represent a fundamental aspect in environmental diagnosis and an essential tool capable of providing the government with practical directions concerning land surveying and monitoring on the basis of analyzed issues (Borri et al., 1998; Geneletti, 2003; Las Casas □ Murgante, 2004; Diamantini □ Geneletti, 2005; Graci et al., 2008; Zullo, 2016). Therefore, the availability of highly detailed geographic knowledge and information, along with progressively less expensive and more performing IT equipment, have made these systems widespread in scientific, economic and institutional sectors (Borruso, 2013). Numeric cartography has totally superseded the production and diffusion methods of the old cartography. The new technologies, the Internet and the increasingly fast data transmission systems have led to the democratization of geographic information - as defined by Goodchild (2007) - linked to the concept of "sensor" citizens and voluntary geographic information (Eisnor, 2006; Hudson-Smith et al., 2008; Hudson-Smith □ Crooks, 2008, Borruso, 2010). In practice, these geographic tools have become widespread also among non-professionals and academicians. In other words, the availability of digital geographic information at different levels (national, regional and urban) has produced, in these recent years, an important transformation in the use of land and locational data, with important advantages for organizations, institutions, governments (both regional and local), public and private operators in the sectors of economics and services (Stefanini, 2006). These geographic data are used, explicitly or implicitly, by most of the public and private activities and organizations. Moreover, their use rises global interest at all levels, from decisional processes to operational realizations. Currently, owing to the remarkable progress in

technology, land sciences have an important tool capable of collecting information on medium-small areas, in a remarkably reduced time frame and with costs definitely lower compared to those of the methods used up to now. This tool - UAVs (Unmanned Aerial Vehicles) or more commonly known as drones - is a radio-controlled aerial device capable of delivering photos, videos, orthophotos, point clouds (already manageable through several GIS software tools) and digital models of the surface of a given area with a level of geographical precision and image geometrical resolution within the order of centimetres.

2. APR Technology and photogrammetry

In the last years, the technologies connected to the development of Unmanned Aerial Vehicles (UAVs) have undergone an exponential evolution. Data collection from UAVs represents the latest frontier for geographic information. The new technologies at disposal enable to acquire data more quickly and more precisely, and to process an extremely high amount of information that can always be updated. UAV is a photogrammetric platform that operates autonomously, semi-autonomously or through remote control without crew on board. Its flight is piloted through various typologies of flight control systems managed remotely by pilots on the ground. It is possible to equip the drones (payload capacity) with various sensors such as super-high resolution digital cameras, as well as thermal and hyperspectral sensors (RGB, IR and thermal). In these recent years, the potential applications of drones have gone beyond all expectations and are still in phase of development. The most requested geomatics applications concern the following sectors: agriculture (precision farming) (Zhang et al., 2012; Candòn et al.,2013; Honkavaara et al., 2013); archaeology and cultural heritage (documentation and 3D modelling) (Russo et al., 2011; Piani, 2013); geology (hydrogeological risks, etc.); controls in urban environments (thermal dispersions, photovoltaic potential, events, safety); monitoring of the environment; remote sensing and photogrammetry. By flying over urban areas, UAVs can produce “3D city models” and update the existing cartography. Moreover, they can carry out photographic surveys for documentation purposes (panoramas, real estate sector, etc.) or are useful in controlling borders, coasts and seas. One of their points of strength is the possibility to integrate different typologies of sensors (cameras, thermal cameras, laser scanners) capable of acquiring different kinds of data. Each sector of interest is committed in developing new procedures and innovative technologies through increasingly sophisticated sensors. Owing to the GNSS positioning and navigation systems, these devices represent the latest step forward in the field of photogrammetry. Installed on board, the GNSS allows to follow a pre-established trajectory (mission planner), to record and deliver the trajectory actually carried out through specific software, and to provide orientation in real time on the basis of a local or global system of reference. The surveys carried out through these devices produce a series of georeferenced photographs of the territory. Photography, as known, represents a fundamental tool in almost all survey operations and is employed in all of the phases of data collection. In some cases, photography constitutes a useful support for obtaining fundamental information aimed at establishing the metric of elements. Through “metric” photography it is possible to acquire both quantitative (stereometry, morphology, geometry) and qualitative information (matter, chromatism, decay). Photogrammetry represents one of the sciences that has evolved the most owing to the new technologies, both hardware (as the drones) and software. These have produced a higher level of automation and new tools for improving work modalities and quality, such as the new compact digital cameras and the most efficient GPS systems. Therefore, besides aerial and land photogrammetry we can talk about UAV photogrammetry, whose characteristics together with the comparison with the previous two are shown in Table 1. It is exactly owing to these new technologies that real time sensing and real time control have been introduced in the last years (Ambrosia et al., 2003; Kingston and Beard, 2004; Kim et al, 2006; Remondino et al., 2011). The main advantage in using UAV systems consists in the possibility to fly at heights definitely lower compared to those of the classical aerial photogrammetric systems with the possibility to obtain high resolution georeferenced images. The latter are obtained owing to a Ground Sampling Distance (GSD, size of the pixel on the ground) in the order of centimeter against the dm/pixel of the institutional cartography, such as that generally produced by public administrations. Of course, the areas that can be surveyed by drones are much more limited compared to those scanned through aerial flight, also due to flight autonomy. Moreover, remote sensing techniques generally entail high costs due to the systems used (aerial platforms that require sophisticated sensors, etc.), while UAV systems constitute a valid and low-cost alternative. With reference to laws and regulations related to UAVs in Europe, the European Aviation Safety Agency (EASA) legislates in this ambit being one of the most qualified authorities in aviation safety regulations throughout the European territory. In Italy an analogous role is carried out by ENAC (Ente Nazionale Aviazione Civile). On 29 October 2015 the European Commission approved the “Guidelines for rules on commercial and recreational uses” of drones, submitted by EASA, while ENAC on 16 December 2013 had already issued its first regulation, modified afterwards with resolution dated 16 July 2015, then amended on 21 December of the same year.

	Aerial photogrammetry	Terrestrial photogrammetry	UAV
Planning	(Semi) automatic	Manual	Automatic and manual
Data collection/flight	Assisted, manual	Autonomous, assisted, manual	Autonomous, assisted, manual
Size of area	km^2	mm^2 - m^2	m^2 - km^2
Ground Sampling Distance	cm - m	mm - dm	mm - m
Distance from objects	100 m - 10 km	cm - 300 m	m - km
Geometry intake	Normal case, also inclined	Normal case, also inclined	Normal case, also inclined
Number of pictures	10 - 100	1 - 500	1 - 1000
Applications	Small-scale maps	Large-scale maps, industrial and architectural survey	Large-scale maps, relief in dangerous areas, real time sensing

Tab. 1: Main characteristics of the photogrammetric techniques

3. A new frontier: IS APR integration

The use of drones in environmental diagnosis is totally changing the world of Land Information Systems owing to their versatility and capability to collect data. The need to acquire information on the territory in the least time possible, at reasonable costs, has finally found a valid support in UAVs. These new systems represent the natural evolution of aerial photogrammetry, with a higher qualitative answer compared to the classical topography. A three-dimensional survey can be carried out through different tools and techniques. The indirect survey is based on techniques that use two different types of sensors, that is: active or range-based sensors (laser scanner) which emit an electromagnetic signal, recorded by the device, so as to derive a distance measure; and passive or image-based sensors that exploit the light present in the environment to acquire images to be processed. Among the techniques that use passive sensors, the 3D images (digital photogrammetry) is the one that has undergone the most important technological development in these years with a particularly profitable cost/profit relationship. Digital photogrammetry allows to obtain a three-dimensional survey starting from a set of bi-dimensional images making use of SfM algorithms (Structure from Motion) completed by stereo matching algorithms. It is a solution that, from many points of view, results extremely effective. In fact, it allows to quickly realize three-dimensional surveys with the use of low cost hardware and software solutions or Open Source, without renouncing to accuracy and quality. SfM is a calculation technique that enables to reconstruct the shape of objects through the automatic matching of points from a set of photos. Based on computer vision algorithms, SfM extracts the significant points from the single photos, gathers the photographic parameters and crosses the recognizable points on various photos, finding the coordinates of the points in space. From surveys carried out through these procedures it is possible to process super-high resolution orthophotos and Digital Surface Models (DSMs) that integrate easily in any GIS software. The use of these operational technologies drastically affects the time and methods for realizing territorial analyses, as well as the methodologies for processing the same. The complete integration between UAV and GIS allows to combine two fundamental aspects for the diagnosis of territorial phenomena, that is: the high resolution and fast data acquisition of the drones, together with the great processing capacity of the geographic software. The new GIS-UAV systems have manifold applications since, besides introducing new technologies and typologies of data in the sector, they also renew the potentialities of the tools and procedures currently in use through information characterized by super-high resolution. The peculiarities of these tools make their use transversal. In fact, they provide operational perspectives in almost all of the scientific sectors involved in the knowledge of the territory and of the environment at all levels. Also the sector of geographic information systems adapts to the new technologies through tools and utilities specifically aimed at processing data delivered by UAVs. During the years, new tools have been created for GIS software owners (for example, Drone2Map for ArcGIS) as well as for open sources (Drone Planner, Video UAV tracker for QGIS) whose use allows to integrate the two systems, thus increasing the efficiency and explorative capacities of the combination. This new integrated approach allows to carry out controls, simulations, comparisons, calculations of very complex indexes. Therefore, both the technician and the political-administrative decision-maker are provided with new and reliable information (that depends on the rough data

available) concerning the territorial realities analyzed, making analyses and decisional processes much more objective. All this can lead to a level of efficiency such that, in a not very distant future, it will be possible to talk about an actual “adaptive control in real time” of many of the territorial decisional processes (for example, territorial planning, strategic environmental assessment, environmental impact assessment, etc.) both at local level and as regards projects. Of course this will require higher precision when inserting data and processing the information available. Consequently, it will also require a considerable amount of human, technical and financial resources that, owing to the use of new UAV technologies, can certainly be optimized.
Therefore, the APR systems are a powerful means for acquiring data, processed through specific photogrammetry software (for example, Photoscan, Pix4D, etc.) and then reprocessed (through GIS software, such as ArcMap, QGIS, etc.) so as to support many thematic scopes. Hereafter, an analysis is provided of the main software necessary for acquiring images and producing orthophotos and digital models of the ground.

4. Data acquisition and processing: analysis of related problematic aspects

The acquisition of data through SAPR is a process that can follow various paths. To obtain a set of information qualitatively valid it is necessary to use automated flight systems using specific software generically called “mission planners.” The mentioned software allows to send flight plans to the flight datasheets of the drones carrying out pre-established actions. These systems, also called platforms, are frequent for “assembled” UAVs, devices whose management requires knowledge and high technical skills. In the last years, though, ready to fly drones have become increasingly frequent on the market. These devices are characterized by a reduced size (weight and bulk), defined semi-professional and very interesting for their great versatility and easiness to use. In fact, various iOS and Android applications are available for the automatic acquisition of data through these drones. Image acquisition in itself is a quite simple operation from a practical viewpoint, but it presupposes technical knowledge of a certain relevance. Owing to the various applications available, it is possible to acquire photos automatically through point cloud processing. A necessary preliminary operation on the drone is the calibration of its electronic compass. This is usually carried out by using the software of the companies that produce UAV systems. The following phase requires the use of an app capable of defining flight plans for the area to survey. The apps described in this work are Pix4d Capture Mapper, produced by Pix4D, and DroneDeploy, a web-based system for photogrammetric reconstruction. Through the A-GPS technology present on any smartphone or tablet, the position of the device (and with it also that of its operator) is visualized on the screen together with a circumference indicating the possible positioning error (the basic cartography is that of Google). At the same time, also the position of the drone is identified using different symbols. This allows to identify - with a certain easiness and unequivocally - the area to survey through a polygon (rectangle/square for Pix4D Capture) whose size/position can be modified (3 anchoring points per side). Within this grid, the “flight strips” carried out by the drone covering the entire area of interest are visualized, as well as the points where the mission begins and ends. The amount of flight strips depends on two parameters: the flying height and the percentage of overlapping. Moreover, it is possible to set the speed with which the drone will carry out the survey (if too high there can be problems in the acquisition of several portions of the territory) and the film angle of the camera (set perpendicularly to the ground) (fig.1). It is very important to make sure that the GPS of the drone receives the signal of a high number of satellites in order to carry out the survey in total safety. To this aim, the drone is equipped with a lighting system that informs the operator of the occurred acquisition of the signal. This parameter is constantly monitored by the application (indication of the number of satellites with which the drone is connected in that moment) as well as the horizontal distance from the controller, the horizontal speed (in m/s) and the height with reference to the point from which the taking off occurred (this point is given the value 0). A very important parameter is the time necessary to conclude the mission. This is shown in the lower part of the screen together with the size of the area to survey. In fact, one of the problems concerns the duration of the battery which limits its use in vaster areas. In this phase the application provides control systems that allow to block the execution of the flight if the area to survey is too vast, if the flight level chosen is too low or if the drone is more than 150 meters from the take-off point. A further control system put at disposal by the application is a drone takeoff checklist shown in Figure 1, on the right. The system analyzes the checklist automatically making sure that all parameters were considered/set correctly before carrying out the mission. The green tick indicates the correct setting, while the red cross indicates parameter errors. In the latter case, the flight is not carried out until the error is properly corrected/modified. During the flight, the images are acquired directly on the mass memory mounted on the drone (several applications allow to archive simultaneously also on the smartphone or tablet connected to the controller). At the same time, the application reports the progress of the mission and the correct taking of photos.

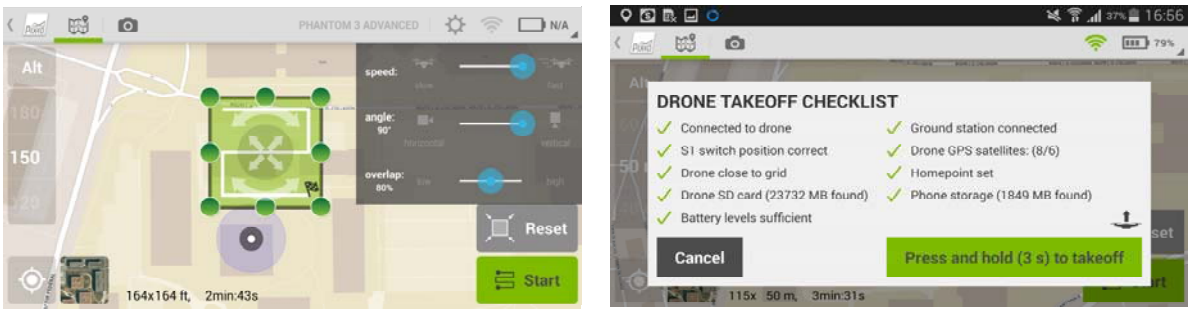

Fig. 1: Selection of the area to survey and of flight parameters (on the left), drone takeoff checklist (on the right) (Pix4DCapture Mapper)

As mentioned, the survey is carried out automatically through a pilot whose role is to visually monitor the device and the telemetry shown on the app. In case of problems during the flight, the pilot can decide if to end the mission making the drone return to the point from where it took off or assume its control directly. The DroneDeploy application presents a series of substantial differences compared to what illustrated previously. It is a cloud web based system that offers the possibility to pilot hundreds of drones virtually through web browser. The area to survey can even be irregular, and it is always possible to add or remove anchoring points. Moreover, the possibility to organize missions and flight plans directly on the computer and then send them to the drone through cloud is very interesting. From the settings of the app it is possible to recall the mission via web. In this case, the flight level - set with reference to the starting point for Pix4D capture mapper - can be set with reference to the country level so that the drone carries out the survey at a constant height from the ground. Whatever the application used, a fundamental parameter is a good Internet connection. In fact, all these systems are based on the visualization of Google cartographies. Therefore, it is necessary to be able to upload the cartographic element and confirm the position of the drone and of the controller. The lack of this condition does not stop the mission, but the impossibility to evaluate possible areas in which there is the risk of collision (surveys on very steep slopes) could create problems.

Fig. 2: Selection of the area to survey and of flight parameters (on the left), drone takeoff checklist (on the right) (Dronedeploy) drawn from: https://geosensornetworks.wordpress.com/2015/03/31/mobile-mapping-with-dronedeploy/.

An interesting solution is represented by the software licensed by UgCS, a system that provides a platform for planning the flight via notebook enabling to manage complex flight plans and send them through app to the drone. It is also possible to choose a ready to fly UAV configuration, such as for example DJI Phantom 3, or to realize a customized one.

Once acquired the photographic datum, this has to be processed through specific software or specific tools within the GIS systems. The number of photos acquired depends on the size of the area surveyed, on the characteristics of the sensor, on the flight level and on the percentage of overlapping of the flight strips. Passing from bi-dimensional to three-dimensional modelling takes place through a technical workflow common to all the software that operate in the field. The first phase consists in aligning images by processing the SIFT (Scale Invariant Feature Transform) as well as the matches for the calculation of the homologous points among the photos acquired. Then, the automatic reconstruction of the sparse dense cloud is carried out, that is of a “low density” point cloud obtained through the reconstruction in space of the points identified by the system for the internal and external orientation of the camera. Finally, through specific algorithms, the sparse point cloud is “densified” to obtain a three-dimensional model made of millions of points, allowing the representation of the area

analyzed in the minimum details. Moreover, from the dense cloud it is possible to obtain a series of output products such as the digital models of the surfaces and orthophotos. The choice of the quality of the reconstruction of the dense cloud is a quite delicate operation because it is starting from here that all the final products are produced. Therefore, the higher the quality, the higher the level of detail with which the surface surveyed will be presented. This kind of operation also depends on the technical characteristics of the hardware (RAM and processor), and affects the time necessary for the realization of the same. As indicated above, the possibility to fly at heights definitely lower compared to the classical aerial photogrammetric systems, together with the characteristics of the cameras mounted on board, allow to obtain images with a super-high geometric resolution, thus with a Ground Sampling Distance (GSD, size of the pixel on the ground) of the order of one centimeter (fig.3).

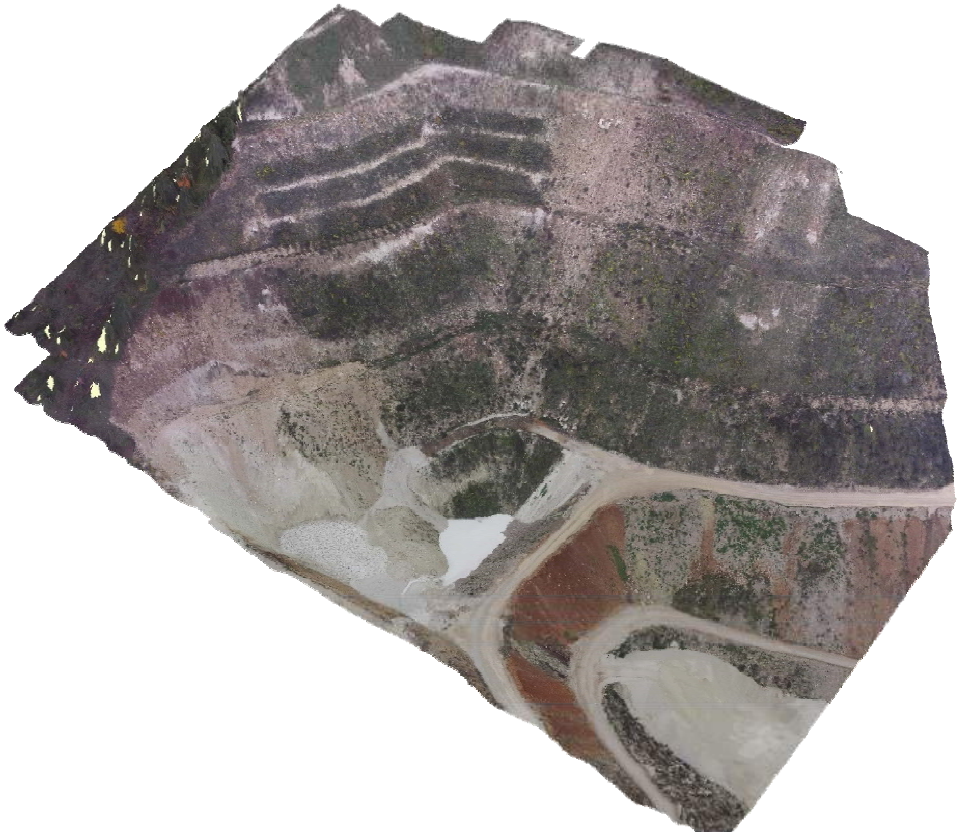

Fig. 3: Cave area surveyed through APR techniques with a 2cm/pixel geometric resolution.

Moreover, specific attention needs to be given to the image georeferentiation process as it affects the accuracy of the output products. A metadata Exif file (Exchangeable image file format) is associated to each photogram. Said file contains the coordinates x,y (Latitude and Longitude) associated to a point placed in the centre of the same. The precision of the coordinates depends on the GNSS system mounted on board the UAV and also on the atmospheric/morphologic conditions that affect the number of connected satellites (precision of the order of metres). This entails problems - especially in the control and monitoring activities - when comparing data collected on the same area in different periods of time since they can present different accuracies and therefore a different positioning compared to a specific system of reference. For example, the control of variations concerning excavations and filling material within a cave area can generate calculation errors if the DSMs being compared have different accuracies. For this reason it is extremely important to use GCPs (Ground Control Point) of ground markers of known coordinates (to be surveyed with precision instruments) that allow greater precision and accuracy in the post-processing phase of the images.

5. Conclusions

Monitoring the territory for control or planning purposes requires constant procedural and technological innovations aimed at surveying environmental parameters. Remote sensing and GIS systems are in quick evolution as regards technologies and analysis methodologies, especially with reference to surveys and studies of the territory. In fact, increasingly specialized and geometrically more performing sensors make this a research sector always in phase of renewal. Therefore, the new techniques connected to real time sensing provide new horizons concerning possible applications and their use in processing environmental diagnosis and territorial planning. The possibility to obtain more

detailed territorial data through UAV surveys and to process information within GIS environment with higher precision and in a rather short time frame, facilitates the comprehension of the dynamics of the phenomena that affect a specific environment. This allows to monitor and control various territorial realities in maximum safety also in case of areas hit by natural calamities such as landslides, earthquakes, floods or also areas in which there has been a leak or dispersion of toxic substances. Therefore, on the one hand there has been an increase in details concerning the processing and delivery of technical outputs (information and analysis), and on the other hand the awareness of the decision-maker has increased with reference to political actions and territorial management. However, UAV survey technologies present several limitations: first of all, the payload, that is the difficulty to use more cameras and sensors at the same time. Secondly, the quality of the GPS systems with reference to aerial navigation, the control of the orientation of the sensors and the georeferentiation of the datum acquired. Moreover, the small dimensions of the aircraft determine a higher risk of external interferences (for example, vibrations caused by wind and bad weather). These problems are linked to the type of UAV used and consequently to costs. In the light of what said, it is clear that the type of system configuration and equipment on board has to depend on the type of survey to carry out. Moreover, surveys carried out at very low heights entail the acquisition of a higher amount of photos, since the area covered by each photo is very reduced. This affects indirectly also the characteristics of the computers used for processing the data that therefore need to be increasingly performing to manage considerable amounts of information. Therefore, the solution to operational problems results to be a substantial part of the surveys. Even flight autonomy of these systems often represents a strong limit since the planning of the missions and data acquisition must last, for safety reasons, only a few minutes. Even with these technical problems, the current possibility to set up increasingly detailed geographic databases updatable with greater frequency cannot disregard their integration with UAV systems. Land sciences and engineering are provided with a new tool produced by this combination whose potentialities are in continuous evolution, owing to which land and environmental monitoring is becoming increasingly faster and more efficient.

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Le Vie dei Mercanti XIV International Forum
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SPOLETO PAINT OF VIE
From the point to the pixel

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Abstract
The proposed contribution intends to present the preliminary results of a research carried out by the Civil and Environmental Engineering Department of the University of Perugia dedicated to the analysis of the techniques aimed to revaluate, regenerate and renew the fronts in relation to tradition and innovation.
The study applies at Spoleto city, in these sense considered a prime example, with the aim to replace the individual planning initiatives under the historical tradition that, by clarifying its identity character, makes it possible to read the polychrome city guise into a new perspective.
An evolution, that analyzed, characterized by the gradual dematerialization of the interventions that, starting from the graffito treatment of facades typical of the nineteenth-century city (carved surface), through the use of the mural technique as part of the street-art coordinated contemporary interventions (painted surface), comes to the experimental architectural projections of lights and colors (virtual surface).
Instruments ever more refined make it possible to introduce, thanks to the involvement of specialized artists, illusive effects to ruined, disorganized or incongruous fronts, or to secondary facades that urban transformations make visible. A fertile contamination between real end virtual which arises from the careful relationship between architecture, art and city and introduces original themes like the temporary nature and the maintenance of the contemporary urban interventions.

Keywords: identity, memory, restoration, urban regeneration

Recognizing the faces of the city
The image of the city is formed by a complex stratification that needs to be interpreted so to define "quell'armonia che lega tutte insieme fra loro le costruzioni, grandi e piccole, monumentali e minime" ("that harmony which binds constructions together, big and small, monumental and minimal") (1). The cross-cutting analysis of the existing and its logical organization make it possible to interpret and to understand the coherence of the urban system using relational criteria. In this sense cognitive and representative actions (by architectural survey and drawing) constitute ways favored means, being able to select, organize and summarize the investigated characters (2).
In view of that and by the use of a discriminating-interpreting path, the present research applied to the specific case of Spoleto, find in facades one of the possible expressions of the city image, faces of the sense of belonging to the urban evolutionary process and to memory heritage. A summary of the identity signs that brings individualities back to a general logic able to recognize and increase its value also with a view to future operations (3).

Point
In terms of dissemination of knowledge dictionaries and encyclopedias have a considerable role in so far as they express the more strengthened thesis at their publication time, transmitting the sense attributed to the definition subject. In the mid-sixties inside the well known *Dizionario di architettura* (4)

under heading “facciata” (“facade”) it is underlined that the “limite dell’*involucro* di un edificio” (“limit of a builing *casing*”) has often been in the middle of issues linked to “rapporto tra spazio esterno e interno, visione statica e in movimento, corrispondenza tra le cosiddette *forma* e *funzione*” (“relation between outer and inner space, static and moving visions, correspondence between the so-called *form* and *function*”), recalling that faced begins to perform an autonomous value starting from Renaissance: “filtro tra esterno e interno nel tempio Malatestiano (Alberti), puro involucro intorno ad un edificio esistente (basilica di Palladio), membrana sensibile increspata nel Borromini, arredo urbano, fino a scenografia a partire dal Bernini e per tutto il Barocco e il Rococò” (“filter between exterior and interior in the Malatesta Temple (Alberti), pure casing around an existing building (Basilica Palladiana), ruffled sensitive membrane with Borromini, street furniture until scenic design since Bernini continuing throughout Baroque and Rococo”) (5), stressing its independent, representative, expressive and allusive character because more related to street and square than to a relationship with the inside”) (6).
The facade in graffiti in the sixteenth century Racani palace in Spoleto is a proof of the new way to conceive facade like an autonomous expression of the architecture. An illusive architecture overlaps with the real one, dotted by figures and scenes, pointing out the fundamental role that the survey drawing assumes, furnishing the knowledge that is necessary to guide the designer’s choices. The author, Giovanni da Spoleto, overlays on the core of the real facade a thick and complex decorative system (false sculpture and false friezes), by multiplying partitions, speeding up openings rhythm, reinforcing existing overhangs and creating new relations between filled and void.
The single case ranks as one of the tradition that starting from the fifteenth-century reaches its widest possible dissemination during seventeenth and eighteenth centuries, related to the simultaneous urban transformations, and it still goes on by using mural technique and video mapping. This highlights the gradual reduction of the works time length and the development of their reversibility at the same time. The need to decorate facades meets different reasons. In the past and even today artists, artisans and decorators are called to characterize a facade that appears anonymous or incomplete, devoid of a significant architectural aspect so to modernize it. A trend that can generate a competitive and imitative spirit also taking into account the economic and time factors which make this operations more incisive than other solutions (7).
In fact the adoption of illusive solutions, like false facade architectures painted or treated by the using graffiti, meets the need to give an ordered and homogenous aspect and to enhance the medieval fronts located along Ponzianina street, because of the extension, regularization and renovation interventions realized between finteenth and sixteenth centuries. The house at the number fifty three is an example of transformation of a medieval tower house in a Renaissance one. The outcome, perfectly integrated into the context, declares the presence of a drawing of project: the building achieves a plastique and animated appearance, by simulating string courses, corners, windows cornice and a checkerboard pattern with the alternating use of light and dark stones (8). During the eighteenth century this technique becomes activity of specialized artisans that apply themselves to simulate architectural elements only. This aspect assumes a more significant character during the nineteenth century with the fronts series of the houses along the Traversa nazionale interna route where the introduction of false ashlar-work and false curtains proves the strong relationship between decoration, architecture and city (9).
The homogeneity of models, materials and techniques makes the volumes morphology coherent each other by developing a global figurative result that regards the minor architecture, simple and usual, as much as the valuable architecture. The addition of the single operations can be evaluated to a harmonious whole formally, an actual drawing of the city.

Paint

While in the case of traditional graffiti techniques it’s possible to observe a strong dependence between street soutes, volumes and iconographic equipment (by respecting, through simulation, the figurative characters, the dimensional relationship and the proportions related to the architectural and environmental context), this aspect is denied in the case of contemporary graffiti (street art) and video projections; the elements and materials simulations begin to lose their mimetic character in favor of naturalistic and illusionist plays by introducing “overflow spaces”. The surface of the facades is increasingly interpreted like a screen, by accentuating the independent character with the interior space and by paying attention to the introduction of visual, formal, matter and chromatic contrasts .
Since april 2015, coming in Spoleto from the north direction, the city shows itself with a street art work involving the Hotel Arca located along the Flaminia trunk road. It’s aspect has been changed thanks to an artistic operation realized by the Italian street artists Tellas and Lucamaleonte. For a period of four days the initiative has focused on three facades of the building by introducing figurative elements and using techniques belonging to the local tradition read into a contemporary way.
By resuming the graffiti technique in black and white Lucamaleonte overlays the background (realized by Tellas and characterized by the green olive leaves) with a set of symbols coming from the local

tradition, through the use of the stencil technique (the rose for Santa Rita, the wolf for San Francesco, the crow for San Benedetto and the sword for San Ponziano, protector of the city). The explosive nature of the play shall be preceded by a clear and careful work proven by the thorough drawings: from those realized using a large scale (necessary to prepare the cardboard, base of the stencil) to the several detail drawings representing objects, plants and animals and in which they are organized, repeated, varied and simplified. The hotel from being marginal becomes part of the city actually thanks to the big wall art work that brings the building back to an artistic tradition seeing Spoleto constantly evolving: uninterrupted growth and dynamism, being true to the urban context identity.
From the municipality administration perspective the Hotel Arca represents both symbolic and real opening of an artistic itinerary able to lead travelers to Spoleto city by beans of a street-art coordinated project. The single actions are going to be realized along a way that starting from the train station and dotted by a series of sculptures, like the *Teodelapio* by Alexander Calder and the *Colonna del Viaggiatore* by Arnaldo Pomodoro (both imagined for Spoleto city, on the occasion of *Sculture in città* international event in 1962), reaching the exhibition centre *Palazzo Collicola Arti Visive*, in which *Collicola Onthewall* project has been operated since 2013; involving five artists, four from Italy (Moneyless, 2501, Lucamaleonte, Sbagliato) and one from Spain (Borondo), the eighteenth century palace surfaces host contemporary mural works, now an essential part of the museum structure.

Pixel
The contemporary *Nuova Memoria* art installation realized by the artist Max Ciogli belongs to the will to stimulate a different interpretation of the environment, by emphasizing its high aspects, breaking into the old town “lo stridore della contemporaneità (□) innestando una temporalità pi□ problematica rispetto all’idea di immutabilità dello spazio storico” (“the contemporary screeching (□) by the introduction of a timing more complicated than the unchanging idea of the historical space”) (10). The work is achieved by the sound dynamic architecture method, a project by which Italian and European historical buildings are differently colored by the interaction with the environmental sound coming from the cities themselves. By using a specific algorithm the auditory inputs become colors that are reproduced on the buildings surface using projectors highly installed which necessitate the presence of a dedicated architectural survey. In april 2012, the fourteenth century Rocca in Spoleto has been the object of the project, in the corner of a collective event. Considering objects and symbols of the city like fundamentals for inhabitants perception and orientation, the monument is reconsidered by the art power with the aim to offer a new interpretation which makes possible to sense reality through a “new memory”: it’s not just space to being “augmented” but rather the experience and the way in which it is perceived by the viewer (11).
Although risked there is an analogy with the works of Christo and Jeanne-Claude realized in 1968 as part of the Spoleto Festival of Two Worlds. Two landmarks of the city, the eighteenth-century fountain, work of the roman architect Costantino Fiaschetti, reference point for who’s leaving the city inside and the medieval *fortilizio dei mulini*, reference point for who’s reaching the city, have been covered for three weeks. The temporary nature of the installation is opposed by the preparatory drawings duration, *Packed Fountain* and *Packed Tower*. About the size of 71 cm x 56 cm they have been realized by the collage technique using pencil, polyethylene, rope, wax crayon, charcoal and cardboard; being works of art themselves, they restate the drawing value in the architectural practice (12).
By selecting valuable architectures that are situated in the most significant and suggestive points of the city, the three artists pay attention to the visual, formal, material and chromatic contrasts, so to overturn strengthen thoughts, ideas and symbols. Both interventions disclose new forms (the first one by lighting up and coloring, the second one veiling) linking enduring and passing: the stone static nature on one side, the mask, the occasion, the sign and the message on the other.

Recomposing the faces of the city
The present essay, in considering the necessary premises for each operation of change, takes into account not only architectural values but also symbolic, affective and emotional ones that are linked to the existence and to the recognition of a stratification. In this sense the recover space process, through knowledge, becomes a necessary condition to make possible the formation of the critical eye that Roberto Longhi considers able to recompose the figurative whole, coining expression as “restauro mentale” (“mental restoration”) or evocative restoration (13), according to which the single fragments of an opera (and of the city by extension), may be completed or integrated mentally, so that the eye would ideally bring parts together, without material operations.
The capability to operate in entire urban sections using few signs or in a totally virtual and reversible manner (as in the case of video mapping) can be regarded as a possible way for our cities reconfiguration with a fruitful connection between engineering, architecture and academy, in the spirit of drawing and architectural survey.

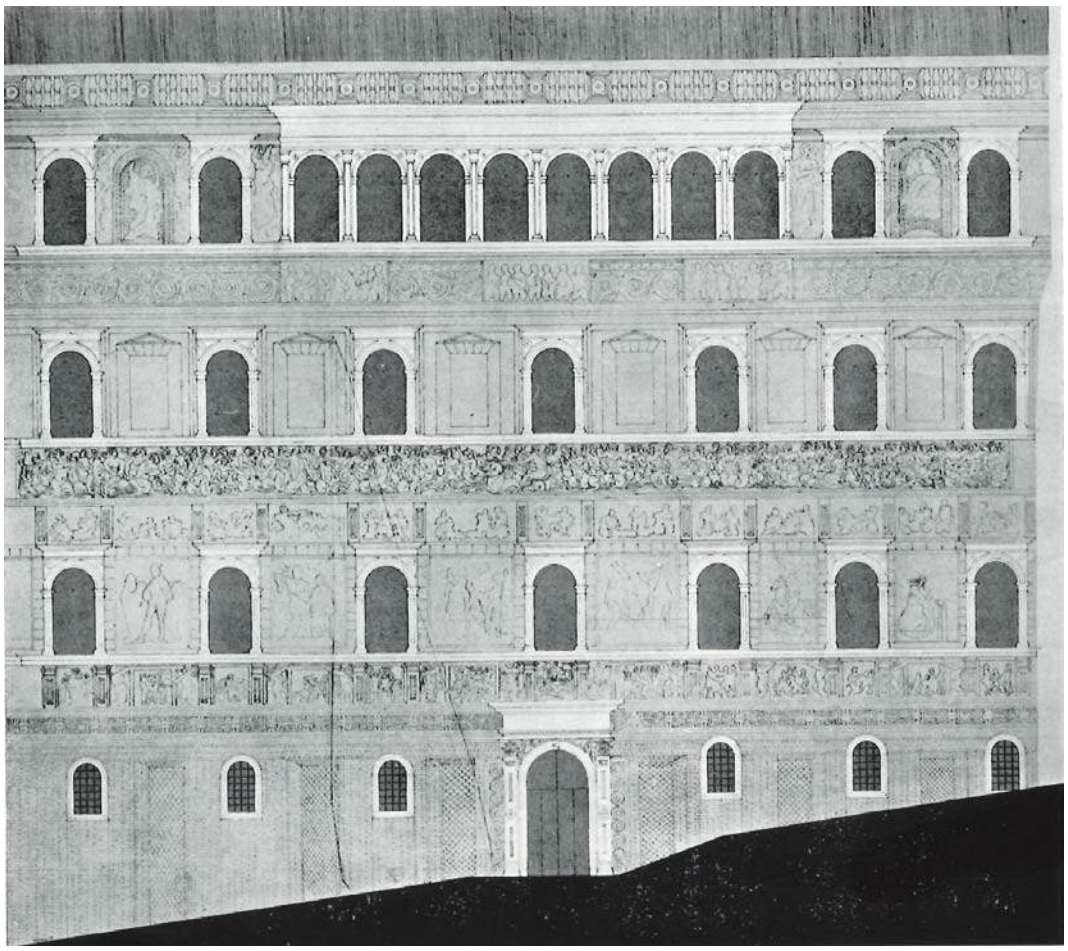

Fig. 1: Palazzo Racani, architectural survey, elevation (Cfr. “Spoletium” 1979, p.67).

Fig. 2: Lucamaleonte and Tellas, senza titolo, 2015.

Fig. 3: Max Ciogli, senza titolo, 2012 (*Nuova memoria*, Spoleto).

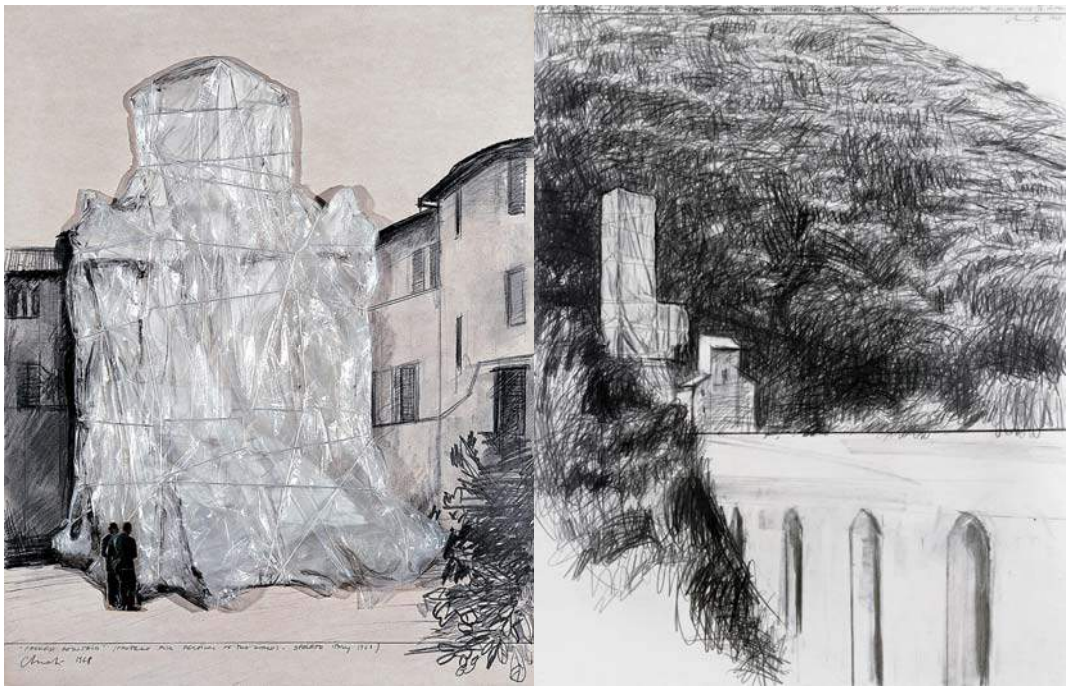

Fig. 4: Christo and Jeanne-Claude, (from the left) *Packed Fountain* , 1968 (Wilhelm Lehmbruck Museum, Germany), *Packed Tower*, 1968 (private collection, France).

(1) Cfr. QUARONI 1983, p. 15.
(2) Cfr. BELARDI 2015, p. 20
(3) A number of degree thesis related to the topic are currently underway as part of the Master's Degree Course in Architecture and construction-architectural Engineering in with the aim to study the identity of Spoleto city and to represent it through the architectural survey and the design.
(4) Cfr. PEVSNER, FLEMING, HONOUR, 1992.
(5) Cfr. PEVSNER, FLEMING, HONOUR, 1992, pp. 207-208.
(6) Cfr. CAPUANO, 1995, p. 11.
(7) Cfr. DE RUBERTIS, 2009, pp. 24-33.
(8) "Spoletium" 1979, pp. 63-75.
(9) Cfr. SAPORI 1985, pp. 103-108.
(10) Cfr. PIOSELLI 2015, p. 78.
(11) Cfr. MANOVICH 2003, pp. 75-92.
(12) the drawings realized in 1968 belongs to the Wilhelm Lehmbruck Museum di Duisburg in Germany and to a private collection in France, respectively, proving their works of art value.
(13) Cfr. ERCOLINO 2012, pp. 165-171.

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Le Vie dei Mercanti XIV International Forum
WORLD HERITAGE AND DEGRADATION
Smart Design, Planning and Technologies
Aversa | Naples 16 - Capri 17, 18 June 2016

Manifesto #SOScopy sustainability [Panel Discussion | Ecozine]

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Abstract
On May 8th, 2015, under the Ecozine International Festival of Zaragoza, a day dedicated to sustainable architecture as a discipline [developed with students from Degree I TIP architecture at the University of Zaragoza] was developed. The Discussion Workshop became an evaluation exercise on ways of sustainability, putting THE COPY as an excuse to approach the discussion of sustainable practices in architecture. Following the debate, a PUBLIC LAWSUIT occurred; a place where sustainable practices in architecture and exercises of thinking about the city in the XXI century were judged. A set of 16 issues which had to do with current city covenants were expressed by the attending professional guests and subsequently refuted and evaluated by the jury. All thematics hid an obvious conflict to embrace and led to examples that allowed the world to bring these GREAT TOPICS to the world of the copy, the version, the mix and even the THEFT itself. While the trial was developing, writing in real time a possible LETTER or manifest on sustainability was taking place, with reference to other letters or historical manifestos, but adding the most common features found in the COVERS. The goal was to turn this letter into a critical object capable of achieving universal accessibility and constant updating, to be versioned and deployed as many times as you wish.

Keywords: sustainability, manifesto, copy, discussion.

1. Panel discussion | Ecozine Festival
On the 8th of May 2015, under the Ecozine International Festival, a day dedicated to sustainable architecture as a discipline [1] was developed. It took place under the coordination of José Javier Gallardo Ortega, executive director of “urban.prospection.network” [2] and “urban.outcast.festival”, the nonprofit institutions which are responsible for the organization [3]. The event was part of a group of urban experiences or laboratories and counted on the contribution of architecture students from the UNIZAR and social partners. Actions are a proactive tool. Researching, analyzing and proposing allow for finding a deeper analysis of the context. It is not about having an established hierarchy of teachers and students, but putting different agents together and make them work coordinately until the actions are done. This allows each member to contribute his/her strong points to the group, learn something he/she considers interesting and think about certain aspects that are being analyzed.

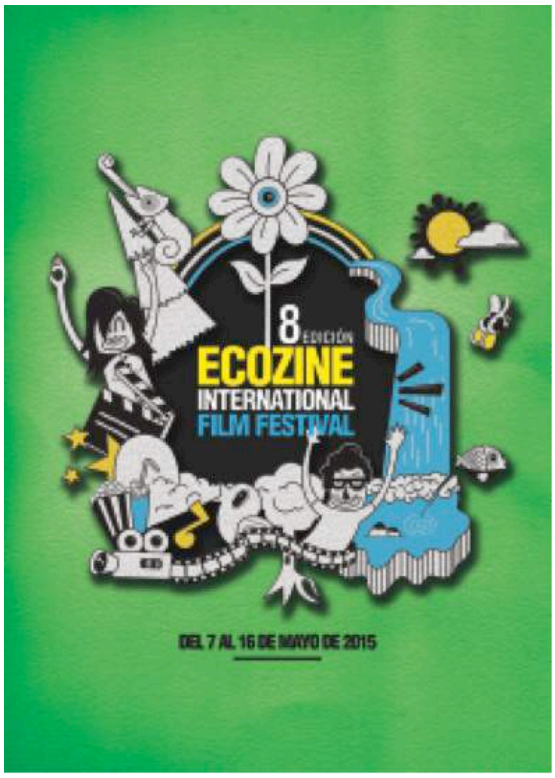

Figure 1. Ecozine Festival Poster 2015 | Access (personal archive)

1.1. Participating groups

/// Architecture groups |
[Zuloark, PKMN, Taller de Casquería and Juanito Jones de León 11]

/// Architecture bachelor's degree students at the UNIZAR
[Teaching Practice in the Projects Workshop I]

/// Citizens who can understand university as an open source area

/// Participants and observers of the ECOZINE International Festival

1.2. Projection of the Spanish film "¡Copiad, malditos!" ("Copy, for heaven's sake!")

/// As a tool to learn the concept of free culture |
[It identifies the social-urban actions in the Spanish context]

/// As a tool for the development of the round table "Taking partiality to court"
[Conflicts arisen from the subject "copying as a sustainable practice"]

¡Copiad, malditos!, directed by Stéphane M. Grueso, is a documentary film about intellectual property. It is the first content created under the license of Creative Commons (BY/NC 3.0 Unported) that airs on the Spanish TV channel and can be freely downloaded on its webpage RTVE.es. In the documentary, we get to know lawyer David Bravo and writer Lorenzo Silva, who are the current focus of the debate on new ethical and moral challenges of the digital revolution.

> *What is intellectual property? To which extent can we have an idea? What rights are emanating from this property, which is widely recognized by law since the time of the Industrial revolution? The law is clear about it and has made possible the proliferation of the so-called rights management entities (such as SGAE, CEDRO, VEGAP, etc.), which are in charge of protecting the authors' rights. However, in the last years (and especially since the massive emergence of the information*

society) the whole system -on which there was already a consensus- is being constantly brought into question. New winds are blowing and new questions arise. To which extent can copying be a felony? Don't we all constantly copy when thinking and creating? Things evolve: there exist already publishing business models that are not based on restriction, but on the free publication of works on the Internet and, oddly enough, it does not involve the drop of published paper works' sales, because buyers feel safer if they can read what they are looking for before actually buying it. Something new is also happening in the music business. There are already thousands of bands and artists uploading their work on the Internet and forgetting about intermediaries, so that the user can download, enjoy and share their songs freely. By doing so, musicians aim to sell out their concerts and consequently give their public the inevitable right to copy. This is what makes COPYLEFT possible, a new perspective of the intelectual property that has already millions of supporters. However, the traditional structures are fighting tooth and nails for their survival.

1.3. Round table: Taking partiality to court

In the film "¡Copiad, malditos!", the research process ends up being the whole subject of the film. In the same way, we wanted the round table to be an analysis of the different types of sustainability. To do so, copying was used as a tool to discuss on sustainable practices in the field of architecture. The round table became a public confrontation, a place where sustainable practices in the architecture field and the city's way of thinking in the XXI century were judged. Guest lawyers presented 16 different topics related to current agreements about the city and the popular jury answered and assessed them. Each topic raised an obvious conflict to be studied, as well as some examples that set copying, adapting, mixing and even stealing subject areas closer to the aforementioned topics. Throughout the trial, a possible letter/manifesto about sustainability was written. To do so, other models of letters and historic manifestos were used as a reference and the most common features found in covers were also added. This letter will be accessible to everybody and can be constantly updated, adapted and even implemented as time goes by.

2. Interpretation of the Discussion Group day | Ecozine Festival

Sustainability is on the table in architectural and urban planning practices; it has been mainstream; it has been trendy; it can be even used in marketing strategies. Not only energy and material sustainability, but sustainability in every aspect related to the city, from its ways of managing and growing, to new professional structures. Sustainability is an enlarged mirror in which by looking at it, a radical change of paradigm appears in a contrasted way. The interests and questions that worried us only a decade ago have evolved in a way that it can be said that today we are not looking for answers to those questions that we asked ourselves, but that the urgent change experienced urge us to search for other questions and other formats.

Democratization in design is breaking many of the prejudices stopping its evolution, and the arrival of the digital surrounding and its new ways of sharing knowledge have put at the centre topics that until now were not on the table.

The idea was to draw up an Ecozine manifesto in Zaragoza, combating prejudices, reprogramming the questions and widening as far as possible the meaning of what today is understood by sustainability. It is a dynamic manifesto included on a hashtag called **#SOScopy**, an expanded subject allowing us to make the manifesto more complex, with a content permanently evolving to avoid obsolescence. In order to boost the use of the hashtag, a panel discussion was prepared presenting sixteen open conflicts and producing sixteen debates on an example taken from the digital context and related to copying as a sustainable method.

These are open and dynamic systems enabling to delocalize producer and consumer, legitimating new references, and finding new more sustainable creative systems that have been key for drawing up an Ecozine manifesto about the city.

Nevertheless, this manifesto must not be read in the usual way. Its sixteen points are neither axioms nor axes to follow but open topics, conflicts putting sustainability at the centre of the debate. A new reading of the manifesto requires everybody to get involved. Therefore, after getting information and analizing the examples continuity can be provided in order to have the opportunity of further discussion by using the hashtag **#SOScopy**.

Furthermore, the drafting of the manifesto has allowed us to research into the relevance of the assembling products, a concept that always can be measured. In architecture, work is done joining your own ideas [the fewest number] or from other places. This practice produces replicability, putting together already existing knowledge [traditional techniques with digital techniques]. "Covering" would be another way of defining this concept.

Figure 2. Architecture group [PKMN, Taller de Casquería, Zuloark and Juanito Jones (personal archive)

Figure 3. Architecture bachelor's degree students at the UNIZAR, Ecozine Festival 2015 (personal archive)

3. #SOScopy | Sustainability letter or manifesto in Zaragoza

...[1] Collaborative Copying Systems

Star Wars Uncut: A New Hope
http://www.starwarsuncut.com/newhope

#SOScopy #starwarsuncut

...[2] Fanatic appropriation.

Hi Brit - Gal Volinez / Britney Spears
https://vimeo.com/97925973

#EcoZine **#SOScopy** #two #apropiacionfanatica #subjectivities #copypaste #conflictosdecontexto #empatetecnico

...[3] Being sustainable equals not being original.

Original Copies
/http://www.amazon.co.uk/gp/product/0824836065
The Chinese Zaha Hadid vs Pirates
http://www.spiegel.de/international/zeitgeist/pirated-copy-of-design-by-star-architect-hadid-being-built-in-china-a-874390.html

#EcoZine **#SOScopy** #three #queesseroriginal #originalcopies #sersostenibleesnoseroriginal

...[4] A fake as a resource.

Fiction as a tool to copy and overcome reality.Orson Welles and his radiophonic alien invasion in 1938.
https://vimeo.com/104296069
https://vimeo.com/6801485

#EcoZine **#SOScopy** #four #fake #efectossobrerecursos #fictions #dudasconlopermanente #queeslopermanente

...[5] Assembly and industrial perversion.

Ikea Disobedients - Andrés Jaque / Office for Political Innovation
http://www.coam.org/pls/portal/docs/PAGE/COAM/COAM_NOTICIAS_Y_OPINION/PDF/12_7_20_IKEA_Disobedients_Andres_Jaque_Architects.pdf

#EcoZine **#SOScopy** #five #apropiaciondelooptimo #laindustriacomooportunidadsostenible #assemblies

...[6] Reuse infrastructures.

Harvestmap / Superuse Studios
/http://www.oogstkaart.nl/oogstkaart

#Ecozine **#SOScopy** #six #infraestructurasdereutilizacion #informacioncompartida #reuse #recycle #materials #allscale

...[7] Industrial customization

Hacker's ethics: Rollercoaster in Ermelo / PKMN experience: Innopia
https://www.youtube.com/watch?v=_qG51mpjF8U
https://vimeo.com/5986285

#EcoZine **#SOScopy** #seven #hacking #personalizacionindustrial #ZGZhacker

...[8] Copying limits.

Grey Album
http://en.wikipedia.org/wiki/The_Grey_Album
Girl Talk Creates a mashup
https://www.youtube.com/watch?v=KykbPtRb0K4
Axis of Awesome - 4 chords
https://www.youtube.com/watch?v=5pidokakU4I

#EcoZine **#SOScopy** #eight #loslimitesdelacopia #sampling #genetic code #limits

...[9] Sampling as a sustainable creative tool.

#EcoZine **#SOScopy** #eight #to sample #share #vs #compete #acumulaciondesaber #legitimacy #adaptation #fronterasdelolegal

...[10] Liberated reproducible objects.

#EcoZine #SOScopy #nine #copyadaptandpaste #context #puntodelpublico

...[11] Reuse vs. Recycling.

#EcoZine **#SOScopy** #ten #reutilizacion #vs #recycling

...[12] Ethical theft.

ACAD / Medre.AA -
163.com / qq.com
http://www.telegraph.co.uk/technology/news/9346734/Espionage-virus-sent-blueprints-to-China.html

#EcoZine **#SOScopy** #eleven #apropiacionextrema #theft #files #virus #autocad #dwg #concienciadelplagio #patents #retrovirals #pharmaceutical

...[13] Open Source and systems that can potentially be copied.

Open Source Ecology - Marcin Jakubowski
https://www.youtube.com/watch?v=Z3XmkLTEqTs

#EcoZine **#SOScopy** #twelve #autonomiaopensource #codigolibre #opensource #opensourceecology

...[14] Personal rehabilitation, the Tuning.

Personal identities and lowcost technologies
https://www.youtube.com/watch?v=hdi9Fcy_4N0&feature=youtu.be&t=410

#EcoZine **#SOScopy** #thirteen #tuning #tuneo #rehabilitation #identidadespersonales

...[15] The Great Remix!

Kill Bill Everything is a Remix
https://www.youtube.com/watch?v=l3yY1FsT1cA

#EcoZine **#SOScopy** #fourteen #everythingisaremix #everythingisacopy #time #Tarantino #KillBill #Zuckerberg #todoestainventado

...[16] Ethics of laziness as a new sustainable paradigm.

#AskMark: Why do you wear the same shirt every day?
https://vimeo.com/111171647

#EcoZine **#SOScopy** #fifteen #fun #mood #sermasvagoessermassostenible #euphemisms #vague #copy #copiadmalditos #Zaragoza #Consortium #Thanks

Copying is not stealing.

https://www.youtube.com/watch?v=ZmYsLTUjXNI

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[4] http://copiadmalditos.blogspot.com.es/p/el-documental.html

Le Vie dei Mercanti XIV International Forum
WORLD HERITAGE AND DEGRADATION
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Portuguese architecture past and present: small architectures as large containers.

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Abstract

During the last century, the socio-economic contest of the Southern Europe has blocked the development of a country rich in culture and history like Portugal.The Portuguese architects always think of architecture located in the territory with research and attention.
However the Portuguese architecture receives international recognition following the political change of '74, in the transition from dictatorship to democracy, with the end of isolation of Portugal from the rest of Europe.It 'a short period but that enables architects like Alvaro Siza to get around 1980 on the international scene with the first works of architecture in Berlin.
The following years are decisive moments of great transformation of the area, great works of architecture provided for the presence of international architects who have contaminated, enriching the qualified and contemporary production of new and old Portuguese masters.
This text aims to highlight the work of small architectural projects, designed in different Portuguese countries. Small architectures, large containers of ideas, culture, history and resources, able to relate to existing architecture and pristine landscapes. Little architectures that arise as a result of research and attention to Portuguese's teachers.

Keywords: architecture, light , containers.

1. Introduction

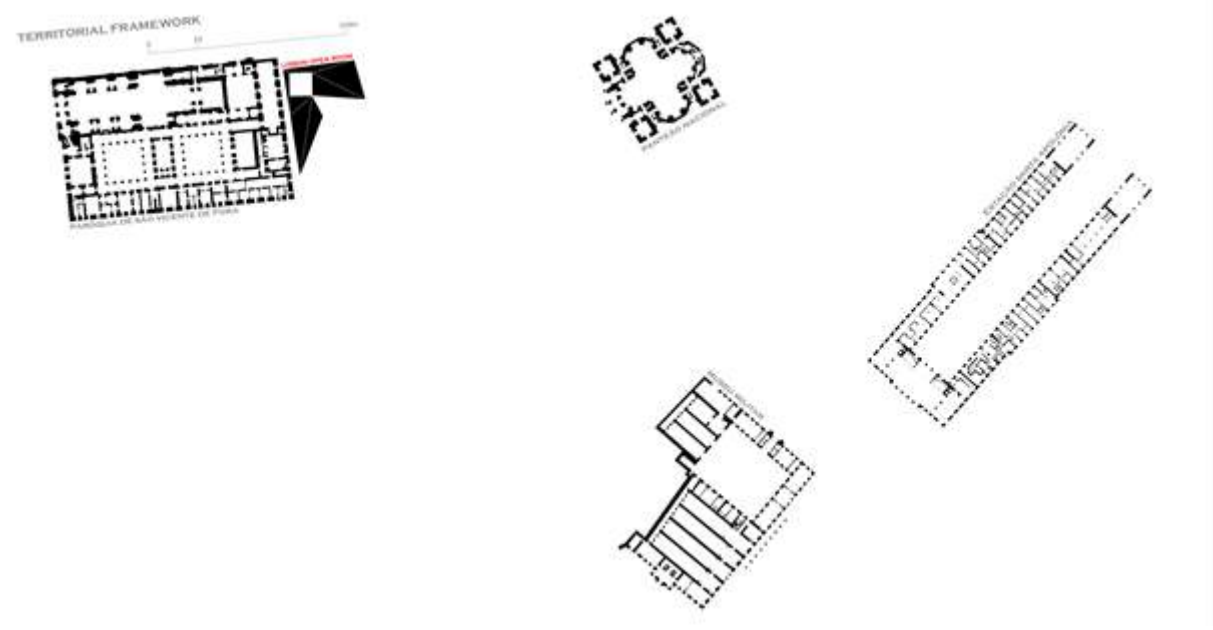
Since 2008, the world is going through a strong economic crisis that has resulted in a profound crisis of values. Originated in the United States, the crisis has created consequences first in the United States and then around the world generating negative economic consequences on an international scale. The countries of Southern Europe have been widely affected, particularly Portugal. However unpleasant this direction has not blocked the desire of a country rich in culture and history of architecture. Many of the Portuguese territory sites are subject to architectural competitions that aim to revive empty or abandoned places that have a strong historical or cultural landscape power. This text brings to light several architectural projects conceived as small containers that have the goal of giving new life to dead space.

Fig. 1: Lisbona, Montemo O-Novo, Fortress of Cresmina in Carcais, Oporto.

1.2 Lisbon Open Room. A open space in an urban void.

The site is the historic district of Lisbon, located in one of the highest points of the city, the Alfama district. This appears with a dense and compact context where the activities fit together in a natural way between them. Next to the area project, there is a top asset value and the historical area, are nearby, residential buildings, markets and churches. Specifically, the project area is located within the Church of São Vicente de Fora and very close to the National Pantheon, it is accessed through a small and significant portal. The great empty space is related in a very natural way with the Tajo river, that is the symbol of Lisbon.

Fig. 2: Territorial Framework.



The project is proposed as a single element, a large container of activities. An open room to the towns that active public space. An architecture that report so sensitive to the historical context of the place and the socio-economic conditions, it appears as an architecture that has references in the history of Portuguese architecture. Below we can see the conceptual diagrams illustrating the structure of the system, designed with bearing walls, the flow system from which you perceive the permeability of the project, the system of openings that allows considerable flexibility and cover system, which it is characterized by the presence of a regular shape atrium from which the different roof slopes.

This architecture is a multi-purpose hall that allows many uses; The proposal is of a structure that can accommodate many activities and to give back value to the historical heritage, the activities that will be developed within the engine that public space active. For this reason it was decided to a single flexible space of about 600 square meters, arranged in two places environments next to a small foyer. The interior space is delimited by large openings able to rotate on themselves to create a new environment always.

Fig. 3: Conceptual schemes.

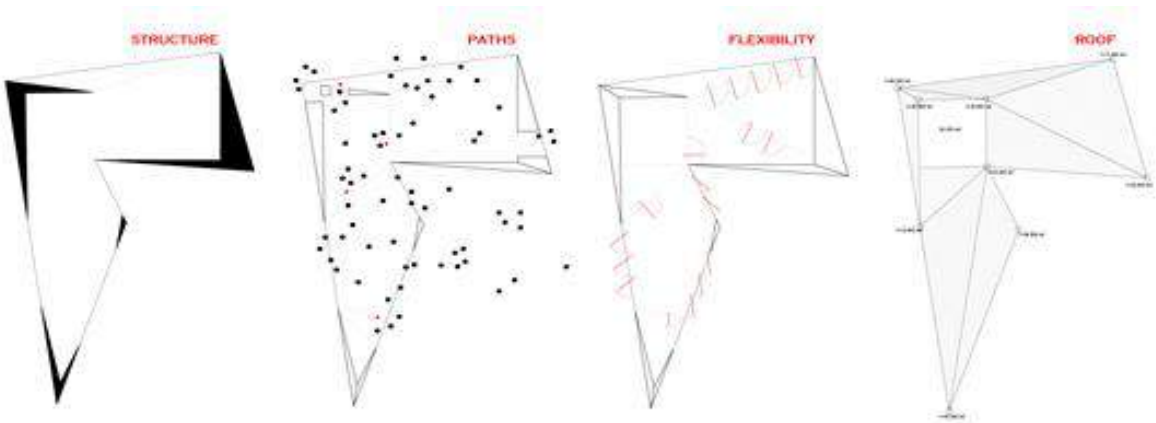


Fig. 4: Sections

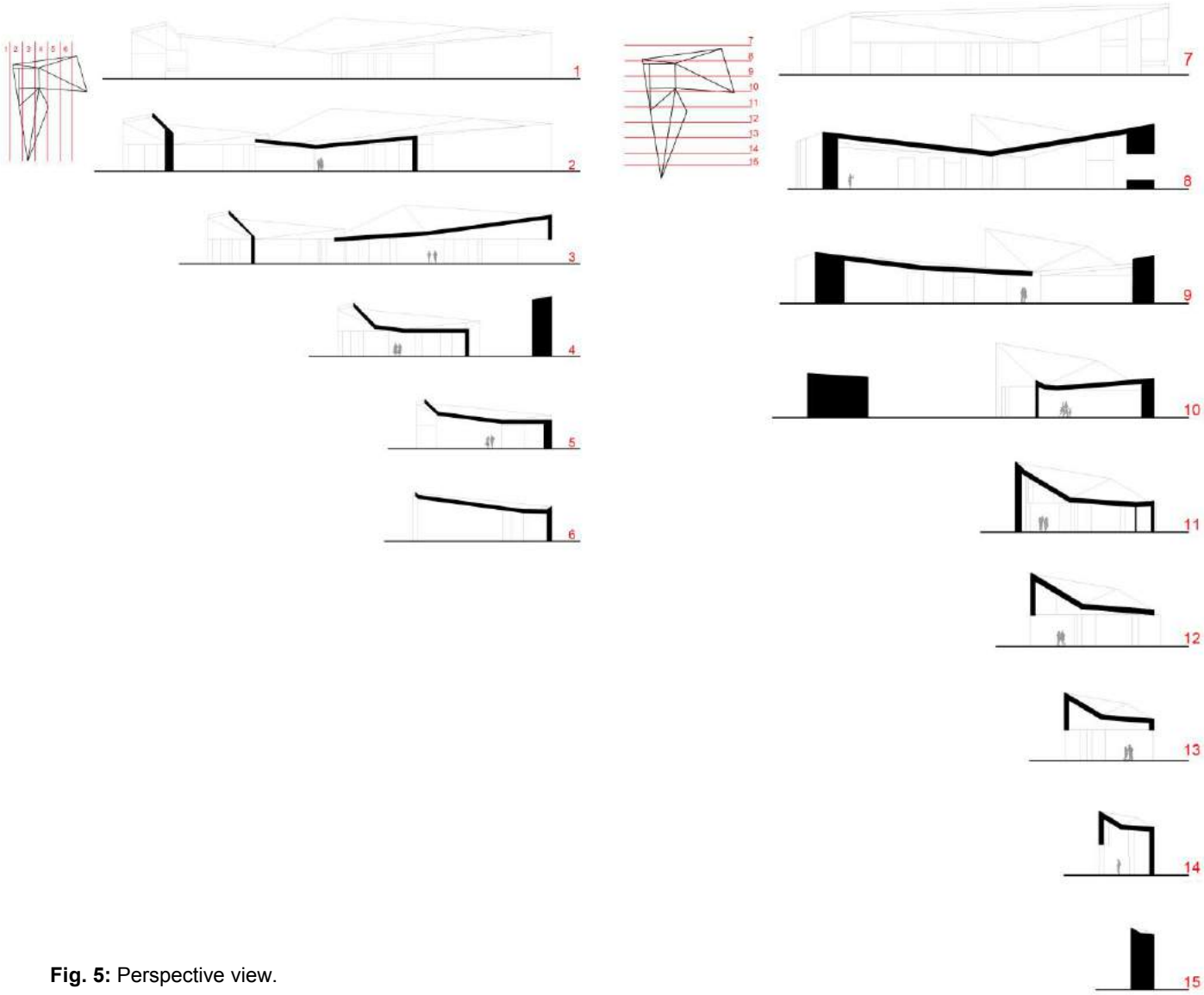


Fig. 5: Perspective view.

1.3 Art center. A little architecture on the seashore.

This project is located within the Fortress of Cresmina in Cascais, Portugal. The Fortress of Cresmina is a significant landmark on a prominent landscape, a place of cultural heritage and historical significance with characteristics that must be fully preserved. When generating a vision for an intervention located within such a remarkable place, it is essential that eatch proprosal emphasizes, respects and celebrate the site and existing ruins within this spectacular landscapes, providing visitors a unique experience.

Located in the Natural Park of Sintra-Cascais and surrounded by cliffs, the Cresmina beach has a unique landscape. Of outstanding natural beauty, this beach is characterized by a large areal extension, with strong waves and winds leading to the formation of the Dune system "Guincho-Cresmina".

During the 17th and 18th centuries, in order to strengthen the defense of the Tagus bar, nine fortifications and batteries protected the approach to Lisbon, the Tagus bar and the Lisbon harbour. Its main objective was the quartering of small garrisons that hindered the landing of enemy forces, while alarming the reinforced critical points in the defense of Lisbon.

The Fortress of Cresmina is an example of military architecture, isolated, on a rocky point of a cliff, on the southem edge of the Cresmina beach. It was one of the fortresses for strengthening the coastline of defense, each located in the most strategic areas. From 1795 the Fortress of Cresmina began to lse its military significance and wad disabled in the nineteenth century when the artillery was removed and the fortress was abandoned. The Fortress Cresmina has a poloygonal plan with six sides of different dimensions. The quarter and powder storehouse were located at the rear. Access was made through a single door and there are still traces of two small rectangular spaces and the pavement slabs still visible. Currently vacant, the Fortress of Cresmina is in advanced state of ruin.

Fig. 5: Territorial Framework.

The project is designed as a container for the ruins of the fortress. Through various activities, the sheer volume becomes an thin and light element that does not rely on the remains ever. The functions are developed within the walls of the old fortress as autonomous cell. The roof is perforated in several places to allow the sunlight to enter the interior spaces. The folds of the roof mark a new skyline of the old building that is visible in the distance from the city and from the sea for the presence of a vertical element that brings the idea of a beacon.

Fig. 6: Perspective explosion.

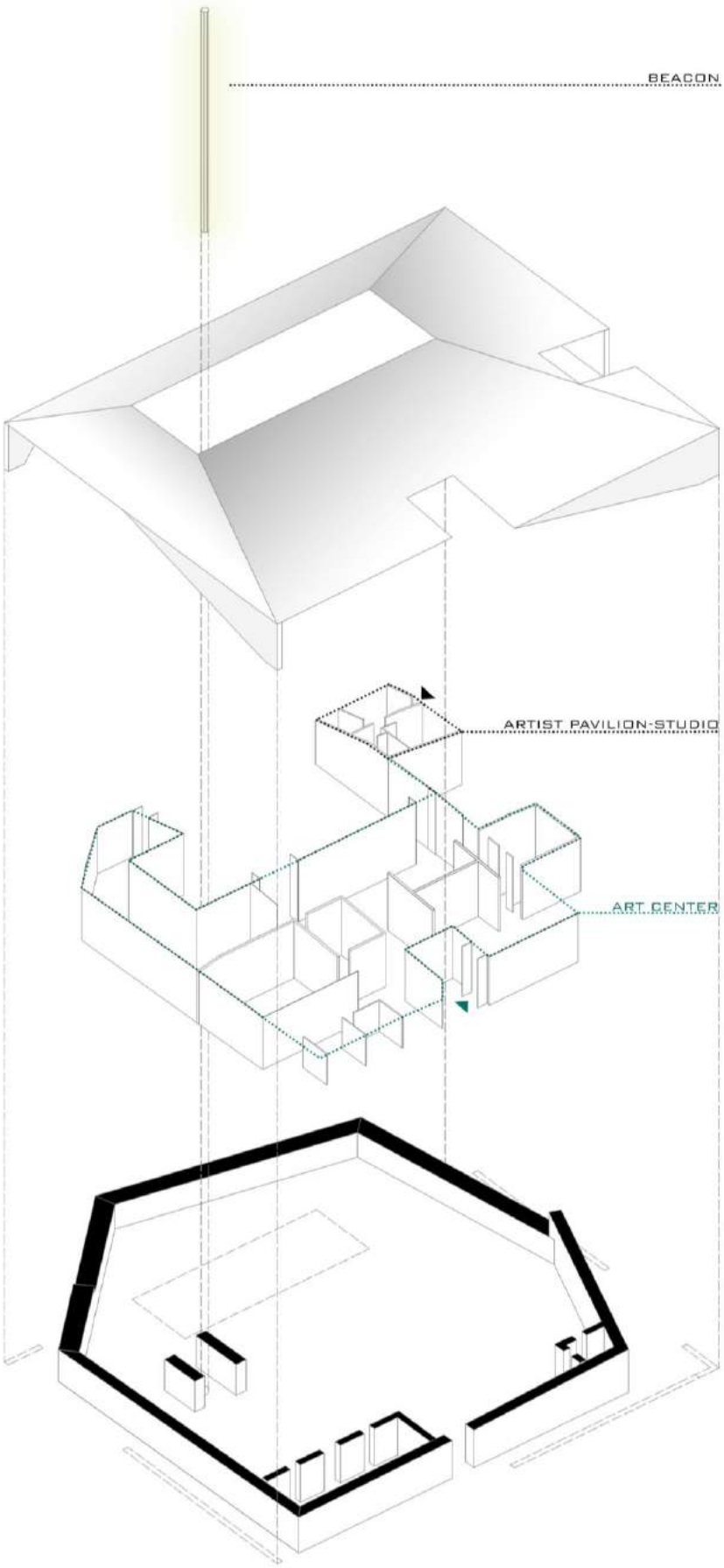


Fig. 7: Composition schemes.

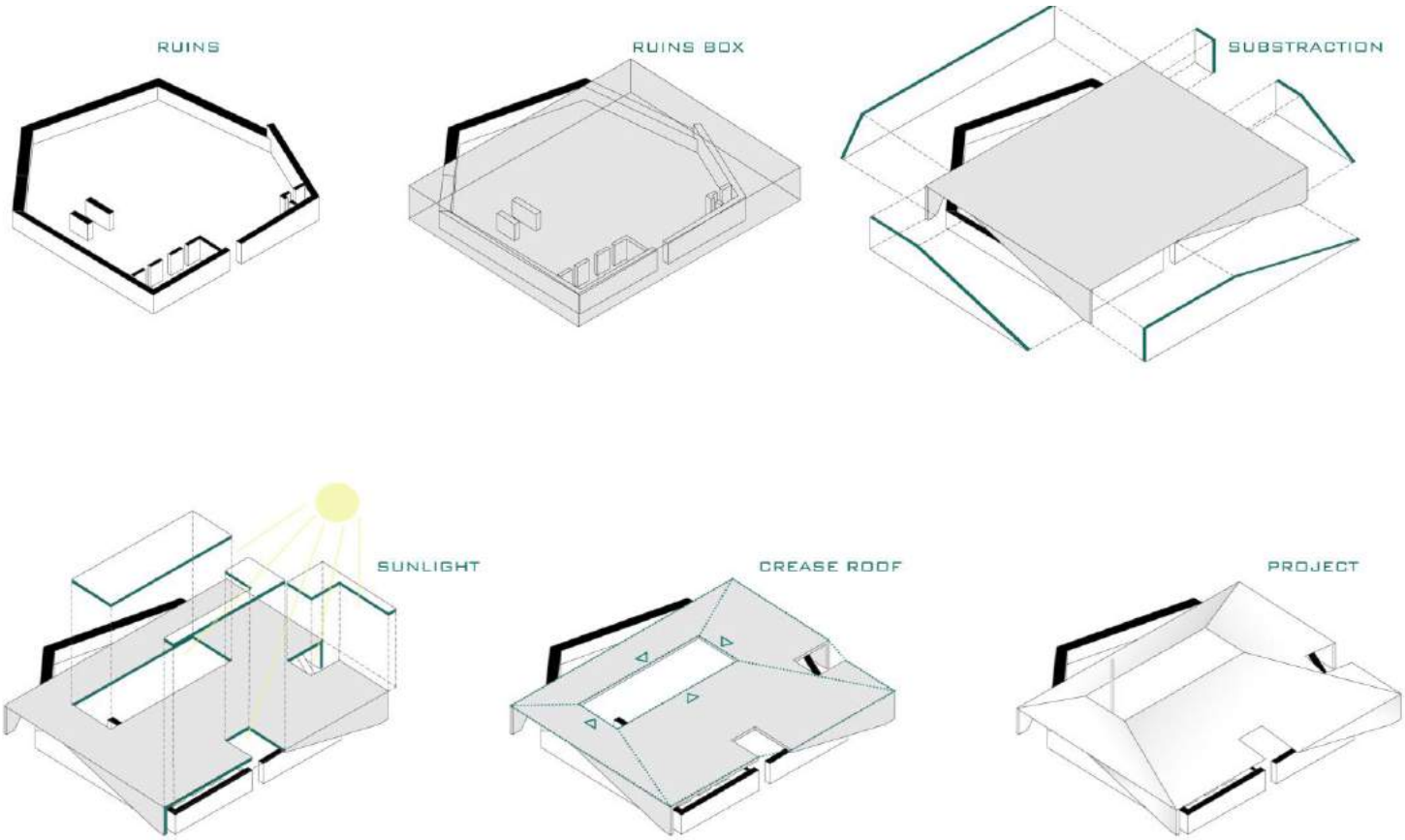


Fig. 8: Architecture plan.

Fig. 9: Sections.

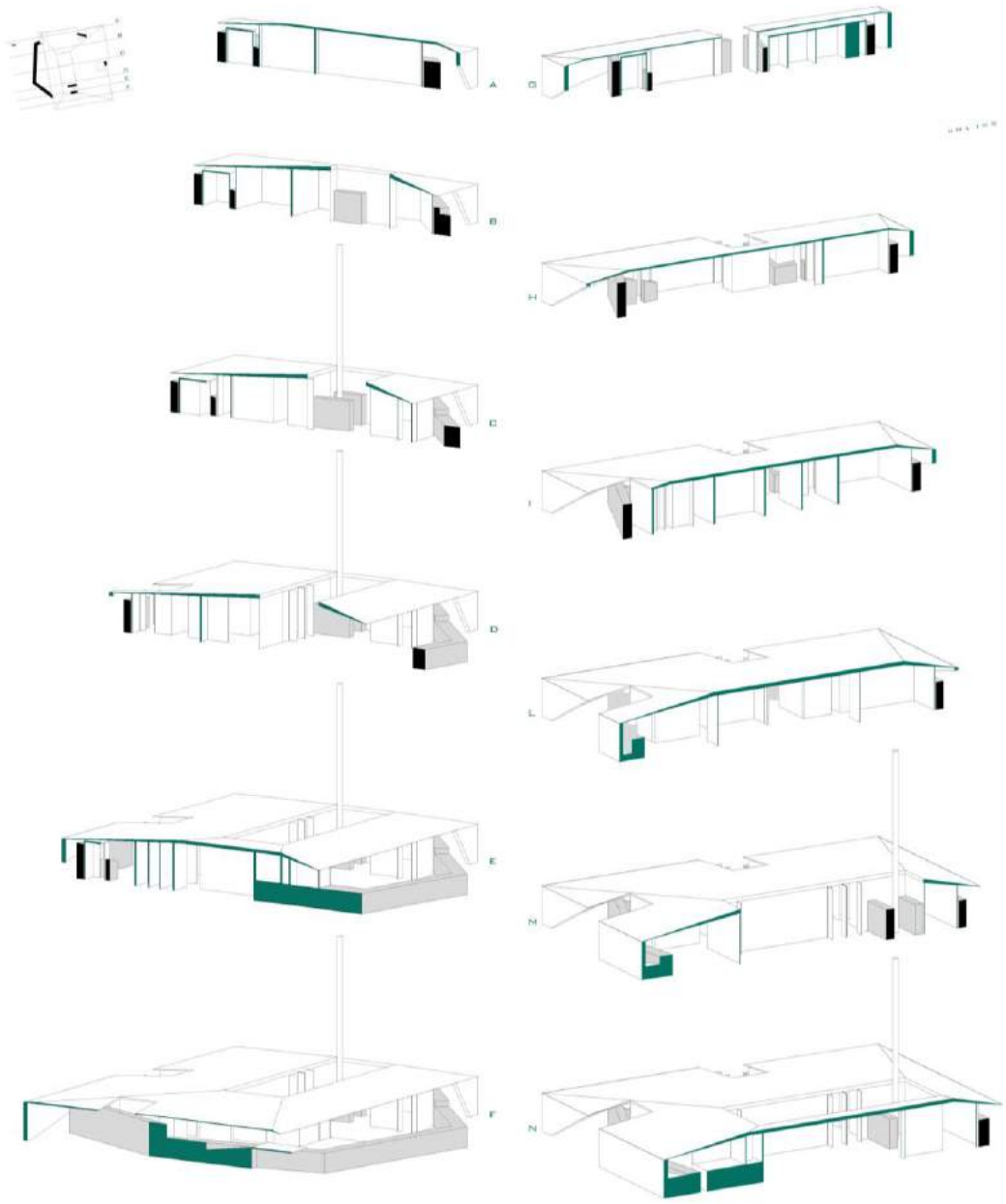
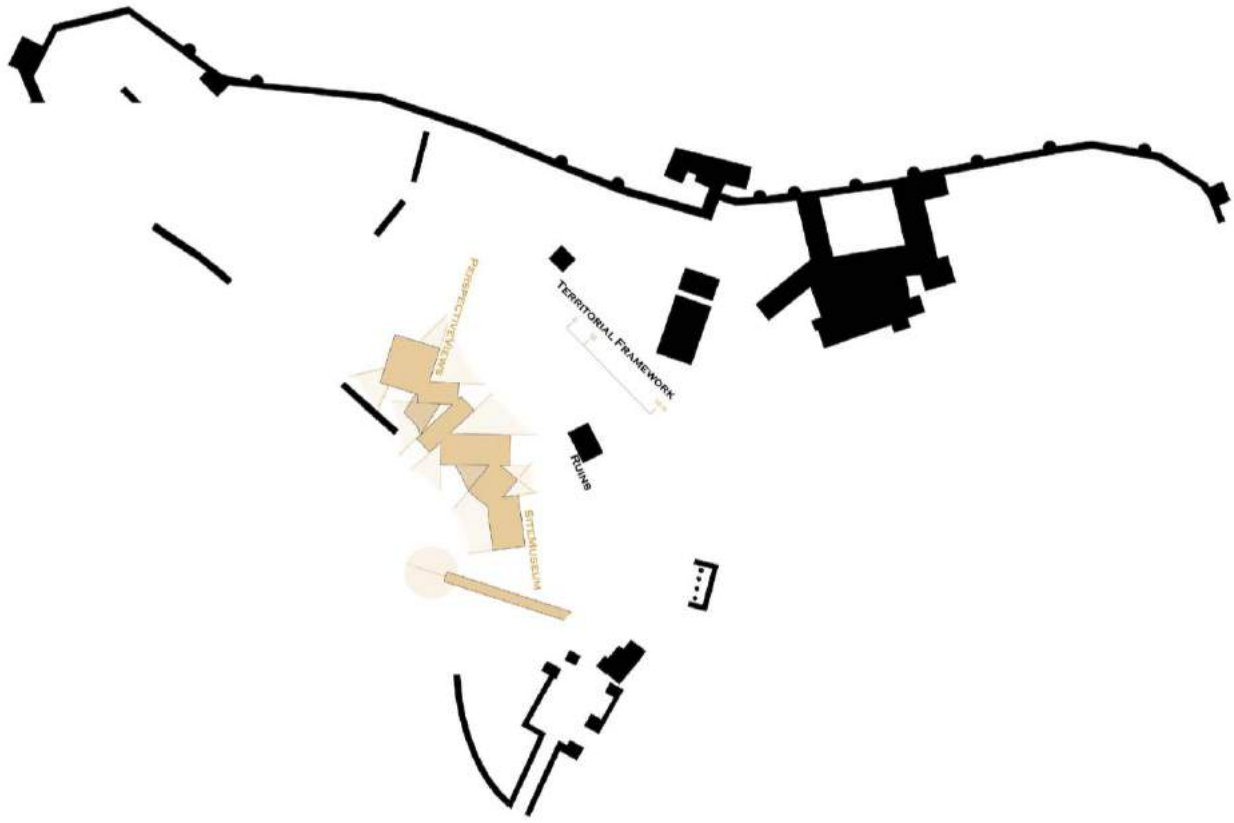


Fig. 10: Perspective view.

1.4 Montemoro O-Novo. A museum as a bridge between old and new.

This project is located within the **Castle at Montemor-o-Novo in Portugal**. The **Castle of Montemor-o-Novo** is a significant landmark on a prominent landscape, a place of great cultural heritage and historical significance with characteristics that must be fully preserved. The Castle of Montemor-o-Novo is located on a hill, about 291 m above sea level, between the Almansor River and the town of Montemor-o-Novo, in an area of great historical and cultural heritage. Occupied since an undetermined epoch, it assumed a prominent role in defense, as well as in the geographical and political context of this area of Portugal. The Castle of Montemor-o-Novo is the original precinct of the medieval village of Montemor-o-Novo, with almost 2 kms of fortified wall, four towers, nineteen turrets and four entries. Traces of occupation were found from the Roman period (2nd b.c. to 5th a.c. centuries). The Romans were responsible for building infrastructure includingaqueducts, roads and bridges that reflect the current development of this area. A roman funerary plate was found in the Church of 'Santa Maria do Bispo', establishing a hypothetical occupation of the site.

Fig. 11: Territorial Framework.



From the Pre-Islamic period (6th to 8th centuries) traces of Visigothic influence (ashlar) were found in the portal of the Church of 'S. João Baptista' and the Clock Tower. Archaeological material was found from the Islamic period (8th to 12th centuries) and according to some historians, is the existence of a fortified settlement that would have structured the intramural urban space. The intramural village of Montemor-o-Novo with an indeterminate origin would have historically evolved between the Islamic period and the Christian reconquest of this region. In the 12th century, the Castle occupied by the Moors was conquered by D. Afonso Henriques and according to historians, was followed by a period of great political and military instability with the destruction caused by the Almohad invasion (1191). In the 13th century, D. Sancho I granted its 1st charter and the walls were rebuilt under the reign of D. Dinis. The intramural village became one of the main towns of the territory. In the 14th and 15th centuries, the intramural village attained a great economic, demographic and political importance. The doors, oriented towards the cardinal points, organised the social and economic life of the village by defining the main intersecting roads and marked the village center with a public square and trading

area. These areas provided a direct relationship between the Castle and the structural axes towards the wall entries. The village was organised organically, with narrow winding streets. From the mid-14th century, the village was formerly confined to the intramural area of the Castle and then began extending to the north outside of the perimeter walls, known as the 'Arrabalde'. It was a very accessible area between Lisboa-vora, lying in a privileged location in regards to communication and proximity to trading routes between the North-South, East-West, while also playing an important role in the economic, social and political scene. The North entrance of the fortified wall established direct access to the 'Arrabalde' (the current town of Montemor-o-Novo). While the people moved to the north, the regal representatives remained within the intramural village, recognizing that this division could create a weakening of their power. During the 14th and 16th centuries, there was a regal attempt to counter the intramural de-population by granting privileges only to those living within the walls and restricting privileges for residents of 'Arrabalde', such as the prohibition of trade outside the intramural space. From the 16th century, it became increasingly evident the relocation of the population to the northern outskirts, until the complete abandonment of the intramural space in the 18th century. The city of Montemor-o-Novo had an important role in the fight against the Castilian occupation (1580 - 1640) and during the French invasions (in the beginning of the 19th century).

Fig. 12: Sequence design.

This project is composed of pure elements, which joining between them, to generate spaces of different heights connection. The joint space is organized so that you always have a volume side stuck in the ground, while the opposite side is opposed to the landscape, making him a hug and become the exposure element .The design choice falls on an architecture that relies on the site from which is born without extensively change the context that surrounds it and above all seeks to create a sensible connection with the pre-architectural existences.

Fig. 13: Architecture plan.

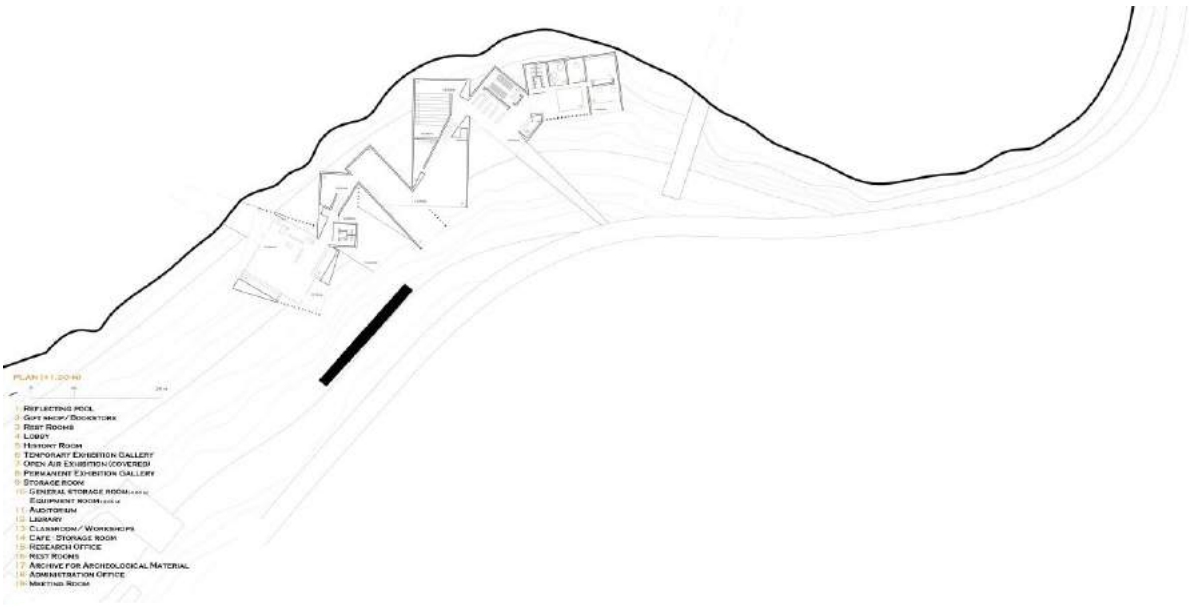


Fig. 14: Perspective view.

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Le Vie dei Mercanti XIV International Forum
WORLD HERITAGE AND DEGRADATION
Smart Design, Planning and Technologies
Aversa | Naples 16 - Capri 17, 18 June 2016

Bristol travellers in the Italy of the eighteenth century: landscape, art and culture

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Abstract
The community of travellers that in the course of time has crossed geographical boundaries, centuries and run endless routes, has made of travelling a status, that of traveller, and made travelling become a particular attitude of life. In fact, travelling represents not only the chance to reach other places, but also means to open a window onto the world and the history.
For this reason, there's a lively interest for travel journals, which in the 1800s were almost always made of notes written ongoing, as the travel was continuing. Our aim is to understand how the English looked at Italy, at Rome and Naples in particular, thanks to the study of some journals and letters kept in the Bristol Record Office. From the grand tourist who feels deeply the universalistic idea of culture trough the art and the passion for archaeology, to the business traveller and the one who travels on holiday with the family, all these travellers had in common the research for the beauty of landscape, nature and civilization origin.
From the past emerge social relations, customs, means of transportation, costs, types of inns and hotels, parties, receptions, ceremonies, visits to kings, even the coronation of Pius IX. However, the time of travel doesn't conjugate in the past but in the present, because it includes the «time of humanity». Differently from what it may seem at first, then, the travel diary has the ability to transform words in images that talk about our present, frames of life and landscapes that capture our history.

Keywords: Grand tour, landscape history, journal

Introduction
The community of travellers that in the course of time has crossed geographical boundaries, centuries and run endless routes, has made of travelling a status, that of traveller, and made travelling become a particular attitude of life. In fact, travelling represents not only the chance to reach other places, but also means to open a window onto the world and the history.
For this reason, there's a lively interest for travel journals, which in the 1800s were almost always made of notes written ongoing, as the travel was continuing. Our aim is to understand how the English looked at Italy, at Rome and Naples in particular, thanks to the study of some journals and letters kept in the Bristol Record Office. From the grand tourist who feels deeply the universalistic idea of culture trough the art and the passion for archaeology, to the business traveller and the one who travels on holiday with the family, all these travellers had in common the research for the beauty of landscape, nature and civilization origin.
The mercantile city of Bristol, an important harbour open to the world, had a great tradition of travellers. In particular, right in Bristol was born Henry Swinburne (1743-1803), who dedicated forty years of his life travelling the world, preferring especially Latin and Mediterranean Europe, and leaving works that became classics of travel literature [1]. He has been one of the many English tourists that made of travelling a real life choice. This great tradition includes Bristol travellers of the XIX century, whose diaries are kept in the Bristol Record Office, three of whom will be shortly presented afterwards.

These writings let emerging from the past social relations, customs, means of transportation, costs, types of inns and hotels, parties, receptions, ceremonies, visits to kings, even the coronation of Pius IX. An ideal connection between the three travels and travellers shortly presented here could be represented exactly by the figure of Pius IX: known and appreciated by John Scandrett Harford; seen with disillusioned and desecrating eye by the young Florence Upton; present in Francis Greville Prideaux even if only through an encounter that was planned, but then not realized. Therefore, the Europe of travellers of the eighteenth century, who were different from each other for social class, age, culture and gender, found itself irreversibly attracted by Rome, origin of the civilization.

1. John Scandrett Harford

The two travel diaries by John Scandrett Harford (1785-1866), banker of Bristol who strongly fought for the abolition of the slave trade, refer to the travel started in September 1846 [2].
Lover of art, and artist himself, he had been to Rome already in 1815, during his European travels. But Rome was not only a travel destination; it became his city of choice. He lived there for a long time, becoming also a close friend of the cardinal Ercole Consalvi. His love and interest for Italian art and history was unconditioned, and during the travel started in autumn 1846 he collected abundant material for what would have become his most famous masterpiece: "Life of Michael Angelo" [3] published in two volumes in 1857.
Descending towards Rome from Ventimiglia, a city picturesquely «situated at the end of a beautiful mountain valley with a fine view upon it" and Sanremo, «a pleasant sleeping place», he could admire along the way «the beautiful valleys which opened upon the sea, crowned by mountains (...) and also towns and villages which spread on the edge of the sea. Among these I would mention Albenga».
Arrived to Florence through Genoa, La Spezia, Pisa and Lucca, he could see again, besides, «with the highest interested pleasure (...) the Florentine Gallery and that of Pitti Palace». But above all, he was struck by Siena, with «all the appearance of an ancient City», and «its narrow dark streets, its lofty houses, some of whom have turrets and rings (...), its magnificent and picturesque Public Palace» which had often been «the scene of popular tumults in the Middle Ages». But especially «the great attraction of Sienna is its gorgeous and beautiful Cathedral, the most perfect (...) specimen of Italian Gothic in Italy». In the diary there are also noted various information exactly about the Sienese school of painting.
The travelers entered into the city of Rome through Porta del Popolo, where there was the customs, through which one led directly into the heart of the city and tourism. The foreigners, indeed, gravitated towards the area between Porta del Popolo, Piazza di Spagna and Via Condotti, where there was also a great number of hotels frequented by them.
The approach to Rome always represented an exciting moment, even when it was a return, as in this case: «I cannot describe the (...) interest with which we approached the "Eternal City" (...) its numerous cupolas, surmounted by the Dome of St.Peter's, and flashed by the purple of the mountains Apennines of Albano and Frascati». Furthermore «a "lasciapassare" at Porta del Popolo and a notice that the apartment awaited us at the Hotel de Russie rendered our entry more delectable». Moreover, John Scandrett Harford was pleasantly struck «on first entering the gates» «by the beauty of the architectural improvements» of the surroundings of Piazza del Popolo. Furthermore, after the uncountable «uncomfortable inns» encountered during the travel to Rome, they were finally «charmed with our pretty suite of rooms in the Hotel looking on a luxuriant orange garden».
After a walk to one of his favourite Roman places, the Pincio, and after having passed through Piazza di Spagna, John Scandrett Harford realized with his surprise that, even years after, the places and sounds of the city still seemed to him «so natural and familiar that I almost began to persuade myself». All this made him conclude: «I could not possibly have been so long absent». Therefore, almost with relief, he could affirm «I was again in Rome».
Already in his first period of stay in Rome, the Pincio had represented his «daily delight», and the destination of his morning walk, one hour before breakfast, to watch the sunrise behind Saint Peter, whose majestic building stood out against the bright sky of the morning.
Before anything else John Scandrett Harford wanted to grant one of his «first desires», and only one hour after his arrival to Rome he was already in Saint Peter, where «no words can describe the impressions of delight and admiration with which I again surveyed its grand majestic features, and its exquisite details».
However, before he could dedicate himself completely to the study of Roman artworks and the collection of documents for his "Life of Michael Angelo", he could attend to the majestic rite of coronation of Pope Pius IX, who had been elected on June 16th the same year, after the death

of Gregory XVI. Exactly the day after John Scandrett Harford returned to Rome, on June 21th the coronation of the new Pope took place. He notes on his journal a detailed description of the great procession directed towards the Lateran, that he could see at the level of Colosseum «from a raised seat which commanded an admirable view of it». The background of the Colosseum seemed really to add a special solemnity to the «gorgeous and picturesque» ceremony.
The solemn and majestic procession seemed to project the bystanders in another epoch: «the mixture of ecclesiastical, civil and military costumes in the various groups composing the procession imparted to it an air of olden times. The long cavalcade of Chamberlains, Prelates, Auditors of the Rota in flowing vestments of scarlet and purple, the Chaplains with hoods, with their scarlet robes, the Prelacy, vast broad brimmed, ecclesiastical hat with tassels; the rainbow liveried pontifical troop; the Bodyguard in their rich uniforms, the Chamberlains of honour looking like Spanish Hidalgos of the 16th century, in black velvet (...), with wide silver-gilt collars hanging low on the breast, all these elements gave (...) a certain Mediaeval character (...)».
A figure stood out in the procession, that of Martin Pfyffer von Altishofen from Lucerne, head of the Swiss Guard and heir of an ancient dynasty of warriors who from the seventeenth century commanded the Swiss troops at the service of the Pope: Scandrett Harford noted that «Captain Pfyffer in a superb suit of armour and surrounded by many of his troop on foot was a striking figure».
The Pope's carriage was obviously the fulcrum of the sumptuous and solemn procession: «the Pope State Carriage drawn by six black horses, (...) was gorgeous in the extreme. It is much in the style of that of Queen Victoria».
Once arrived to the cathedral of Rome «in a rich pavilion at the entrance of St. John Lateran His Holiness received the homage of the Prince-Senator of Rome and other functionaries, after which he entered the Basilica in procession». The religious procession inside the Lateran was even richer in symbols and solemnity: «the kissing of the crucifix at the threshold, the presentation of the keys and a Latin oration by the Cardinal Archpriest followed. The Pontiff being borne aloft in a splendid Chair, the Triple Crown on his head, (...). The Cardinals in white vestments, stiff with gold lace; many of them were bending with age, the various scarlet and purpled robed Prelates, Chaplains and Chamberlains passed one after the other in a splendid succession».
John Scandrett Harford had also the chance to approach the Pope and therefore could get a precise idea of his personality and characteristics: «I was almost close to the chair of the Pope for several minutes. His bearing was noble and amiable. The benediction followed from the upper Portico of the Church. The assembly below was vast. His voice in prayer and benediction was loud and clear and his acting fine».
The ceremony ended in a spectacular and sensational way: «the military band stretched up and the trumpets, the drums and the roar of cannon mingled with the shouts of the people producing a grand effect».
During the next days he could dedicate himself, moreover, to the ascent to St. Peter's cupola, to a visit to the catacombs of Saint Agnes («we descended a long flight of steep stairs by the light of wax-tapers which were put into the hands of a one to another of our party») and to Castel Sant'Angelo («where we enjoyed a splendid view of Rome and St. Petrus»), together with the other classical destinations of the cultured tourism of that time.
A closer and more personal encounter with Pius IX took place soon after, when John Scandrett Harford led a committee of English people present in Rome, constituted for the purpose of collecting funds for the terrible famine in Ireland. The Pope intended to make a donation too, and on that occasion the committee was received in hearing: «the Pope, after I had kissed his hand, in a most gracious manner signified his assent». Then Scandrett Harford spoke, and said in a perfect and fluent Italian: «Abbiamo l'onore di presentarci alla Santità vostra come una Commissione di sudditi Britannici costituitasi in Roma per raccogliere delle soscrizioni in soccorso di quella si gran parte di nostri compattrioti (sic) Irlandesi che soffrono in questo momento la calamità dolorosissima della carestia, onde esprimere a vostra Santità la viva nostra riconoscenza per la maniera tanto benevola e tanto spontanea con la quale ha ella voluto farci cognosere per mezzo del Dr. Cullan la sua caritatevole e generosa intenzione di contribuire scudi mille a tale oggetto. Noi preghiamo ancora la Santità vostra di permetterci di esprimere la nostra convinzione che il sentimento che anima in questo momento i nostri cuori sarà vivamente sentito non solo dagli Inglesi che ora sono in Roma ma in ogni parte del Impero Britannico».
Far from the solemnity of the official ceremony of coronation, the Pope seemed to everyone as being characterized by modesty and pleasantness. Indeed, he «had a benignant smile» and reaffirmed with simplicity his sorrow for Ireland suffering conditions. At the end «the Pope then inclined his head with a most amiable look, and retired leaving us all very pleased and

impressed by the benignity of his manners and the utter absence of any parade in his mode of addressing us. His countenance is fine. His figure good and his voice very pleasing».
Despite the cordiality and the human congeniality, The English people could not avoid to look at the theocratic reign of the Pope in a critical way. In this sense, the encounter with the English consul in Rome, Freeborn, was significant. John Scandrett Harford noted on his travel journal the concise judgement he gave to the Pontifical State: «I have lived here in Rome for 33 years. I have been consul for 23», the consul said, therefore he had the opportunity to know deeply «the nature and conduct of the Roman Government and I am convicted that a more atrocious one does not exist». The consul would have played an important role in 1849 when, once the Roman republic had fallen, he would have granted a great quantity of English passports to guarantee the escape to those who were compromised and had fought for the republic, despite the protests from France.
Also the return to Naples, where he had been in 1816-17, was like a homecoming. The city in which «we entered in a beautiful morning» seemed to him immediately «so familiar under the magic influence of a cloudy sky and the radiance of a light sunset». Moreover, he visited the excavation of the ancient Pompei where, although «it is clear that the most important part had already been excavated, such as the Forum and its temples, the streets of the Tombs» he was struck even by the Villa of Diomedes, the temple of Mercury and that of Isis. The archaeological tour ended with a visit to the archaeological museum of Naples. Returning from an excursion of some days in Sicily, with a tour for the Amalfitan coast, John Scandrett Harford was welcomed by the sight of the Vesuvius' eruption, which he could admire from the roof of the hotel Crocelli: «After my return from Sicily, Vesuvius was often brilliant (...). There was a night in particular when G. Bunsen and I were together on the roof of the Crocelli at Naples», from where «distinct streams of lava were visible on its sides, and some brilliant girandoles of flame that ashes flew up from the Crater so as to shed a high light on that part of the Bay of Naples». The event was a real spectacle of nature which impressed upon his memory: «we were charmed with a good fortune. I never saw the mountain so active before or after».
The stay in Naples, before the return to Rome, ended with a more mundane purchase of the famous and precious Ridolfo's soap: Bought some Naples soap of Ridolfo behind the Chiaja, 20 libre “de Saponello fine senza odore, a grana 30”».

2. Francis Greville Prideaux

Following the return travel from Malta of Francis Greville Prideaux (1818-1903), through the letters written to his father to Bristol, it is possible to reconstruct the entire fascinating route followed, from the heart of the Mediterranean to the Alps, in the opposite sense if compared with the one usually covered. Also these letters refer to a travel which took place in 1846, between March and April [4].
Once left from Malta at nine in the evening on the boat "Ercolano", the wind was immediately favourable: «the wind had been so high for several days that we found a good deal of sea as soon as we left the harbour». The deck appeared to be desert already before ten, so «I believe all had tipped on » while everything was «so quiet that I had no idea of who or how many fellow passengers I had».
But the next morning everything changed, and the group of travellers gelled immediately after the arrival to Syracuse at sunrise, at the moment of coming down for breakfast. All the passengers, in fact, with the exception of a single gentleman, met together again: «we breackfasted at the same Inn, at the same time and at the same table and you may suppose we became acquainted soon».
Together they also decided to visit the ancient city, after having recruited a guide. But the visit revealed itself quite disappointing for the young man, who confessed to his father that «I never could love (...) any thing simply because it happened to be old» and moreover «my classic remembrances are very slender too».
Once resumed the travel, before the sunrise they were catching sight of Messina, where the view of the Strait in the light of the dawn was particularly suggestive, even thanks to «the snow-capped mountains of Calabria». The unfavourable weather forced our travellers to stop in Messina for the entire day, where they took advantage for enjoying the city and especially the cathedral dome and the church and convent of St. Gregory. Once left again in the evening of the next day, breakfast and lunch were served on board but, because of the excessive number of persons embarked from Messina, the crossing became uncomfortable and difficult, because the ship: «early in the day it had become very dirty and the smell very heavy», so that Francis Greville Prideaux had to remain closed in the cabin until the disembarkation to Pizzo. In exchange, the landscape was very suggestive: «the coast here is very bold and the town or village of Pizzo very pretty situated on the ascent».

They finally reached Naples bay, where they were welcomed by the eruption of Vesuvius: «Vesuvius was in a state of eruption, we saw it to great advantage (...) the lava was going out quietly in considerable quantity at the base of the crater». In Naples, where he encountered the Carnival celebrations, after having visited various churches he went up along the Mount Vomero up to Camaldoli, from where he could enjoy «the most magnificent view» of the city and the bay. Once reached Rome, which interested him very pleasantly («I have been much delighted with what I have seen in Rome»), he wanted to attend the Mass celebrated by the Pope in the Sistine Chapel, the day after his arrival and before leaving again. Unfortunately, in the hurry he didn't have enough time to collect the exact information «about the matter», and at his arrival he found out with surprise and disappointment that it wouldn't have been possible for him to enter the chapel: «I found I could not be admitted as I had not a dress coat (...)» and so «I was therefore unable to see His Holiness, which I certainly regret». However, after all, he didn't really want to see Pius IX: «I have no passion for looking at men whose greatness is dependent on position alone» [5].
The travel continued to Florence and then to Genoa, through Pisa and Carrara [6].
«A decisively handsome tour» of Milan struck him favourably («I was very much pleased with Milan»), even if it wasn't comparable to what he had seen in Rome, Florence and Genoa, in Milan «the principal streets are wide, very long, straight, well paved and clean» [7].
After a moment of uncertainty about which road to take for the traverse of the Alps («the information which was given to me by different persons» about the passes of St. Gotthard and Splügen «was so excessively contradictory that I was for some time undecided with what to choose»), he chose the Splügen. However, he had to postpone the departure until the next day, and stay in Milan a day more than expected, to find a front seat on the couch, in order to admire the landscape. That was, in fact, «the only place to see the scenery».
The coach left Milan at three in the afternoon on April 6th, and «after about 12 miles of straight uninteresting road», once arrived to Lecco the landscape changed completely: «we got into some nice country and (...) reached the small town of Lecco, situated upon the lake of the same name which is a branch of the Lake of Como». At that point, they found themselves «among the hills with snow-capped Alps».
After dinner, they left again under «a most lovely moonlight and continued on the very margin of Lecco and Como lakes», and arriving to Colico at two in the morning, after an entire night of travel through a spectacular nocturnal landscape, with the help of the moon: «the most delightful night's drive you can imagine, the effect of the moonlight on the lake's water and on the snowy Alps being very beautiful». Once left the lake, the view lost charm, and our tourist could sleep at least from three to five, when they arrived to Chiavenna.
Once the coach changed, they left again at six, and the ascent began immediately, while «the weather was fine (...) the scenery very wild and the sides of the mountain for a considerable distance planted with chestnut trees». At about ten in the morning, it started raining intensely and the rain became immediately snow, snow that «continued to fall rather heavily with a slight wind in our faces until we reached the Suisse Carrier a little after 12». However at the sunrise it was «very difficult to keep our eyes open sufficiently to see the top of the pass» and even the sun «burned my face perfectly red in a manner I never remember I have had it before ».
Finally they arrived at the top of the pass, where sky and earth almost seemed to blend: «we reached the highest point of our route where the only prospect was sky and snow on all sides».
The descent, however, was even more exciting than the ascent to the pass, because a horse started having difficulties due to the snow height and «my companion, a German woman of about 30 years who had lived in Milan many years, and who, turning away her head, kept up a continued exclamation of "Oh Signor!"».

3. Florence Upton Cottrell Dormer

The diary of Florence Anne Upton (1837-1907) [8] and her mother, Mrs Eliza Upton, refers to a travel in Italy and Switzerland occurred exactly ten years later than those of Francis Greville Prideaux and John Scandrett Harford, therefore in 1856. Many things have changed, the year 1848 with its upheavals is passed, but Pius IX is still reigning in Rome, with the military support of the troops of Napoleon III.
Narrated in first person by Florence, the tour that would have brought mother and daughter to Rome is seen with the carefree and irreverent look of the not yet twenty-year-old girl. With characters that are very different from the classical ones, the tour of mother and daughter is seen particularly in an essentially female and juvenile viewpoint, and is made especially of romantic landscapes, gardens and flowers, beautiful views but also clothes and shopping.
The travel started on St. Valentine's day, on February 14th, in 1856. Embarked from Folkstone at two in the afternoon, they arrived after «a very rough passage» in which they «were both very

ill» and reached Boulogne, in France, with relief, at about nine. Immediately «the novelty of scene and dresses took away all the illness at once».
Arrived in Paris by train in the evening on February 15th, they stayed in a hotel at the Champs-Élysées «where we found a comfortable but very noisy room». The following Saturday and Sunday passed between «great deal of shopping» and the Tuileries gardens «amongst innumerable nurses and children».
After almost twelve hours of train, they reached Lyons where, despite the difficulties, they got a guide «a man of heavy and corpulent appearance» to visit the famous silk factories. «He walked first and we followed and he took us straight before the windows of M. Marise-Freres, which contained the most lovely and impossible silk dresses; of course we entered this delightful shop and stayed there about two hours, and chose some pretty dresses», without thinking about the problems they would have encountered because of them at every customs. They finally arrived to the factories «which are hot, close and interesting».
During the journey to Marseille, our traveller «commenced a conversation with Miss Mills, she is travelling with her father and mother and aunt», and were members of the group that had started the travel from Folkestone at the same time. In fact, the two women were not travelling alone, but as part of a greater group whose members travelled independently, but that reunited at every stop-over; furthermore they were accompanied by a trustworthy man who arranged for organizing their transfers and finding the accommodations on their behalf.
Approaching the city «the woods of olives and almonds in full blossom looked lovely». They found the hotel to be guarded by soldiers inside and outside, because of the presence of the Pasha leaving for the Peace Conference in Paris, which would have ended the Crimean war. «He was going in a hour and we should have his rooms, an unenviable perspective seeing how filled they were with tobacco smoke, so we declined them». In Marseille, the two women could enjoy the romantic landscape: «we went on a hill, from which there was a most lovely view of Marseille and the blue Mediterranean with its rocky islands, amongst them, the dear old Chateau d'If from which the Count of Monte Cristo would have thrown himself». After a night spent in the coach they arrived to Nice, going through a «horrid douane» to enter the Kingdom of Sardinia. Then they arrived to a hill where «aloes of immense size coming into blossom an prickly pears all over the rocks. From this hill there is a splendid view of Nice and Villefranche».
They continued the journey along «a very giddy road» between a «frightful precipice down to the sea on one side, and high rocks on the another. Mama holding me by both hands».
In Genoa «we went through the curious high and narrow streets» and encountered Maria Amalia, former Queen of France and widow of Louis Philippe d'Orléans.
After having visited La Spezia, Florence, Siena, they entered the Pope's dominions on March 13th, after a month of travelling, but the first approach wasn't good «wished the Pope would mend his ways, which are shocking».
Then finally the arrival to Rome, after the rural landscape of the Lake Bolsena: «Passed such a lovely deep blue, peaceful lake. Walked a little way, and picked the butcher's broom with the red berries (...) Got our first glimpse of Rome, passed Nero's sepulchre, and over the Tiber, through Porta del Popolo, and arrived in the Eternal City». After a long wait, being the hotels full, they stayed at the Hotel des Iles Britagnes, which was near the Pincio and fronted onto Piazza del Popolo.
The morning after Florence had been woken up by the manoeuvre of the French regiment under her windows, since «6,000 French troops are now in Rome to keep poor old Pius on the throne». Only after a series of vicissitudes the two women managed to get the tickets for the celebration of the next day, Palm Sunday. But sometimes the excitement plays tricks: «So exciting is Roman air that I did not get to sleep till four in the morning and had to get up at six». Once woken up, Florence started the preparation: «draped in black with veils on our heads of the same sombre hue». When they arrived to St. Peter's at eight in the morning «found two tribunes with raised seats on each side, and managed to get seats in the right hand. Two men were in each. Two men to place more than 300 ladies. One man in purple garments that we pitied deeply, a nice bright little man pulled in all directions by excited females asking him questions, he seemed rather to enjoy being made so much of them», while the other man «our other protector was dressed in dress of the olden time, a doublet of dark cloth with the nearest and whitest of ruffs round his neck, gold chains and a ruby and diamond cross on his breast». The narration becomes more and more ironic and desecrating with the appearance of Pius IX, "the poor old gentleman":«at 9.30 the Pope was carried seated on a chair, preceded by the Cardinals in violet. I thought the poor old gentleman should be quite giddy, with such a sea of heads under him». Two women exactly in front of Florence and her mother stood up, impeding them to view. They complained about it with «our faithful little man in purple and he only laughed and said "Montez donc", so many of us also stood on the benches and were probably in our turn wished at Jericho by others too stiff or too lazy to get up too».

At the end of the procession «Pius then dismounted from his chair and walking up the steps sat down on his own cosy throne, and all the cardinals came and bowed to him and kissed his hand, which took a long time. Then hundreds of palms were brought and Pius must have been tired of taking them, blessing them and passing them on. Then mounting his chair, he was carried off again and I was by that time quite a "gone coon"».

Conclusions

In order to classify travel diaries and stories here examined according to a specific "service code" [9], it is necessary to affirm that they are not intimate diaries, but they don't even give a fictionalized version of the travels. If especially in the case of John Scandrett Harford the love for knowledge and art prevails definitely, in the other two cases it seems to dominate an intellectual curiosity and the desire to learn, and especially to live new and stimulating experiences. After all, the deep motivations for the travels of each of them can be found exactly in the prevailing of the attitudes and inclinations of each of the three figures.

For all of the three travellers mentioned above, the travel is felt as an adventure that is as intellectual as material, because both realities stimulate senses and mind, and are a source of always new emotions and personal enrichment. In this sense, it is possible to understand how the travel journal and reports are the intellectual and sentimental reconstruction of the external reality [10].

From this short cross-section it is also very interesting to note the so called "multiplicity of the lived experience", that is, noticing how the same places are reached, the same roads and taken and the same characters are encountered by the travellers, but in everyone's lived experience, impressions and knowledge everything becomes unique and always different. It is really as it's been written, «travelling is moving in the territories of the resonance that places have in the traveller's soul» [11].

Also for this reason, the time of travel doesn't conjugate in the past but in the present, because it includes the «time of humanity» [12]. Differently from what it may seem at first, then, the travel diary has the ability to transform words in images that talk about our present, frames of life, people and landscapes that capture history, Europe history, our history.

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Intervention on the building of Red Cross Society of B&H in Sarajevo, as the beginning of critical restoration approach in Bosnia and Herzegovina

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The building of the Red Cross is a unique accomplishment of the modern architecture dating back to 1929. Its uniqueness reflects in complexity of its functions – healthcare and educational-cultural purpose, with a cinema hall intended for lecturing. At the beginning of the siege of Sarajevo, the building was set on fire.
B&H's cultural heritage underwent systematic destruction in the period 1992-1995. Under those circumstances, the heritage protection strategy was based on principles of reconstruction following the model of Warsaw after World War II.
Primary structural repairs carried out in order to prevent a structural collapse of the building were given another meaning - it was the beginning of critical thinking about the protection of architectural heritage, where materials and structural systems different than original were applied.
An example of restauration of the building of the Red Cross is an ongoing process and it reveals the latest trends in development of architectural restauration in the country which, at the end of the twentieth century, experienced unprecedented devastation. The living example, with the ongoing Phase II of development and noticeable signs of return of the old reconstruction concept "Come era, dove era" ["As it was, where it was"], opens possible avenues of development of restoration thoughts in general, particularly in the example of modern architecture with complex history.

Keywords: Red Cross, Sarajevo, Restauration, Aproachs

1. Historical context and significance

The building of the Red Cross Society of Bosnia and Herzegovina in Sarajevo represents the unique accomplishment of one of the pioneers of the modern movement [1] in this part of the world- an architect called Helen Baltasar[2], from 1929.[3] **(fig 1)** Its uniqueness is reflected in the fact that in that

[1] Milošević, P. *Architecture in the Kingdom of Yugoslavia (Sarajevo 1918-1941).* Foča: Prosvjeta, 1997, pg. 170

[2] In the entire field of works of art designed and created by this architect, there are three prevailing phases: In the first phase it is possible to recognize remnant Czech influences before the modern architecture appeared, where high roofs appear (The Institute for the Children without Parental Care "Ljubica Ivezić"). In the second phase, the architect designs in a pure spirit of the Czech Modernism, actually of Cubism (the Rašidagić's house and the building of the Red Cross in Sarajevo). During the third phase, when the architect moves from Sarajevo to Split, the influence of Bauhaus is noticeable. - Milošević, P. Ibidem , Foča, 1997, pg. 284

period in B&H not a single object, which had the healthcare and at the same time the educational and cultural[4] purpose and function, was built. In the very object, there was a cinema hall designed and intended for lecturing aimed at promotion of the medical and health-care culture, and after the World War II , the object was turned into a cult-like famous cinema in the very city's centre. The object was also unique in the terms of the building's quality, as well as in the terms of the manner and style when fitting and adjusting of the modern architecture within the historic urban core form is in question, especially keeping in mind the fact that the object complexes built during the Ottoman and Austro-Hungarian period existed there.

In the architecture of the medical and healthcare institutions, the principles of Modernism were thoroughly applied:They directly offered the answers and solutions to the current social, human, economic and functional social[5] issues. The medical and healthcare institutions from that period are the reflection of the modern aspirations to create more human and socially more righteous architecture[6] based on the principles of respect of the function and construction. In the building of the Red Cross in Sarajevo, beside the existing offices for administrative needs, there were also the public bath facility and the cinema hall.[7] During the World War II period in the very object there was the active first-aid and emergency medical assistance department.[8] In 1960s, the commercial cinema "Sutjeska"[9] started working. Within a few hundred metres of distance, the cinema "Radnik" (*The Worker*) and "1. maj" (*The 1st, May*) were opened as well as the famous "Kinoteka" (*Film Archives*), which was opened in the building of the former beer production plant from the Austro-Hugarian period.[10] This zone becomes the meeting place where the famous film makers and workers, members of the cult-like famous movement named "New Primitives"[11] and young people met and hung out.

2. Degradation and designation of the object as the National Monument

The building of the Red Cross was hit by an inflammable high-explosive shell on the 12th May,1992, in the week when the International Red Cross week is celebrated and denoted. The building was severely damaged and only its construction was preserved. In the period from 1997 until 2008, two idea-like solutions aimed at the renovation of the object of the Red Cross[12] were created. The intention

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[3] Tomić S. *Memorial 1876-1936*, the Red Cross Society of Kingdom of Yugoslavia, Belgrade 1936 - The decision of the Commission to Preserve National Monuments upon designation of the Red Cross Society's building in Sarajevo as the National Monument adopted at the session held from the 10th to the 16th March, 2009 in Sarajevo.

[4] Previously, H. Baltasar in 1926, during its first creative phase, in the terms of being a co-author, he created his first architectural piece of work in Sarajevo in Bosnia and Herzegovina with the elements of Modernism. - Milošević, P., Quoted piece of work, Foča, 1997, pg. 136 - The decision of the Commission to Preserve National Monuments upon designation of the Damić's house at Radićeva street no.10 in Sarajevo as the National Monument adopted at the session held during March 2009 in Sarajevo.

[5] Milošević, P. Quoted piece of work, Foča, 1997, pg. 170.

[6] Milošević, P. Quoted piece of work, Foča, 1997, pg.169 and 170

[7] Tomić, S. Quoted piece of work, Beograd, 1936., pg. 258, 259

[8] The official letter issued and delivered by the *District Board of the Croatian Red Cross in Sarajevo, to the Central Board of the Croatian Red Cross in Zagreb,* Sarajevo, the 10th January, 1944

[9]The decision of the Commission to Preserve National Monuments upon designation of the Red Cross Society's building in Sarajevo as the National Monument adopted at the session held from the 10th to the 16th March, 2009 in Sarajevo.

[10] The decision of the Commission to Preserve National Monuments upon designation of the building of Radnički dom / The Workers' House (*Kinoteka / The Film Archives*) at Alipašina street no. 19 in Sarajevo as the National Monument adopted at the session held from the 25th to the 26th April, 2013 in Sarajevo.

[11] The official statement given by Zenit Đozić,one of the founders of the artistic movement named as "New Primitives", Sarajevo, January 2016. (In 1980s and 1990s, "New Primitives" presented the leading sub-cultural movement in the region of former Yugoslavia gathered around the rock bands "Zabranjeno pušenje"(*Smoking Forbidden*) and "Elvis J. Kurtović". Even nowadays, Zenit Đozić, Branko Đurić, Nenad Janković, Davor Sučić, Boris Šiber and others present charismatic individuals who are nowadays active on the artistic and cultural regional stage, while the spirit of the artistic movement is still alive and active. The controversial film director - Emir Kusturica was also the member of the movement).

[12] The first project was done in 1997 by the company called "Arhitekt"/"Architect", while the second one was done by the company called "New way" from Sarajevo in 2004- The decision of the Commission to Preserve National Monuments upon designation of the Red Cross Society's 'building in

of the Society's people in charge was to prevent the rapid decay and ruining process of the object by means of the relization and carrying out of one of these two projects. Neither of these two projects was based on the specific theoretical base, nor it offered the vitally important and key answers to the necessity of the valuable historic object's complex restoration process. Besides the building of the former Termoelektrana (*Thermal power plant*)[13], until 2014 it presented the only object in the very city centre which was not repaired almost for 20 years since the war finished. On the basis of the research feasibility study, the Commission to Preserve National Monuments designated the object as the National Monument in 2009 and then the following protection measures were stipulated:

- All works are prohibited other than research and conservation and restoration works, repair works, and works designed to display the monument, with the approval of the Federal Ministry responsible for regional planning (hereinafter: the relevant ministry) and under the expert supervision of the heritage protection authority of the Federation of Bosnia and Herzegovina (hereinafter: the heritage protection authority);
- During restoration works on the property, its original appearance shall be retained;
- Missing parts shall be reconstructed in their original form, of the same size, using the same or the same type of material and the same building techniques wherever possible, based on documentation on their original form; ...the structural consolidation of the building and the repair of structural elements using the same materials and building techniques wherever possible;

3. New social circumstances and the Project of protection

After the object had been recognized as the object of the national interest, for the period of entire four years, neither the works on the object were done, nor the working out process of the restoration projects was planned. Finally, in 2012, expert collaborators of the Commission to Preserve National Monuments in B&H, in cooperation with the Red Cross Society of B&H, designed the Project of the primary construction's rehabilitation. That Project was presented to the American Embassy in B&H in 2013, and the American Embassy made the decision to financially support it with 67.700,00 USD.[14] Before the construction's rehabilitation works began, it turned out that the urban circumstances had been radically changed. The part of the city, where the objects with the cultural assignation had been and existed, were transformed into the trade-banking zone. The nearby cinemas stopped working while some of them were turned into the beauty shops. The records and documentation about the original condition of the severely damaged object, which in the meanwhile became home for homeless people and shelter for some petty criminals, were rather poor. In the suchlike existing circumstances, the pondering on the possible ways of restoration started,the restoration which practically presented the outset for the whole district revitalization.

In this connection, we should keep in mind the fact that the architectural and cultural heritage of Bosnia and Herzegovina endured and undewent the systematic devastation and destruction during the last war (in the period from 1992 to 1995). The Strategy of the heritage protection has been for 20 years based on the reconstruction following the pattern "*come era, dove era*" (as it was, where it was). The reconstructions were done following the model of Warsaw and severely damaged Italian cities after the World War II: The protection measures, applied in practice, implied the possibility of the" thorough and consistent" reconstruction. The similar thing is with the measures of the urgent construction's rehabilitation in the case of the Red Crosss' building where the following notion is implied: "*Statical consolidation of the object and the rehabilitation of the construction parts using the same materials and technological procedures as much as it is possible* ".This project was designed and created by the company called "Ecoplan" from Mostar at the beginning of 2014. The Project comprised "The Feasibility Study upon the cleaning process" and "the Project of the primary construction's rehabilitation ", which also included the Project of the south facade's stabilization and the Project of the cinema hall rehabilitation on the north side.

The cleaning of the object, in order to remove and get rid of the construction waste, medical and other waste which was disposed and piled over the period of 20 years, done by the company called "Neimari"/"Builders" from Sarajevo, presented a little bit more than improvement of the hygienic conditions. **In a suchlike way, the reintegration of the part of the historical urban area in the very city centre was done**. It was the part past which thousands of citizens passed by every day and which did not belong to them anymore. That area bacame the centre of the micro-criminal world, and

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Sarajevo as the National Monument adopted at the session held from the 10th to the 16th March, 2009 in Sarajevo.

[13] The decision of the Commission to Preserve National Monuments upon designation of the Architectural Ensemble– Power plant at Hiseti (Marijin Dvor/Maria's Court) in Sarajevo as the National Monument adopted at the session held from the 3rd to the 5th, 2015 in Sarajevo.

[14] The project was financed by the Society of Red Cross of B&H –the financial support of the total sum of 16.400,98 KM-, which was carried out and done by the Commission to Preserve National Monuments.

the proofs for that are the found identity cards which were discarded from the purses and bags of the mugged and robbed citizens over the period of the last 20 years, as well as the huge quantities of the medical waste- syringes. The cleaning process was done from the preserved ceiling surface above the cinema hall towards down, manually, by means of the tools, while for the purpose of the cinema hall at the ground floor and the basement's cleaning, machinery equipment was used –dredgers and lorries. During the cleaning process, the selection of the undamaged brick was done and the bricks of that kind were stored in the cinema hall area, in order to be used later in the limited process of reconstruction of the south part object walls. During the cleaning process, the damaged stone slab was found and it represents the proof that the object was built on behalf of the king Aleksandar I **(fig 2)**. Furthermore, the undamaged original ceramics at the entrance part of the object in the south, was also found. In this way, the **cleaning of the object** spontaneously developed into **the continuation of the research process**, and it presented the compensation for the poor records and documentation. Thanks to the object's cleaning process, the assumptions for the undisturbed shooting and survey processes of the entire object were obtained. **(fig 3)**

The construction's rehabilitation, done by the company called "Gradnja"/"Building" from Mostar, aimed at the prevention of the construction's collapse, got a completely different meaning: **the previously mentioned rehabilitation can be considered as the beginning of the critic-like reflection upon the protection of the architectural heritage,** which differs from the former principle of the practice of the thorough and consistent reconstruction.[15] Suchlike case appears 19 years after the war in B&H finished. Exactly, the same period of 19 years passed from the end of the World War II until the Venetian charter appeared, in the period when, especially in Italy, the ideas close to the "critic-like restoration".

The Project's aim was putting the safety and protection at the higher level as well as the construction's stabilization: The construction object's collapse was prevented and the protection of passers-by from the collapse of the street south facade's parts was introduced. The partial covering of the object was envisaged on the north part- the cinema hall, the object's south part construction stabilization as well as the protection of the street facade by means of the galvanized sheet. **The Project proved to be the innovative one in the terms of the theoretical-conceptual meaning** and different from the most part of the previous interventions: The Project envisaged that the burnt ceiling beams in the south **(fig 4)**,should be altered, in consistence with the critic-like thinking law, with the steel "I" sections **(fig 4bis).** Actually, it also had a practical role, taking into consideration the fact that at the beginning neither funds nor financial support could be found for the south part object's roof rehabilitation, and that the introduction and installment of the of wooden beams, obeying the principle "come era, dove era" would lead to the crumbling and ruining during the winter period. While choosing the type of the primary construction's rehabilitation in Phase I, the decision was reached and adopted anticipating the future total construction's rehabilitation : The basic bearing and supporting built structure of the existing object, which by means of the brick walls defies the horizontal impacts without any vertical bearing and supporting elements, was completely preserved, and it turned that it can bear new burdening and freighting which will rise from the new functions and purposes of the renovated object. Consequently, in this case, it was possible to do the restoration act of the bearing and supporting building's framework using new-old materials (wood,concrete,steel), recognized in the remnants of the damaged building. In that context, "Ecoplan's", designers applying the critic-like estimation, reached the conclusion that the steel "I" sections would suit the functional and statical needs best, because the same materials in the original construction were used as the bearing and supporting elements beneath the partition walls and concretre staircases **(fig 5).** Before that, the walls' stiffening process was carried out and done by means of the installment of the horizontal reinforcement at the level where the loft was, as well as the limited reconstruction of the transversal bearing and supporting walls built of the original bricks previously stored in the cinema hall.[16] Besides

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[15] Giovanni Carbonara, considers that the construction's rehabilitation is the integral part of the restoration and he quotes the different authors' theories which confirm this: Roberto Di Stefano – „*Consolidation is one of the vitally important and key operations among numerous operations which make the restoration of the cultural properties!* In the spirit of critic-like restoration, at the Symposium from the 1980s (Lucca 1981) Renato Bonelli quotes: ***All technical-technological operations have to be historicized.*** *Separation of consolidation from restoration presents the conceptual mistake which rises from the wrong defining of the historic monument (property).* Carbonara also states and quotes that restoration implies **historic-critic-like estimation but the scientific-technical knowledge as well**! That is the point where human-historic and technical-operative components become compressed- Carbonara G. *The Approach to Restoration* (*Avvicinamento al restauro*). Chapter: Critical consolidation and restoration. Rome: Liguori editore, 1997, pg. 454 and 455.

[16] Reconstruction of the transversal bearing and supporting walls on the south part was envisaged with the aim of the statical stabilizationof the street facade. After carrying out the survey of the construction's condition, it was stipulated and concluded that the facade wall is in a much better

that, it was estimated that in the conceptual context it is the most appropriate system for the restoration of one of the first objects which were built in the spirit of the modern architecture in Bosnia and Herzegovina.[17]

The primary facade construction's rehabilitation, at first envisaged in the terms of the function of protection and safety of the passers-by in the city centre, also started gaining critic-like connotations. The introduction and installment of the galvanized, slightly profile-formed, sheet on the steel subconstruction presents the flexible intervention by means of which temporarily the original facade and passers-by were protected.[18] **(fig 6)** Actually, here is the first flexible intervention in question, the intervention which was carried out and applied on a certain historical building in B&H, after the end of the war in 1995.[19] The galvanized sheet is the same sheet which will be used while carrying out the action of the entire roof's cladding and covering process, and it will be possible to use it in the next (second) phase, keeping in mind the fact that at that moment it will have to be considered and pondered on the idea of the final facade's restoration under the conditions of the original documentation and records' lack. The concept is considerably different from the earlier work and practice of the thorough and consistent reconstruction and it was envisaged that the object goes under the shape's transformation during the process of restoration which is divided into a few phases.

In the background, in the north, the concrete ceiling surface above the cinema hall remained almost untouched (apart from two oculi in the central part through which the water leaked inside). For the purpose of the primary rehabilitation, oculi were closed. Above the stage, the part of the roof was reconstructed, by means of which the cinema hall became protected. Inside, where still nowadays the traces of the fire can be seen, the temporary stage[20] was built and the electricity supply attachment

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condition than it could have been supposed. However, the reconstruction process was carried out and done, taking into consideration the fact that there were clear indicators of the *in situ* existence, and according to the critic-like thinking that the limited „thorough and consistent" reconstructions are acceptable in order to conserve the object.

[17] In the certain sense, it is possible to compare this case with the restoration of the Royal picture gallery in Rivoli, designed and created by A. Bruno, wo also had a dilemma which material should be chosen for the orginal construction's rehabilitation:After the removal of the degraded wooden trusses, instead of the „thorough and consistent" reconstruction, he ponders on the installment and introduction of the undressed wooden beams, the beams which used to be suchlike before the damaged roof construction's removal, but he was also thinking about using ad applying the modern materials: Reinforced concrete or laminated wood: *I opted for the laminated wood since it* was *the most harmonious and in the terms of the setting, the most suitable solution when we have in mind the fact that the form of the irregular walls exist .....To act and intervene in accordance with the object's existing material is the choice that the architect has to make and opt for depending from case to case and there is no a precise rule which could be applied..* - Bruno A. u Bosco N. *Andrea Bruno, Tecniche esecutive e dettagli progettuali*, The interview with Andre Bruno. Milano: Libreria CLUP, Milano, 2000. pg. 137.

[18] Here, the flexible, intervention *in the space*, is in question, which in the theoretical terms is different from the reversible intervention. The reversible intervention, although designed and created as „time limited" intervention, is carried out and done with the long-lasting materials. Contrary to it, that intervention on the building of the Red Cross was envisaged as the temporary one– until the entire roof's cladding and covering process has been finished and done. Here, the flexible (space), intervention is in question, but the one which is time-limited.

Dealing this issue, A. Bruno theorizes that *reversibility does not imply the temporariness but permanence and it is something which has been projected for the etemity, of course under quotation marks, but which appears and locates in our times, next to or above or leant against something which already exists, and which is already clear and visible.* – A quotation by Andre Bruno from Bosco N. Quoted work, Milano, 2000, pg. 15

[19] Although flexible and temporary, the intervention on the facade of the Red Cross Society's building of B&H in Sarajevo will probably be deeply remembered in the collective memory of the city, confirming the compatibility of the material and the righteness of the concept: A great number of Sarajevo citizens during 2015, until the process of the removal and transfer onto the roof was done, asked the question whether the final project solution to the facade had been in question.-the quotation of the Main Secretary of the Red Cross Society, Branko Leko,Sarajevo, the end of 2015.

[20] The Project envisaged building of the temporary staircases by means of which the cinema hall would be connected to the gallery which is positioned and located above, but that would mean cutting the part of the authentic concrete gallery's balustrade. While carrying out the works, the decision was reached to give up and discard suchlike idea, and the money, set apart for these works' needs, was used for building the wooden stage on the opposite side.

was renovated and introduced again, allowing the rise of the necessary conditions for showing the first film in a former cinema called "Sutjeska", after 23 years.[21]

The Project of the second phase implies doing and carrying out of the rest of the roof's trusses and the roof's cladding process on the south side, but also above the even surface above the cinema hall.[22] For the reconstruction purposes, the only historic photograph was used, and it was necessary to follow the traces of the roof's trusses on the neighbouring buildings' gabled walls, as well as the traces of the roof's leaning against the reinforced concrete slab above the cinema hall. This time, it was necessary to respect and stick to the sipposed protection measures: The missing parts *"should be reconstructed in the original shape, of the same size, of the same or of the same kind-like material, applying the same technological approaches and techniques as much as it is possible"*.

In the photograph, only some signs of the roof's covering on the south side were visible, and on the basis of the comparison to the preserved plan scheme and the analysis of the roof's traces on the gabled walls, thanks to the consultations and advice given by a professor of free drawing and the expert in the field of perspective, Mr Svetozar Bojanić, the team of designers and architects found the solution which at the great level of possibility suits and corresponds to the original state of the roof's construction.

However, the **conceptual inconsistency** is noticeable when compared to the Project phase I : It is completely understandable in a country the entire cultural heritage of which was under threat of disappearance, and where the reconstructions in the "*come era, dove era*" manner represented the higher goal stipulated by the complex social relations. During the primary construction's rehabilitation process the first indicators of the critic-like attitude towards the heritage were present, while the conceptual platform of the second phase was closer to the tendency *come era, dove era*.[23]

Beside the theoretical aspects, it is obvious that the conception has got a drawback, which in the light of the works' urgency and the lack of the financial means proceeds following the principle of the independent design and project process of the certain phases. After the representatives of the Commission to Preserve National Monuments, the representatives of the Red Cross Society of B&H and the representatives of the Federal Institute for Monuments' Protection had noticed that huge conceptual-methodological drawback, it was agreed that the entire construction project should be finally drawn up and done parallelly with the phase 3 works.

In phase II it was already realized and easily noticeable that it is impossible to separate the phases having in mind the fact that the roof's reconstruction was stipulated by the previous reconstruction of the central part of the wall of the street facade.That task was accomplished as well as the reconstruction of the roof'strusses: As the primary source, a historic photograph was used, as well as the traces of the construction *in situ*. The reconstruction, following the "analogy"pattern, was done with the reinforced concrete and bricks. The part of the facade's profiling was reconstructed, following the analogy pattern of the preserved parts. The decision was reached that in Phase II only rough protection of the facade's remains should be done (which does not imply the final restoration), in order to accomplish the conservation process after the protective sheet's removal. During that phase, the flexible idea of the sheet's transfering from now statically firm facade onto the roof was indeed done. **(fig 7 and 8).** The danger of the object's further degradation was definitely removed and one more part of the floor steel joists was built and done, so it was possible to discern the outlines of the interior.

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[21] In February 2015, the symbolic opening event of the historic cinema hall was held, at which the USA ambassador, the High Representative of the International Community, the Mayor of Sarajevo, the representatives of the International Organization of the Red Cross and many other guests of honour were present. The film about natural and cultural properties in B&H "Enjoy life, Enjoy B&H" was shown.

[22] The work was financed by the Italian Red Cross

[23] That conception is definitely different from the theories of the members of the Italian "critic-like restoration": Restoration activity, which has a critic-like character, has to be based on "**the method which wil include either the imitation or the comparison**- Carbonara G. *Quoted Work,* Chapter: *Methodological uniqueness of the theoretical thought of Umberto Baldini.* Rome, 1997, pg. 348

The Critic-like restoration, in the theoretical sense, is closer to the stream called "conservazione pura" (regarding all differences in the context of of the relation towards the „removal of the additions", which is not the theme of this piece of work): *Something which has been lost in the physical context in architecture,it has been lost forever! There is no magic which could possibly enliven the naive nostalgy, and which could enliven the lost components of our past.* - Dezzi Bardeschi M. *Restoration: from the beginning to the end. Fragments of the (impossible) theory,* the editor Vittorio Locatelli, Milano 1991, pg. 419-429 – Carbonara G. Quoted Work,Chapter: *Restoration, Conservation, Reconstruction*. Rome, 1997,pg. 362

The US Embassy in B&H continued financing the project, to be more precise- the Project phase 3, but the Red Cross Society of B&H decided to take the responsibility for working up and designing of the entire construction project.[24]

After the process of cladding and covering of the object, the removal of the danger of the construction collapse, the need of working of the entire restoration programme is being posed, in order to avoid collisions, but also to provide-theoretical-conceptual consistences of the experimental restoration enterprise.

In that way, it is possible to get the historic object of the particular significance for the capital of B&H again, where the cultural, educational-medical and healthcare, and why not to say some new functions and purposes, would intertwine in a modern manner. Let's get reminded that even during the war (in the period from 1992 to 1995), the exhibition events and performances were held. In the future, the renovation of the cultural assignation is desirable and favourable, keeping in mind the fact that an effort should be made to provide the most up-to date technical equipment, functionally and in shape compatible with the historic hall[25], while in the basement it is possible envisage some other contents in accordance with the favourable active protection suitable to the object's value. It is distinctive that after the accomplishment of phase 2 works, the famous members of the "New Primitives" contacted the Red Cross Society of B&H, expressing their wish to actively participate in the creation of the final project's task, based on the traditional complex function - cultural, educational, medical, healthcare and administrative one.

4. The possible ways of development

The example of the restoration of the building of the Red Cross Society of B&H in Sarajevo is the process in progress and it reveals the possible ways of development of the restoration's thought in general on the example of the modern architecture of the medical and healthcare objects with the complex history and intertwining of the functions and purposes.

It also has to be said that intertwining of the conceptions in the modern restoration practice is nothing new. One of the examples are the events and experiences associated and connected to the continuation of the restoration of the most significant Cathedral in Georgia which was built by the king Bagrati about year 1000, and which was organized and designed by Andre Bruno in 2012.[26] During the 20th century, the reconstructions were done in the "come era, dove era" style, and 20% of the original stone blocks[27] were built in it. Considering the fact that the carried out and done researches until 2000 didn't reveal what kind of form the west wing could have had, obeying the recommendation given by UNESCO, it was advisable to turn to Andre Bruno and Jukka Jokilehto who offered the solution in a manner of the modern architecture, in a shape and material context compatible with the conserved cultural property, close to the critic-like approach and attitude of the restoration, discarding

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[24] The additional value to this restoration enterprise is presented throughout the fact that different institutions at the state and entity level, with active participants from the area of the whole B&H, wholehearthedly cooperate on the Project of a great significance. The object, which once used to be the object of destruction, now is becoming the reason for cooperation and the mutual understanding.

[25] The examples of "renovation" of the original function such as the restoration of the exhibition hall of the royal family of Savoia in Rivoli is, proves that something like that can be successfully carried out and done, applying the most recent architectural and technological achievements and working within the frame of the modern creative concept. - Mastropiero M. *Oltre il restauro – Architetture tra conservazione e riuso. Progetti e realizzazioni di Andrea Bruno (1960. - 1995.)*. Milano: Libra immagine, 1996. pg. 164.-171; Bosco N. Quoted Work, Milano, 2000., pg. 15-29; Ćorović A. *Andre Bruno – Creating new authenticities in the modern approach to the cultural-historic heritage* – doctoral dissertation. Chapter: *Intervention on Manica lunga (1984.-2001.)* Sarajevo: Faculty of Architecture in Sarajevo, 2012, pg. 181-191

[26] Presentation dedicated to the restoration of the Bagrati Cathedral „Bagrati Cathedral 1003-2012" – National agency for cultural heritage preservation of Georgia, 2012 – Archive Studio Bruno, Torino, 2012.

[27] Il Giornale dell'arte, n. 329 – Il Giornale dell'architettura, n. 113, Il giomale del restauro. Chionne R. *the Bagrati Cathedral. After false genuine, new authentic. The awarded final intervention by Andre Bruno, article.* Torino: Umberto Allemandi & C, marzo 2012, pg. 15 - http://ripensareilcentrostorico.blogspot.com/2013/05/rassegna-stampa-premio-domus-restauro-e.html the 21st March, 2014

the possibility of reconstruction.[28] That skilfully carried out and done intervention, where the historic and authentic was preserved applying the authentic modern creativity, was awarded by the prestigious DOMUS award for architecture and restoration for the year 2012.[29] The skilful creative extension on a completely another restoration language was done, the language which exclusively envisaged and predicted reconstruction or specific reconstruction called anastylosis.

Instead of the standard conflict on the relation reconstruction- conservation, at the beginning of the second decade of the 20 th century the concept was offered, a concept which may be the sign-post for the creative solutions in the future, on the trace of the line "*intermedia*", which was made perfect in the period longer than a century, starting from Camill Boit. Is the future of the restoration theory and practice in the creative compromise between the conservationist and a restorer who don't shun the usage of the modern creative language, in order to preserve historic properties understood in the bipolar nature (historic and aesthetic) in the expectation of their transfer into the future? Maybe, nowadays it is not possible to offer the answer, but the suggested examples are greatly in favour of such a claim. The further development of the restoration of the building of the Red Cross Society of B&H in Sarajevo can offer the elements which will help and contribute to giving the answer to that question.

The sense of the beginning of the "critic-likel" activity from phase 1 will be possible to notice and reckon only after the end of at least phase 3, when the partial rehabilitation of the interior at the level of the first storey has been done and carried out. It is possible that the "conceptual step-forward move" of the construction of the "different" bearing and supporting beams will be annulled by carrying out of the final layers because of which it will not be able to perceive and predict the work realization from 2015, with the distant overtone of the methodology of "Scientific restoration".[30] On the other hand, there is a possibility that the project will be aimed at the experimental restoration activities close to "critic-like restoration" and that the result will be the creation of the "new authenticity", as a recognized "modern creativity", in order to preserve "historic authenticity".

No matter what the potential result might be, the creative dialogue between the members of the different streams of the restoration theory and practice in B&H was spontaneously started on this example, and it will, if not now, then in the future cause significant results. Also, it is definite, that this restoration intervention is actually the beginning of the social revitalization of a degraded urban district, which not so long ago had traditionally emphasized cultural component.

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[4] The decision of the Commission to Preserve National Monuments upon designation of the Damić's house at Radićeva street no.10 in Sarajevo as the National Monument adopted at the session held from the 12th to the 18th March 2009 in Sarajevo

[5] The official letter issued and delivered by the District Board of the Croatian Red Cross in Sarajevo, to the Central Board of the Croatian Red Cross in Zagreb, Sarajevo, the 10th January, 1944

[6] The decision of the Commission to Preserve National Monuments upon designation of the building of Radnički dom/ The Workers' House (Kinoteka/The Film Archives) at Alipašina street no. 19

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[28] Presentation dedicated to the restoration of the Bagrati Cathedral „Bagrati Cathedral 1003-2012" – National agency for cultural heritage preservation of Georgia, 2012. – Arhiv Studio Bruno, Torino, 2012.

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Photographs:
(Photograph no.1 was taken from the Archives of the Commission to Preserve National Monuments; Photographs nos. 2, 3, 5, 6 and 7 - Adi Ćorović, period from 2014 to 2016; Photograph no. 4 - Predrag Kožulj, 2014)

Fig. 1: Historic photograph of the building of the Red Cross Society of B&H from 1929

Fig. 2: The found damaged stone slab from 1929

Fig. 3: The cleaning works

Fig. 4: A Conserved wooden beam

Fig. 4bis: Newly-designed steel "I" sections

Fig. 5: Steel "I" section as the bearing element beneath the concrete staircase

Fig. 6: The façade of the building of the Red Cross of B&H after introducing and installment of the galvanized sheet

Fig. 7: The façade of the building of the Red Cross of B&H after the accomplishment of Phase II

Fig. 8: The roof of the building of the Red Cross of B&H after the accomplishment of Phase II

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Digitalization as prevention of degradation and contribution for the knowledge of the libraries' cultural heritage.

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Abstract
The beginning of the new century led to the consolidation of the so-called digital revolution, which deeply changed every field of human knowledge. In the humanities it has just settled a new science, humanities computing. Libraries were among the first cultural institutions to feel the need to change using the network to speed up the search.
Digitalization is a process that allows the reproduction of cultural heritage (manuscripts and books in this case), by hardware and software requirements, in order to foster knowledge and availability at a distance and allowing conservation by degradation due to manual use. Europe, for many years, has been keeping on the very issue of digitalization in order to coordinate Member States in enhancing and preserving cultural heritage with the aim of expanding a large European network, Europeana, with the biggest number of digitized objects. The guidelines, manuals and practical proposals are fundamental, too, as a starting point and methodological support for the organizations which wish to start a digitalization project. Italy, as a European state and nation with a strong cultural value, has initiated several projects in the field to contribute for the creation of new digital contents.

Keywords: Digitalization, prevention, knowledge, libraries, cultural heritage.

1. The digital revolution: the digitalization of cultural heritage
"Preserving cultural heritage therefore means allowing its contamination, to see it as a richness that only in its circulation can grow" [1].
Information science and technology applied to cultural heritage, or Digital Humanities, is a discipline that has been consolidated over the past few decades, when the need to spread cultural information by network has proved essential [2] [3]. The need to catalogue and integrate the data was mainly felt by libraries, which have encouraged the consultation of bibliographic data through online catalogues, with the consequential expansion of the group of users.
The principle of a single catalogue had already been advanced over the years '60 on several occasions, only to be better defined in the '70s with the invention of a basic circuit to operate unambiguously: it was thought a card from multiple operational value to enclose different nature of bibliographic information [4]. Subsequent updates have contributed to enhancing the efficiency of the entire computer system in the humanities, completely transforming the visitors' approach to culture. In this context, the computerization and digitalization are two sides of the same coin, two separate procedures but which contribute to the same goal: to make accessible and preserve the cultural heritage.
The computerization of cultural information includes the conversion of the information on various media, forms and languages [5]. This proceeding right now highlighted a number of issues related to the processing of the information, which led to the breakdown of the data in objective (object/document, inventory number, title, artist, date, location, size, technique and format) and subjective (or interpretation, e.g. for subject) [4]. Libraries have long since begun a careful and precise process of cataloguing of library material and not, in a period in which the other cultural institutions were still moving roughly data in the network.

Digitalization, today, is one of the strength of cultural sector. The proceeding relates the documentary heritage in its entirety and is based on the reproduction of manuscripts and/or printed documents through the scanner or camera to high resolution, thanks to techniques that capture text and images, which allow the transfer on electronic media [5].
At the beginning the production of digital documents was considered essentially an intervention of protection and conservation of paper documents, but later began to be considered as a starting point for a global change in the field of service and access to information, by moving the attention from reproduction to the content transmission [6] [7]. This, of course, posed other problems concerning the clearance of the cultural institutions and the digital world, in addition to the issue of preservation, organization and updating of database.
The so-called digital revolution of the new century draws strength from the creation of software *ad hoc* that are able to manage and make available computer data and digitized material through an integrated system of: the conversion agents, fundamental moment for the digitalization of text (Optical Character Recognition) and of images; agents for the management of the interface and user guide ranging from basic research to personalized service; registration and preservative agents [8].
The set of technological innovations at the service of cultural heritage brought from the beginning the idea of creating a global digital library in which interact more independent entities each other, but interoperable [9]. The Central Institute for the Union Catalogue (ICCU) [10] realized, in fact, two software with the intent to protect and promote the heritage of the Italian manuscript heritage in libraries, through a collaboration with librarian and university institutions, by setting standards for bibliographical documentation and cataloguing of the manuscript book in Latin script: BibMan [11], for the creation of a basic bibliographic data related to the manuscripts, which would allow an online interrogation of the bibliography of manuscripts in Latin alphabet preserved in Italy, and Manus [12], for cataloguing and online query of heritage manuscript census; both given in free use to organizations and institutions that request them and provide for periodic sending of their data to the Central Institute for the Union Catalogue (currently attend by more than 200 state, private, ecclesiastical and municipal libraries) [13].

2. Europe and digitalization

"Europe's cultural and scientific knowledge form a unique heritage public value that reflects the collective and evolving memory of several companies that characterize Europe, while providing a solid starting platform for the development of the European content digital in a society of knowledge in the sustainable dimension" [14].
The European debate on the digital world began in 1999, when the European Commission launched the e-Europe initiative, a program designed to spread information technologies throughout Europe to foster social cohesion and industrial input in the digital age, thus preventing the "digital divide" [15]. At the Feira European Council (June 2000) was therefore endorsed the Action Plan e-Europe 2002 to promote the creation of European content on the global networks and to a faster and cheaper internet access for the greatest number of people [16].
The discourse on digitalization as a tool to foster the preservation and knowledge of cultural heritage was taken on April 4, 2001, when representatives of the Member States of the European Commission met in Lund (Sweden) to discuss about the coordination and enhancement of national programs of digitalization in Europe. From this meeting the Lund Principles came out of, then concretized with the Lund Action Plan, i.e., a list of actions for all Member States [17]. The principles they emphasized the need to: ensure a sustainable and public European heritage, promoting cultural diversity (and, indirectly, tourism and the global industry) and to learn about the different resources through the digital. The achievement of these purposes could take place only through the establishment of a stable coordination, the creation of a European vision on dissemination of national and Community plans in harmony each other [14].
In this circumstance the National Representatives Group (NRG) was born [18], a group of experts with the task of implementing the strategy set out at Lund in digitalization field. The group meets twice a year, under the aegis of the President of the European Union, to submit national programmes and policies on digitalization, making sure they are in line with the Community programmes, and to promote collaboration between the national ministries and the European Commission. On 19 November 2003, the working group formulated the Charter of Parma, an important document focuses on the principles of Lund [19].
The work of the National Representatives Group will further showed itself with the publication of the guidelines of the Minerva Project (Ministerial Network for Valorising Activities in Digitisation), a consortium that the then leadership of the Italian Ministry for Cultural Heritage and Activities started in 2002, with the objective of defining a common methodology on the digitalization of European cultural material through the activity of specialized working groups. The document on good practices, product of the Working Group 6, is the main cornerstone of all subsequent manuals offered in digital matters. The Minerva Project was then extended to MinervaPLUS in February 2004 with the aim of expanding

the results of the initial project promoting the creation of a European platform to become the Community driving in the field [20] [21].
In April 2005, five European heads of state, including the Italian, sent a message to the President of the European Commission and to the President of the European Parliament to urge Europe to give a strong response on the digitalization of Europe's cultural heritage to the digital dominance of Google. In summary, the message showed the uniqueness of the heritage of European libraries, which were to engage them through the different content in digital format in coordination each other thanks to the supervision of Europe. On that occasion it began designing a single large network, the European digital library, multilingual and cross-sector, to give an opportunity for European citizens to view freely online the digitized cultural heritage [22].
On 15 November the same year, David Lammy, the then Minister of the British culture, from Bristol launched a new plan on the accessibility to the European cultural heritage by Internet. The "Dynamic Action Plan for the EU coordination of digitization of cultural and scientific content" is the result of the presidencies of the Netherlands, Luxembourg and the United Kingdom to coordinate the Member States in the field of digital culture and is considered the successor to the Lund Action Plan [23].
The following year, the EC Commission, in the framework of the "European Digital Library Initiative", named a "High Level Expert Group" which outlined some general principles on digitalization and accessibility, proposing a system of individual or collective licenses with the aim of curbing conflicts of interest between private and public. Recommendation 2006/585/EC "On the digitization and online accessibility of cultural material and digital preservation" invited the Member States to coordinate policies on digitalization, mandatory deposit, preservation of digital files and had as objective the creation of digital libraries by 2010 [24].
In October 2006, the consortium MinervaPLUS, in the wake of new action plans, was enlarged in Minerva EC (eContent) in order to support the initiative "i2010 - A European Information Society for growth and employment" and contribute to realization of all projects previously proposed in the European digital sector [25].
On October 27, 2011, the European Commission issued another recommendation on digitalization: although the results for 2010 from the previous recommendation (2006) were quite satisfactory, it was decided to make the European cultural heritage further accessible through Europeana, the European digital library, archive and museum [26]; the new recommendation (2011/711/EU) invited Member States to add to the Europeana network thirty million objects, compared to nineteen million available, by 2015: "Europe has probably the most extensive cultural heritage of the world. It can not afford to miss the opportunity offered by digitalization and remain inert in front of the cultural decline. Digitalization brings culture into people's homes and is a valuable resource for education and for the sector of tourism, gaming, animation and culture industry in general. Investing in digitalization will stimulate the creation of new businesses and create new jobs" (Declaration of Neelie Kroes, Commissioner for the Digital Agenda and Vice-Chairman of the Committee in 2011) [27].
The current European strategy, rightly called Europe 2020, includes the "Digital Agenda for Europe" with the aim of exploiting the digitalization of European cultural heritage to disseminate knowledge and encourage investments by the creative industries. The points on which insists the new strategy, in summary, are: the creation of a Digital Single Market, the improvement of the general standards and interoperability among networks, the strengthening of Europe's fight against cybercrime, the promotion of faster and faster access to Internet, new investments in research and innovation through funding programs promoted by Horizon 2020, the promotion of digital literacy in those parts of the world that are not yet connected and the exploitation of the potential of ICT (Information and Communications Technology) of the European Union to the benefit of world society (among the high-potential areas figure Europeana and the digitalization of content) [28].
Italy, although it is not among the first countries with a "high rate of digitalization", moved and still moves today towards two directions: the first line is the definition of standards and guidelines shared on a European scale in the field of digitalization and publication of resources on the network, for the preservation and archiving of digital material and access to digital services functions; the second line concerns the creation of the Italian Digital Library (BDI) and Internet Culturale, a portal for access to digital content and data. In this context, the Central Institute for the Union Catalogue (ICCU) coordinates certain digitalization projects of cultural heritage in Europe - whose data flow into Europeana - making it the main Italian representative of the European network and service center for all libraries and Italian cultural institutions whose objective is to enter their data on the Community portal [22].

3. Guidelines on digitalization

The consortium Minerva, promoter of cooperation between Member States and the European Commission on culture, has produced a number of documents to support the cultural institutions along the path towards digitalization [22]. The expert groups have worked continuously to the identification of guidelines that could contribute to the definition and to the success of digital projects.

One of the first manuals, version 1.3 2004, dedicated to good practices for the digitalization of cultural heritage, shows and describes those which are the main steps for planning a digitization project (they were later produced other books, also published in more than one language, about other issues related to the digital environment).
Minerva in 2006 published the "Technical Guidelines for the creation of digital cultural content programs. Version 2.0", the result of WP4 working group that focused more content in this document extracted from manuals, good practices and guidelines implemented on the basis of internal and external experiences at Minerva consortium: "It must first be stated that the purpose of these guidelines is not to impose a model or a normative set of requirements to which all projects must comply. It would be impossible to produce a single document can capture every specific need of the contexts in which operate a lot of different programmes; it is natural that different programmes take different approaches in the adoption of the guidelines. It tries here to identify areas where a common approach already exists, and provide a nucleus around which to structure the additional requirements, specific to single contexts" [29]. This document, in fact, is accompanied by a substantial bibliography for each topic covered, thus creating hyperlinks that give the person the opportunity to deepen their research sector. For the practical aspects of digitalization guidelines 2.0 are based on the first hand of Minerva, the good practices 1.3, a milestone in this field.
To outline a digitalization project is based on five points: what should be done, who should do it, where you should do, when it should take place and how it will be done. The crux of all the work is, however, the motivation for which you decide to start a digitization project, identified in the will of individuals and/or institutions to make available on internet little known cultural resources and/or protect them from deterioration caused by manual use [17].
The different phases of the project and the choice of material to be digitized revolve around the motivation: generally prefer collections or collections in their entirety, followed by the assessment of the conservation status and receiving permission to proceed with the project. The cataloguing of the material is certainly a preliminary step of great importance because it allows the creation of a first bond with the future digital collection.
The next step is the choice of the necessary technical equipment, that is the hardware, which includes digital cameras, scanners for books, documents or microfilm and so on; a computer system to link the hardware itself; the identification of software for capturing and processing of images, metadata and quality control. The environment in where we operate must be suitable for the treatment of rare or fragile materials: conservation experts should be consulted to avoid the slightest damage to the heritage, especially if the latter requires special hygroscopic conditions.
The digitalization usually uses different hardware, such as scanners and digital cameras, the choice usually falls on the instrument that best adapts to the physical characteristics of the material to be digitized. The elements that contribute to an appropriate choice of hardware are the optical characteristics (resolution, focus and depth) and the sensor, illuminators, stability, shooting stalls, acquisition server, local network and Internet access [17][29].
The scanner is used for materials that can be subjected to pressure on a hard surface, such as manuscripts and printed documents unbound, which adapt easily to the horizontal plane of the flatbed scanner; to the lectern scanner it is suitable for bound documents, the volumes and the codes, so as to respect their size. In general, the scanner should be large enough for your material to be digitized to avoid any damage.
To digitize materials that can be neither crushed nor resting easily on the floor or on the lectern, are used high resolution digital cameras: in this case you should prefer the most powerful cameras on the market, they can capture the details thanks to greater number of pixels, the colour depth and quality of the optical lens being used.
The choice of the resolution, i.e. the number of pixels making up the image, is undoubtedly a fundamental step of the project because it varies in end-use of the digitized material; captured images must then be "expelled" in the form of uncompressed files (lossless), of which it retains a master copy to be kept on file. The reading of the master file can only be supported by an appropriate software (generally distributed together with the hardware), that is able to: open file very large images; change the resolution and colour depth; save different versions of files of various sizes; select and copy a part of an image and save it as another file; export different format image files. In most cases the software also has the component OCR (Optical Character Recognition) [17].
More conceptual than technical, in September of 2014 were approved, then changed at the beginning of 2015, the guidelines for planning the digitalization of collections of rare books and manuscripts of IFLA (International Federation of Library Associations and Institutions) Rare Books and Special Collections Section. In a passage of the introduction it reads: "The digitalization transforms the opportunity to discover and access to special collections and antique books to a greater extent than the rest of the heritage of libraries. These collections, once made accessible, are fundamental resources. Without digitization, special collections and antique books remain hidden or poorly understood". The guidelines are inspired by previous studies published in Europe and exploit the

"reports" of such experiences to focus attention on the specific case of old and special books, with an emphasis on activism of the scholars, both on cultural sensitivity users to digitize collections and create open access to digital content. In summary, the recommendations concern: the careful planning of the project and the choice of appropriate work team, on anticipation of the academic community needs in digital research, the propensity to digitize barely visible collections, preferably in their entirety, by associating the assets of other institutions and the quality of the digital resource provision [30].

4. Digitalization projects in Italy: the case study of the Diocese of Alife-Caiazzo

In recent years Italy has been characterized, in the wake of other European countries, by an important activism in the field of digitalization of cultural heritage. After European discussions of 2001, ICCU formed a research group that produced the standard Mag, while the "Direzione generale per i beni librari e gli istituti culturali" (DGBL) decided to establish a Committee on the development of the BDI programme (Italian Digital Library) which was followed by the launch of several digitalization projects - Historic Catalogues, pre-unification Magazines and music sources - in 2001-2003. In 2004 came the first Internet Culturale version in order to collect all results of digitalization projects within the BDI and was created a new software, MagTeca, for the conservation and management of digital objects. With the proceeds of Lotto 2007-2009, digitalization projects were favored at the "Biblioteca Nazionale Marciana", the "Biblioteca Estense", the National Central Library of Florence for the creation of a digital case and the National Central Libraries of Rome and Florence for the filing of PhD thesis, to name just a few. After there was the agreement between the then Ministry for Cultural Heritage and Activities (MiBAC) and Google to digitize 700,000 volumes - initially 1 million - kept at the National Central Library of Rome, the National Central Library of Florence and the National Library of Naples and project “Cataloguing and digitalization of ancient library heritage”, funded by eight per thousand funds for personal income tax (Irpef) in 2010, to expand the data of the National Library Service (SBN) and the Internet Culturale [22] [31].

As interest and openness proof of the institutions to the digital world to promote the preservation and knowledge of cultural heritage by network, there is a Campania project close to completion, held at the diocese of Alife-Caiazzo, entitled "Memory to the Future: Digitalization of archives and library collections of the ancient diocese of Alife and Caiazzo for knowledge and valorization historic, artistic and cultural of the territories of Alto-Casertano" (original title: “La Memoria al Futuro: Digitalizzazione dei fondi archivistici e librari delle antiche diocesi di Alife e Caiazzo per la conoscenza e la valorizzazione storico, artistica e culturale dei territori dell'Alto Casertano).

Presented for the regional competition "Culture as resource", the project "Memory to the Future" aims at the transmission of part of the funds of the sixteenth century (cinquecentine: books published in the sixteenth century) and the main archival materials, preserved in the Library of St. Thomas Aquinas and the Historical Archive of the Diocese of Alife-Caiazzo. For the purposes of this study, dedicated to the digitalization of cultural heritage of libraries, we will speak mainly of the library and the digitalization of its main funds.

The Diocesan Library "St. Thomas Aquinas" is made by the Fund Library of Piedimonte and the librarian Fund of the Episcopal Library of Caiazzo. It was founded in 1696 by the will of Bishop Pietro Paolo De Medici, following the founding of the Seminary, to carry out the studies and research related to higher studies in theology and philosophy held at the diocese. Msgr. Pellecchia, in 1966, rearranged the library heritage and expanded the library with the inauguration of a new room, and since 1990 the library also hosts a fund of the Institute of Religious Sciences (I.S.R.). Later other funds merged and were cured by Bishop Di Giacomo and prof. D. Giacomo Vitale: belonging to the bishop are numerous miscellaneous (dating from the XVI-XIX century) and the acts of the Subalpine and Italian Parliament, while the prof. Vitale enriched the library with numerous literary works. Recently added two other generous donations, one of the prof. Literature and Classical Philosophy Antonio Manzo (Catholic University of Milan) and another of the diocesan priest Don Giuseppe Leone. Since 2003 the library, attached to the Institute of Religious Sciences of Piedimonte Matese and belonging to the Diocese of Alife-Caiazzo, has changed its original name "Biblioteca Seminario-Istituto di Scienze Religiose" in "St. Thomas Aquinas Diocesan Library", annexed to the Seminary of Alife.

The fund librarian of the Episcopal Library of Caiazzo, updated until the 80s of the twentieth century, was born at the same time of the Episcopal Seminary of Caiazzo and consists of about 8,000 volumes dating from the sixteenth century onwards; until the mid-20s were kept twenty-four illuminated manuscripts (X-XIV century), which were then transported to the "Biblioteca Apostolica Vaticana" (BAV) to be restored and preserved properly. The works currently stored at the Episcope, show a significant degradation caused by moisture environment in which they remained in the past (the refectory of the old seminary) and gaps caused by the attack of wood-eating insects.

Thanks to the availability of the Dott. Luigi Arrigo, coordinator of the project "Memory to the Future", as well as librarian and director of the Diocesan Library, it was possible to read the information in the presentation document of the project to ensure proper and full disclosure. Specifically, the project aspired to the digitalization of the two funds of the Diocesan Library, the sixteenth-century editions,

and the fund "Di Giacomo" (dedicated to the Bishop Gennaro di Giacomo, 1848-1874). Cataloguing and computerized inventory, which took place according to the ICCU-SBN standards (Central Institute for the Union Catalogue-National Library Service), were the preliminary stages of this digitalization project: one of the objectives was the creation of a digital library freely consult on-site or via remote access through the portals Italian Digital Library and Internet Culturale, and possibly also through other networks born within the project itself.
For the creation of a digital database were followed the quality standards required and indicated by the Italian Digital Library: a digital resolution between 300 and 600 dpi, and the compilation of catalog cards (for each manuscript); the use Mag software for management and administrative data. Added to this is the use of a software ICCU to adapt the cataloguing and digitalization with subsequent steps of processing and publishing. For the physical digitalization of the material were used a planetary scanner A2 format with cold light illumination at a low intensity and a digital camera with optical prepared for the macro-reproduction of more than A2 formats, capable of capturing digital images in colours with a resolution of 12/18 megapixel. They were therefore products of high-resolution master file for each document to be kept on file for possible future use, and an access files in JPEG (i.e. compressed) for online consultation. On the sets of these files, divided by type, it created a hypertext available for both the screening network and on site.
Leading the methodological choice of the "Memory to the Future" there was the desire to preserve and promote the knowledge of library funds of significant interest both from the historical and bibliographic point of view. In fact, have been digitized editions of the sixteenth-century poet Ludovico Paterno, native of Piedimonte Matese, and the underlying issues "Di Giacomo", with over 700 titles of texts and documents of Bishop Di Giacomo, leading figure of the Risorgimento period for culture, profession and thought. The project was then concretized with the renovation of the old diocesan site http://bibliodigit.bibliodac.it/, currently under renovation, where you can "flip" the works of the librarian fund in the library sections [32] [33].

5. Conclusions

The case study of the project "Memory to the Future: Digitalization of archives and library collections of the ancient diocese of Alife and Caiazzo for knowledge and valorization historic, artistic and cultural of the territories of Alto-Casertano" is an important example of the cultural activism in Campania digital field and representing what is now widespread distribution of digitalization in Italy as the vanguard of the Humanities. The digital age, in fact, has transformed the way of culture, focusing on reaching changes in the field of accessibility, use and transmission of cultural content. Among the various institutions, the diocesan library of St. Thomas Aquinas of Alife-Caiazzo wanted to take advantage of the digitalization and network to promote knowledge of its own funds.
The digitalization of cultural heritage, nowadays, plays a key role both in conservative and cognitive level helping to put on the net heritage subject to degradation and/or of unknown knowledge and, above all, it makes accessible the global culture through open access digital content. The debate on the digitalization, therefore, is taking on an ever larger scale in Europe and in individual Member States, where the tireless activities of expert groups are giving remarkable results for the creation of a common digital policy.

Fig. 1: Scanner Bookeye 4 V1A-C35.

Fig. 2: Scanner Bookeye 4 V1A-C35.

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LE OPERAZIONI
DEL COMPASSO
GEOMETRICO
ET MILITARE.
DI
GALILEO GALILEI
NOBIL FIORENTINO
Lettor delle Matematiche nello Studio di Padoua.

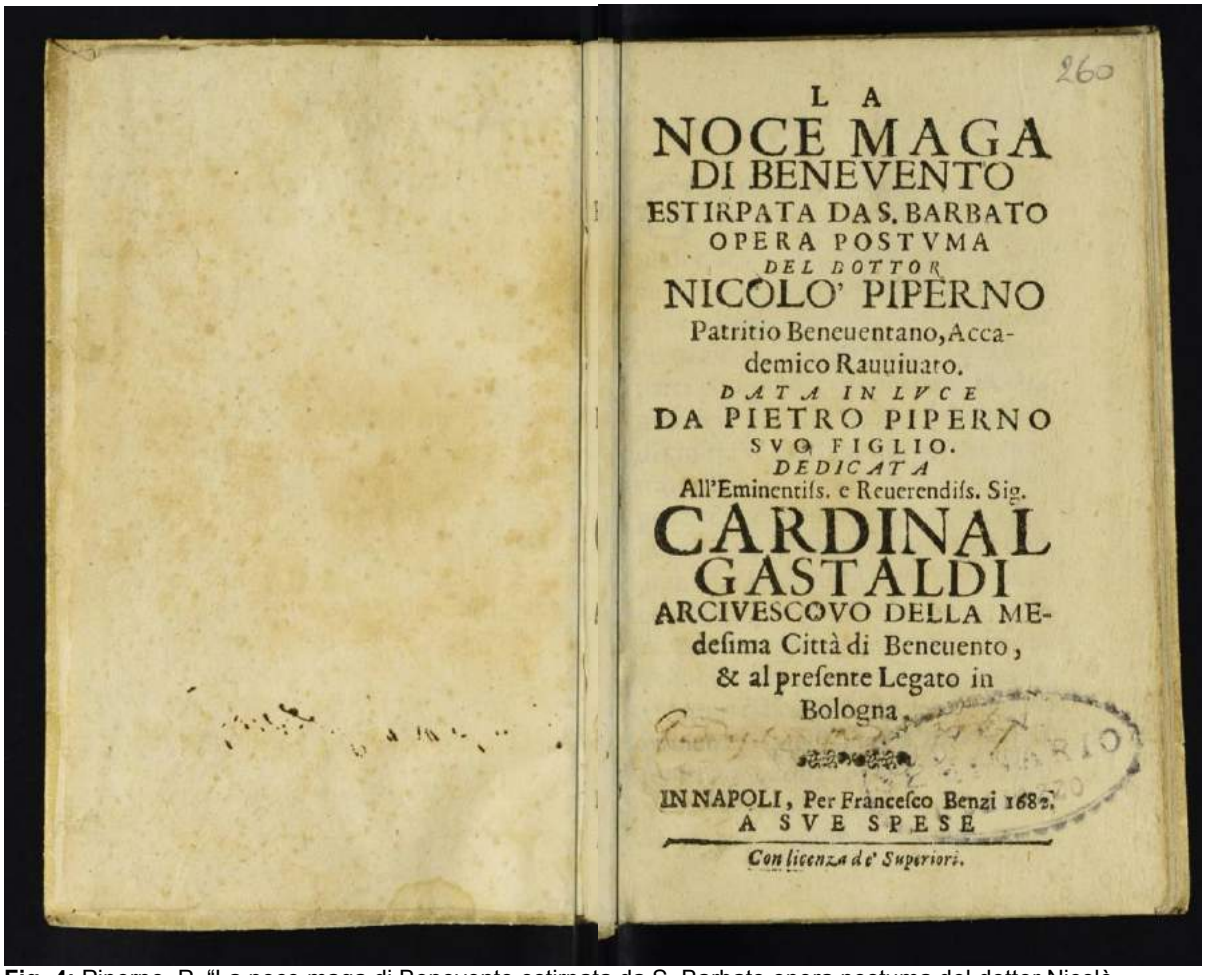
TERZA EDIZIONE.

IN PADOVA, M. DC. IL.

Per Paolo Frambotto. *Con Licenzia de' Superiori.*

Biblioteca Diocesi Alife-Caiazzo

Fig. 3: Galilei, G. "Le operazioni del compasso geometrico, et militare", III ed. Padova: Per Paolo Frambotto, 1649 (Example of a digitized text of the Diocesan Library of Alife–Caiazzo).



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L A
NOCE MAGA
DI BENEVENTO
ESTIRPATA DA S. BARBATO
OPERA POSTVMA
DEL DOTTOR
NICOLO' PIPERNO
Patritio Beneuentano, Accademico Rauuiuato.
DATA IN LVCE
DA PIETRO PIPERNO
SVO FIGLIO.
DEDICATA
All'Eminentiſs. e Reuerendiſs. Sig.
CARDINAL
GASTALDI
ARCIVESCOVO DELLA MEdeſima Città di Beneuento, & al preſente Legato in Bologna.

IN NAPOLI, Per Franceſco Benzi 1682.
A SVE SPESE

Con licenza de' Superiori.

Fig. 4: Piperno, P. "La noce maga di Benevento estirpata da S. Barbato opera postuma del dottor Nicolò Piperno", Napoli: Per Francesco Benzi, 1682 (Example of a digitized text of the Diocesan Library of Alife–Caiazzo).

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Developing a Multi-scale Approach for Rehabilitating the Traditional Residential Buildings within the Old City of Aleppo Syria

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Abstract
The relationship between historical and metropolitan areas usually has to pass through a transitional area (buffer zone). On the one hand, this constitutes a connecting point for the typical transformations between historical and modern urban contexts and, on the other hand, it provides mobility system filtrations. This process has affected the historical center of Aleppo, where the old city was surrounded by mixed areas, characterized by a similar morphology and sometimes by modern typologies.
This paper will focus on developing a preliminary analysis useful to the subsequent formulation of an integrated approach to rehabilitate the traditional residential buildings within the old city of Aleppo, taking into account the related urban structure and its more recent transformation. Then the study will address two scales (Macro Micro); whilst macro scale will assess, in the first part, the historical urban structure, determining the mutual relationship between historical and metropolitan areas and discriminating multi urban levels efficiently, architectural typologies will be assessed on the micro scale, with reference to residential sector and courtyard house. In this part of the paper will be analyzed the courtyard house, highlighting its features with the aim to provide a knowhow useful to the adoption of this solution in future projects

Keywords: Multi-scale Approach, Rehabilitating Traditional Buildings, Environmental Performances.

1. Introduction
Most of the implemented policies of urban development and rehabilitation projects in Aleppo Old city formed a controversial topic for decades, starting with the master plans from the 1950s until the late 1970s and ending with the Rehabilitation project of the old City of Aleppo in 1998. According to this last project, a preservation area about 90 Hectares was defined around the historical center of Aleppo. The aim of this area was to isolate the “old city” from its surrounding areas, as a defensive reaction to the implementation of several master plans which affected both the urban texture and the social life in the historical city of Aleppo, based on the vision of the Buffer Zones’s role (BZ) as Preservation and Protection Areas. The misguided process of these interventions is testified by the way how to handle the BZ, as a place and a tool to integrate urban development between the historical center and its metropolitan areas. The analysis of the relationship between the historical center and the metropolitan area in Aleppo highlights three factors that, according to this study, contributed to limit role of the BZ, its ability and adaptability to organize the interrelationship between the historical center of Aleppo and the metropolitan area:

- An imbalance between preservation and development in the BZ and historical center, which has caused a series of devastating transformations in the urban structures. The troubled methodologies have transformed the historical center’s role from a residential place providing the essential requirements for a few thousand inhabitants to the main metropolitan center for more than three million people. The influences of these transformations had been articulated in rapid commercial growth, which began in the historical markets which grew and expanded until they occupied and demolished the residential neighborhood functions, not only surrounding the historical markets but also surrounding the intere historical center.

- Lack of connectivity between the historical center and the metropolitan area, causing the second level of transformations, represented through isolating historical centers from the dynamic surrounding areas and creating a transportation crisis that negatively affected the historical texture and its BZ, by fragmenting the BZ and disconnecting the continuity of the urban context.
- Undermining the distinctive character and attractiveness of the site and damaging the outstanding universal value of the historical site.

In the First Part, the research will address the most critical methodological issue that confronting enforcement of the rehabilitation approaches in the BZ at the macro scale, in terms of the relationship between the historical center and the metropolitan areas, by emphasizing multiple spatial dimensions such as framework of the comprehensive rehabilitation methodology. Two main approaches are adopted, inspired by practices in Baghdad and Liverpool. This new approach aims to achieve a balance between preservation and development projects in the BZ and enhance its connection with both the historical center and the metropolitan area in a manner that preserves the characteristics and the attractiveness of each site. The **Second Part** will treat the Micro scale, with reference to the analysis of the courtyard house as main residential typology, useful to reflect on the future housing policies, taking into account flexibility and adaptability (to socio-economic transformations occurred during the past centuries) properties of the typological scheme and sustainable aspects of the original building.

2. Macro scale rehabilitation approach

2.1 Historical Evolution of the Buffer Zone

This part will discuss the expanded areas at the eastern and western sides of the historical city and its surrounding corners (south-west and north-eastern). They include all the spaces in front of Bab al Faraj, Bab Jnein, Bab Antakya, Bab Al Hadid and Bab Qinnasrine, which are the main gateways to the historical city. The most distinguished development took place in the 16th century at the northern and eastern wall of the city. The quarter of Janissaries (Turkish infantry forming the Sultan's guard) and the people dealing with caravan activity lay to the east of the Bab al-Hadid Gate. The suburbs to the north, around Bab al-Nasr, were noted as the industrial quarters, the main activity being the production of textiles. The suburbs to the west were developed considerably until the second half of the 19th Century. The area to the east and north of the city was already covered by suburbs until the 19th Century. Therefore, the new districts with Western style planning principles, were established on the existing empty area to the west and the north of the city [3]. The growth of the city to the north and east can be explained according to obstructions in other directions. The existence of the Qoueiq River prevented the growth of the city to the west, while in a southernly direction a considerable amount of area was occupied by cemeteries. In addition, the activity pattern to the north and the east had contributed the growth of the city in these directions. The extension of the settlement pattern was related with the activity pattern at the boundaries of the city. The suburbs were divided as districts according to their ethnicity, religion, and activity. The main suburbs had developed in the north and the northeast direction in Aleppo, as can be seen in Figure 1.

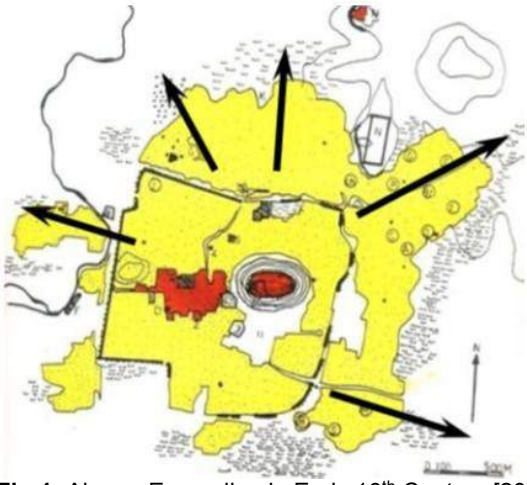


Fig.1: Aleppo Expanding in Early 16th Century [20]

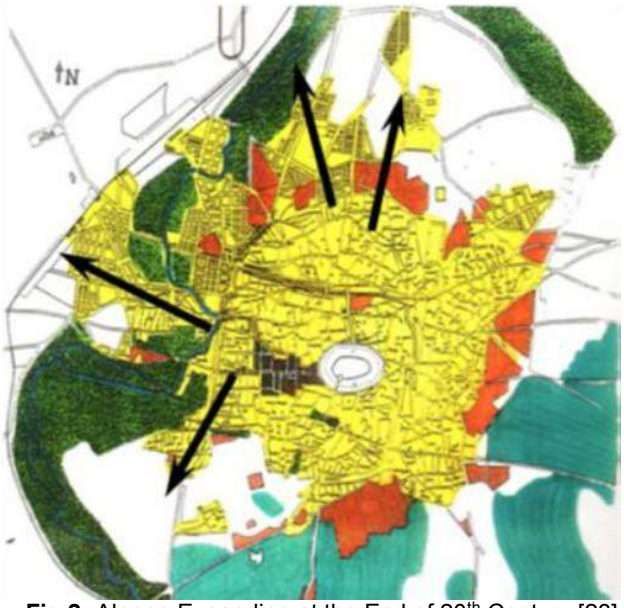


Fig.2: Aleppo Expanding at the End of 20th Century [23]

These suburbs cannot be considered as an extension of the intramurals referring to their activity and settlement patterns. Aleppo's residential quarters were the outcome of the tendency of members to settle with proximity to their related group; and also the other constraint such as the place of work [3]. The result of the economic activities such as trade routes to the north to Anatolia and to the east to Iraq and Iran had resulted in the formation of new suburbs in these directions. The settlement pattern in the northeastern suburbs consisted of activities related to caravans; also, this district, named "Banqusa" was the center of the Janissaries. The districts of Kurdish people and those originating from Marash were located to the north of Bab al-Nasr Gate. The Christian suburbs covered the northwestern part of the extramural. The area of suburbs had extended from 91 hectares to 200.5s hectare from the 16th Century to the 19th Century [19]. However, the situation changed at the beginning of the twentieth century. Several factors such as new means of transport, the growing importance of trade with the coast, as well as the dynamic development of the European style town to the north-west of the Medina had a growing impact on the area as shown in Figure 2. Traffic and commercial activities intensified and were partially absorbed by the new quarter of Bustan Kulab. This area, conceived for the use of automobiles, offered the needed facilities and services and established certain continuity with the traditional centre, through the link of Bab al Faraj. The continuity was further stressed by the newly introduced tramway connecting Baron Street with the Citadel [23]. On the other hand, the center of Bab al Faraj started expanding in all directions. New commercial and administrative facilities began extending into the area from north to south. The northern suburbs are separated from the old town intramurals by a street built on top of the moat (Khandaq Street) which runs alongside the city walls, from Bab al Hadid (east side) to Bab al Faraj (west side), passing by Bab al Nasr. To the west is Tilal Street, which connects with the center of the modern city. It has a very important and attractive commercial location [24]. To the north are new districts which began to surround the suburbs at the end of the nineteenth century, such as Hamidiye, Nayal, Jabrie, and Aqyol. The last is linked to a large road which was cut through the historic fabric in the eighteenth centuries and represents the eastern limits of the suburbs. Further to the east, a narrow strip of old built-up area lies between this large north south road and the hill upon which the Ottoman barracks are located [23]. The most remarkable district market was located in the northern suburbs, the Al Jdedieh district, which followed the basic pattern of the old city intramurals and was characterized by the luxurious items that were sold. Apart from this, there were also economical centers developed around the main circulation axis, which cut through the districts. There was a similar development on main streets linking the "medine" to the north to the Bab al-Nasr Gate [3]. However, there are traces of collective town-planning operations from the 16th and 17th centuries, resulting in more regular street patterns and wider public spaces than is the case in the walled city.

2.2 Defining the Buffer Zone: Characteristics and Features

According to the rehabilitation project of the Old City of Aleppo developed in 1998, a preservation area approximately 90 Hectares (BZ) was defined around the historical center of Aleppo. The aim of this area was to isolate the "old city" from surrounding areas as a defensive reaction to the implementation of several master plans which concerning the urban texture and the social life in Aleppo's historical city and which is based on the project's visions concerning the BZ's roles as Preservation and protection Areas promoted by the Rehabilitation project of 1998. Demarcating the BZs of the historical center raises a lot of criticism and controversy due to the exclusion of the western northern part of the old city (Bab Al Faraj) from the Historical City boundaries, and considered the northern and eastern parts (Hanano Barracks) as a BZ. In addition to buffering, separation areas are neither compatible, nor do they respect the visual, functional and morphological interrelationships, especially in the Southern and Western sides, see Figure 3. It should be noted that a listing issued to a building or a site carries with it an automatic definition of a protective BZ. Though construction work may be permitted in that zone, it is necessary to obtain approval from the Directorate General of Antiquities and Museums for such constructions. The definition of such a zone is not specifically announced in the listing decree; however, the affected plots are marked in the cadastral records as being part of the BZ of the listed building [25]. These transitional areas between the historical city of Aleppo and its Metropolitan area, present several differences between each other in terms of typologies and extension. They sometimes formulate large separation zones and at times do not exceed a street or a part of the historical city wall. Consequently, this reflects negatively on its performance as a protection area; therefore, only a few zones could achieve their purpose of protecting the historical city of Aleppo from surrounding problems and negative effects. The only transitional area existing in the southern side (Bab Al Maqam) which consists of a street and multi-story buildings located on both sides of the street, separates the historical city of Aleppo visually from its surrounding area developed after the mid of 20th century. This side still retains similar characteristics and maintains the historical urban fabric continuity. To the eastern side, residential buildings suffer from poor physical situations and most of the urban fabric had been replaced with wide streets, close to the cemetery and isolates the old city from the surrounding areas.

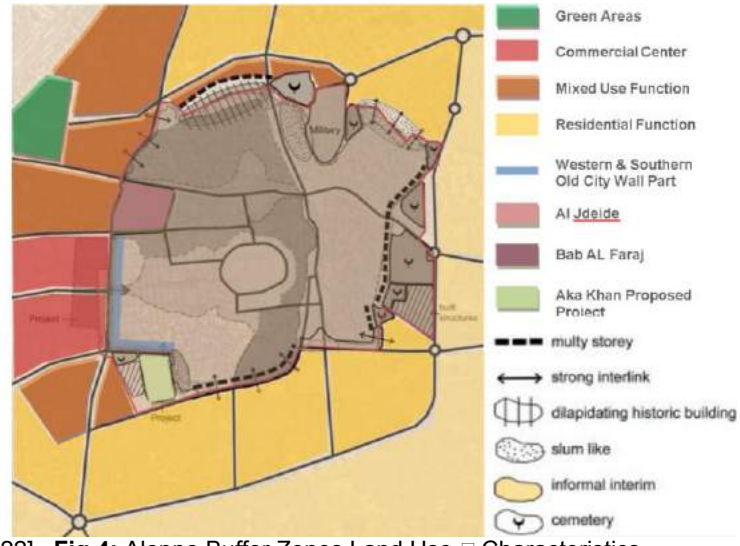


Fig.3: Buffer Zone of Aleppo Historical City [22] **Fig.4:** Aleppo Buffer Zones Land Use Characteristics

Despite the presence of the Hanano military barracks, the northern side continues to enjoy active interaction and a strong relationship with the surrounding neighborhoods, especially the Al Jdeide area with its traditional souks which add their picturesque vitality to the unique feature of the northern suburbs. The traditional souks and industrial activities include handicrafts, textile related industries, soap factories and workshops producing copper goods. The Bab Al Faraj area considers the commercial historical center expansion's in the western side, where the residential function has been replaced with new commercial functions, constituting a great attraction and pressure preventing the old city from growth in the preferable side, as shown in Figure 4.

2.3 Description of the Existing Situation in the Buffer Zones

The current BZ failed in achieving its main goal of preserving the historical center of Aleppo from surrounding negative effects. Furthermore, it did not succeed in forming a transitional area or natural expansion of the historical city. This continuity could only be achieved by redefining and delineating the BZ, through close monitoring of the functional, visual and morphological transformations. Where its physical and social structures had shown different types of changes, which led to increase its tendency to isolate the historical city, the BZs lost their role of transitional areas. Only the areas adjacent to the old city edges have maintained the social and spatial relationships with surrounding residential areas, which are located directly outside the world heritage site boundaries. Many of these areas belong to either the old city, without being part of the heritage site, or being part of illegal housing [8]. As a result of this negligence, the socioeconomic development and the organization of the mobility system between the BZ and the surrounding areas in the Eastern and Southern sides of historical city, mobility, commercial and illegal multistory housing have been able to penetrate the BZ and have also infringed the historical city of Aleppo. This has led to adeterioration of the physical and social situation, resulting in a significant gentrification of the population (as a result of the displacement of indigenous people and their replacement with newcomers from Eastern and Southern regions of Aleppo city). In contrast, most of the development and restoration projects were concentrated in the Northern and Western areas of the BZ, as testified by the presence of the new city's commercial center and several significant projects: Bab Al Faraj Gate, rehabilitation of Al Jdeide and the Al Tilal Area, and the Revealed Western wall of the old City. As a result, at the beginning of the XXI century the western area in front of the historical walls offers an incoherent view of piecemeal development, due to the inappropriate master plans and planning policies. In addition to the proliferation of transport facilities and mobility services such as terminals, garages, parking lots, shops, important public and commercial buildings were being planned or erected, while vacant areas in between were temporarily used for bus and taxi stations, parking and garages, chaotic shops and building material storage. Therefore, the proper development of these BZs might represent the last chance to achieve a unified central area linking the historical and the metropolitan areas.

2.4 International Practices

The next part of the paper will highlights two international practices, among the best ones in postwar reconstruction situations, even if in their own cultural contexts. The first presents the Liverpool project, addressed towards the economic development as method to achieve comprehensive urban development for all the city. The other concerns the methodological approach applied to the rehabilitation of the historical center of Bagdad and its surrounding areas.

A Liverpool Project

The BZ economic development project of Liverpool, presents holistic and significant practice of economic regeneration and economic development planning as a method to achieve comprehensive urban development for the entire city. This case helps the case of Aleppo for defining principles of land use and potential development within analytical protected and transitional zones. Liverpool City Council (LCC) considered that the conservation and enhancement of the historic environment is fully involved in all decision-making that affects its future [13]. Three main points can be summarized from the Liverpool case. These topics formulate a correlated series of procedures that could be of assistance in organizing the interrelationship between BZ and both historical and metropolitan areas, providing a significant step towards the implementation phase, as follows [21]:

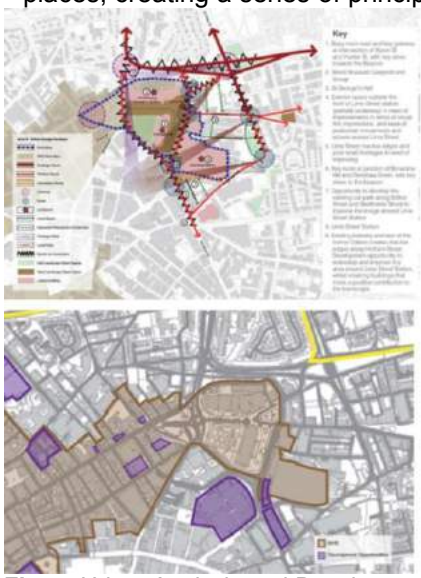
- The case of Liverpool has shown a spatial integrated approach which covers the entirety of the World heritage Site (WHS) and parts of the BZ, and could integrate urban development between WHS and BZ areas, as shown in Figure 5. Therefore, unifying urban design considerations would provide a checklist of key issues that should be addressed during the development process. The research will seek to widen this approach to also include the metropolitan area.
- In the city of Aleppo, identifying principles of the new development (New projects) in certain parts of the BZ will assist in solving the issue of identifying new project locations and their potential negative impacts on the neighborhoods, and support Aleppo city center in achieving economic regeneration.
- The study presented in this paper will use the Liverpool practice in studying the development opportunities approach for the historic center and the BZ, in order to create principles for preparing development proposals and provide guidance on parameters for redevelopment.

B Bagdad Project

The historical integration strategies applied in the Bagdad plans presents an evolutionary practice of urban regeneration for the built heritage site and the surrounding areas [2]. This experience enriches the case of Aleppo through a practical approach that was proposed in Bagdad context. The case suggests principles concerning different forms of use and activities within the BZ and introduced these principles into development and integration plans in double perspective strategies, as shown in Figure 6 [5]. This practical approach with double perspectives on the methodological approach formulates a significance guide to urban requalification and integrated development strategies through discrimination between multi levels of urban places, creating a series of principles and measures for interventions at each level.

The outputs of Baghdad urban requalification plans could assist the city of Aleppo in solving many of its urban integration problems, and provide this part with significant principles, guidelines and strategies, articulated in [21]:

- Comprehensive planning and design approach to achieve compatibility between modern interventions and the existing city structure.
- Restrict decision-making through a multi-evaluation process of alternatives, and select promoted projects from alternatives.
- Handle urban space transformations in historical cities and surrounding areas.
- Urban requalification and use of integrated development strategies applied to multi levels of urban places, creating a series of principles and measures for interventions at each level.



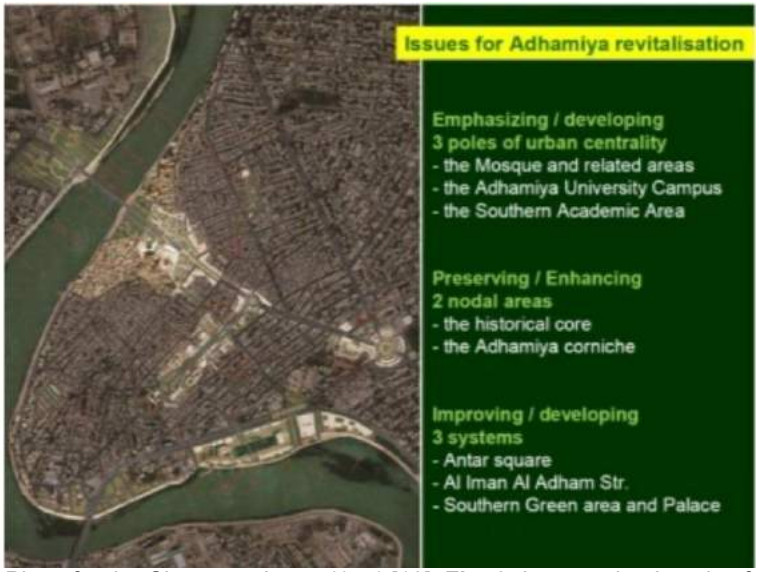


Fig. 5: Urban Analysis and Development Plans for the Character Areas (1, 5) [13]. **Fig. 6:** Intervention Levels of Aadhamiya Integrated Development [5]

3. Micro Scale rehabilitation approach

The definition of a multi-scale rehabilitation process of the old city and of the related buffer-zones will take into account the main architectural typologies covering the urban structure. The continuity and the natural transition from the historical center towards the buffer zones and then the surrounding metropolitan areas could be achieved also through a coherent evolution of the typological system of the residential sector, derived from the original schemes. Then the designation of design strategies and micro scale tools as a preliminary step, concerns the analysis of mainstream architectural forms. In this part of the paper will be analyzed the courtyard house, highlighting its features with the aim to provide a know how useful to the adoption of this solution in future projects, improving its performances in terms of adaptability to the socioeconomic changes and in order to the current environmental sustainability performance. With reference to the residential sector, the courtyard house was one of the most present architectural typologies in the urban structure of the old city, as well as in the BZ (especially in Bab al Faraj) and surrounding areas, which has also another residential building type, the traditional connected building. This last building typology represents the link between the old town and the BZ in terms of maintaining building form continuity and preserving the identity and characteristics for both sites. However, in the modern part of Aleppo the courtyard house has become rare and has almost disappeared in contemporary architecture, due to the rapidly-changing residential building types. In the past, the courtyard was a common residential typology in hot and arid climatic zones. The traditional courtyard house in Aleppo consisted of three levels. The underground floor used for food storage during the year; the ground floor included the main living areas called 'Al Salamlek', the kitchen, al-Iwan (is an important covered open apace from which the aesthetic qualities of the courtyard can be enjoyed), family living room, the guest room, and toilets. The first floor comprised the private areas called. This floor consisted of bedrooms as shown in Figure 7. Moreover, courtyard houses in Aleppo can be divided into three categories: the large courtyard houses of rich families, the medium-sized houses of traders and craftsmen and small houses for workers [1].

A conscious and responsible rehabilitation approach of the old city of Aleppo would take these traditional residential buildings into consideration to preserve and enhance the complex identity of the city's history and suggest a contemporary reuse of this architectural typology founded on a balanced relationship between local materials and building techniques, social customs and climate. This part of the paper will address the post war rehabilitation strategies with reference to the traditional residential buildings in the old city of Aleppo focusing analysis on the environmental and sustainable perspective. The traditional residential buildings in the old city of Aleppo have survived a series of armed conflicts and wars, due to many aspects. On one hand these buildings preserved the close relationship between local building techniques, climate conditions and subsequent morphological and construction characters of the buildings. On the other hand, the flexibility of the traditional morphology of the introverted courtyard house allowed it to be adapted with several social, economic and environmental mutations [21].

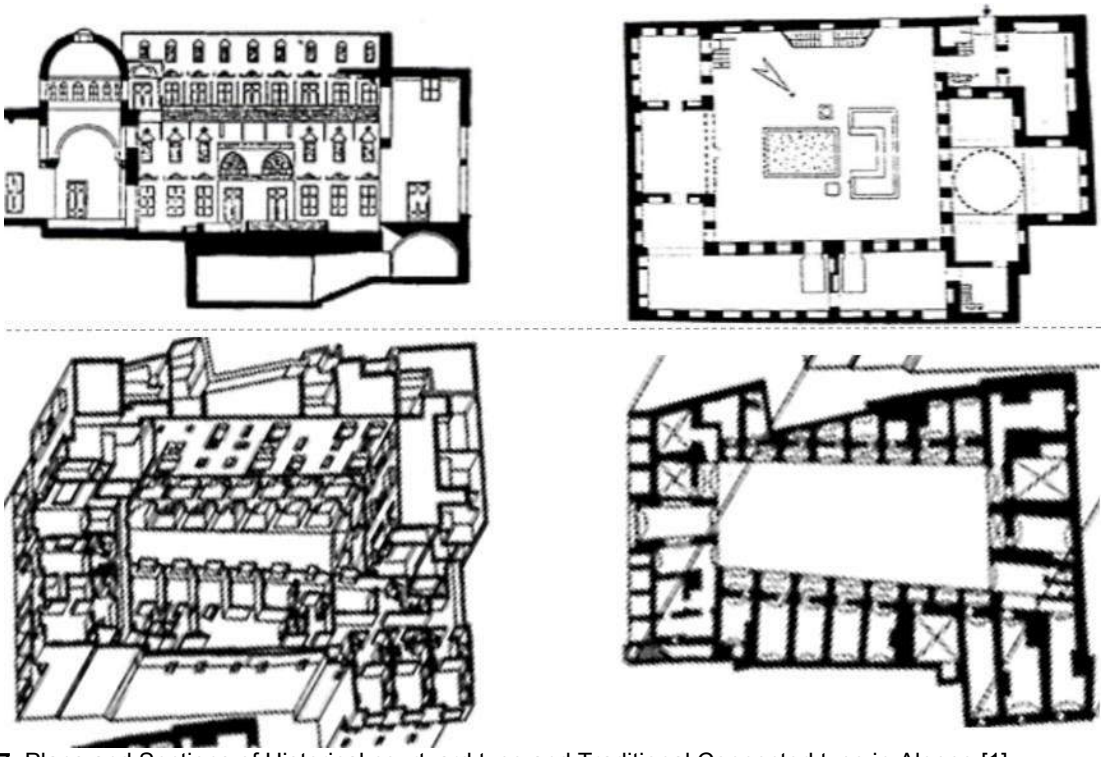


Fig. 7: Plans and Sections of Historical courtyard type and Traditional Connected type in Aleppo [1]

However, after the development of living types and vast climatic changes, at the beginning of the twentieth century, courtyard houses were not able to follow the growing functional requirements, related to the diffusion of modern technologies and especially in terms of reducing building energy consumption and achieving thermal comfort, thus there is an urgent need to adapt the old typology to the new functional requirements and thermal comfort standards. As is well known, currently achieving sustainability is one of the most complex and challenging goals facing architects. The energy conscious design aims to gain thermal comfort in indoor spaces with a decreased demand of mechanical energy suppliers by enhancing natural energies, as demonstrated by studies developed over the last 60 years by many scholars (Olgay, 1962; Gupta, 1987; Ratti, 2005; March, 1972; Rayden, 2006; Hakmi, 2006; Baker Setemeers, 2000 and Okeil, 2010.

3.3 Sustainable Environmental Design:

There are several main factors that affect the environmental conscious design approach highlighting the behavior of Aleppo's traditional courtyard house. Taking into account analytical studies developed for the climate of Aleppo, we will highlight strengths and weaknesses of the courtyard house, suggesting some design criteria that could be useful for the new development of these residential buildings.

Different topography is desirable for habitation according to the specific bioclimatic needs of a region. Each type of topography (coastal, forest, valleys, maintains, cities) is characterized by climatic condition through their location and local weather patterns. It should be remembered that coastal areas are affected by sea breezes and have higher winter temperatures than inland areas and enjoy lower summer temperatures. Forests are affected by high humidity and high shade, while valleys are influenced by topographical shading and slope orientation; furthermore, in mountain regions temperatures reduce by 0.7C for each 100m rise in altitude. It is also important to note that both heat island effect and reduced airflow levels affect cities.

Aleppo lies about 120 km inland from the Mediterranean Sea on a low altitude plateau which allows it to avoid strong winds and it affords it good isolation in winter while it benefits from a warm breeze in summer.

The area of Aleppo can be considered to have a semi-continental climate, where the mountains stretch from Aleppo to the Mediterranean Sea and the Latakia and Alomanus Mountains, which mitigate the effects of the city's Mediterranean climate. Average temperatures range from between 18-20 degrees Celsius, and there is an annual average of about 385 mm of rain, 80 of which occurs between October and March. Snowfall is rare and the average humidity is approximately 58 .

As is well known, building energy performance is related to five factors: climate conditions, urban geometry, building design, system efficiency, and occupant behavior [4]. In this context the preventative techniques which can evaluate building design involve: optimum building forms, optimum building types, selecting appropriate materials and orientation. We will indicate strengths and weaknesses of the courtyard house in order to address these four points with the aim of orienting evolutionary lines improving the courtyard house properties in terms of energy performance and adaptability to the contemporary quality design of residential buildings.

A. Optimum Building Form

The surface-to-volume ratio identifies the amount of exposed building envelope per unit volume. The surface area which is exposed to the outside determines heat loss and heat gain through the envelope of the building. According to March's approach the perfect built form is a rectangular parallelepiped, as heating gain is equal to heating loss. In his study, March assumed that no heat transfer occurs from the building to the ground [15]. However, Ratti, in 2005 presumed that if ground losses were taken into account, and were equalized to losses through all other sides of the building, we could find that the optimum shape would become a cube or half cube form for building. Also sustainable environmental design must offer opportunities to mitigate the extreme climatic conditions and visual amenity of an area, and this can be achieved by using roof gardens, climbing plants on walls, window boxes and balcony gardens [7]. Finally, Gupta, (1987), found that "The principles of good thermal design for temperate climates require: 1) a building that promotes solar heat gain; 2) a low surface to volume ratio to reduce conductive heat flow, and 3) a tight building envelope to reduce infiltration" [9]. On the other hand, Raydan i(2006) found that courtyard configuration has optimum building form because it is suitable in hot climates, and it may be as environmentally adequate in cold climates, with key differences such as proportions and layout [6]. In this regard, decreasing the external surfaces is an optimum solution for cold winters and hot summers by utilizing a cube form to reduce heat transfer through external surfaces thanks to the use of roof gardens or climbing plants on the walls.

As noted before, traditional courtyard houses in Aleppo have cuboid or rectangular forms with a central open space, therefore this living space forms an attractive place in periods of extreme winter or summer temperatures, because it consists of plants, ponds and other natural elements.

B. Optimum Building Type:

Building typology affects thermal comfort because single-family houses can achieve more efficiency for energy than multi-story and collective buildings, due to the layout of these buildings that affect the orientation and natural ventilation of the spaces. As is well known, improving thermal balance in buildings would increase heat gain in winter through maximising solar radiation falling on faces by utilizing terraced houses and reduce heat gain in summer through minimizing solar radiation falling on roofs by utilizing green roofs. In his study, Okeil (2010) compared linear urban forms and block urban forms. He observed that block urban form increases solar radiation in winter and has a high potential for passive utilization of solar energy in buildings, supporting strategies to mitigate the urban heat island through air flow between buildings [16]. In this context Raydan (ibid), compared two different building types of the same height in a hot arid climate, the first one is a courtyard house type, and the second is cube compact house type. She found that buildings with a central open space have better energy performance than the compact cube buildings [6]. In 2006, Hakmi from an analytical study on single and multi-story building types found that in areas with medium or high density the buildings which are of medium height are more effective from climatic and social aspects than high buildings [10].

As result from studying and comparing the previous studies we can conclude that buildings with a central open space or semi open space of medium height (three or four levels maximum) are more effective for achieving natural lighting and ventilation in various climate conditions. In this regard, traditional residential buildings in Aleppo had a low height (one or two floors only) enable it to benefit from better solar radiation and ventilation.

C. Materials Selections:

To preserve cultural identity, improve building energy performance, and decrease building cost, it is possible take into consideration the following criteria selecting materials:

- Using natural materials derived from nature to reduce negative environmental impact such as example (stone, wood, straw…).
- Selecting materials which are available in the local area to minimize transportation cost as example (stone, brick, block …).
- Using materials that do not generate toxic and harmful substance for human health.
- Selecting durable materials which require little maintenance with a long life cycle such as (reinforced concrete).
- Select high energy conservation materials with low heating conductivity and high resistance to humidity like opaque materials or thermal mass materials.
- Using traditional materials with new techniques to conserve cultural identity and adaptation to climate conditions.

In the context of Aleppo most of the traditional buildings such as courtyard houses used local materials like (stones, wood).

D. Orientation and Fenestration:

According to Olgay (1962), “An optimum orientation for a given site would give maximum radiation in the under heated period while simultaneously reducing insolation to a minimum in the overheated period” [17]. Many of recent theories relating to solar houses have preferred south orientation to obtain the greatest advantages of sun radiation at the winter solstice and the least amount of insolation at the summer solstice. Also the size and number of windows in each façade influence day-lighting and natural ventilation. Marboutin, (1931), calculated sun intensities, and he found that for achieving thermal comfort (warmth in winter, coolness in summer) the main facades of building must be oriented towards south, that facades which oriented towards southeast and southwest provide more insolation, but they are colder in winter and warmer in summer than facades which are oriented towards south. Also orientation towards east and west are warmer in summer and colder in winter than south, southeast, and southwest.

Windows are an important component to improve natural lighting and ventilation. As proved by studies over recent decades (Demery 2010, Hyde 2008 and Jonse 2010) the largest and majority of openings must be placed south side to receive maximum solar radiation in winter and protect from summer radiation by trees or porches, while in the western and eastern sides it smaller and less openings would be preferable. The north side should have minimum openings to provide cross-ventilation in summertime and to minimize heat loss in winter [11].

Traditional residential buildings in Aleppo had south-west orientation and usually used top inlet openings to the outside and low outlet openings to the inside central space (courtyard) to improve air movement inside building.

4. Conclusions

The results of this study want to represent a preliminary analytic framework, aimed at supporting the future visions and actions to be done in the next wished Aleppo post-war. The strategic vision proposed is based on a multiscale and integrate approach, conceived as the only one possible and useful. Making reference to international trends and focusing on the old city of Aleppo and its patrimonial value and significance, the study has for this reason crossed the issues related to the tradition of courtyard house and those ones referred to buffer zone future role. An historical and typological analysis has been conducted, going from macro to micro scale. So, looking for possible intervention guidelines, the aspects of strenght and weakness of the past master plans for the buffer zone have been highllighted, in order to point out the new possible directions in its regeneration process. At this aim the tradition of courtyard house has been taken into account as a fundamental topic, to be reconsidered in the future challenges, also in the necessary strategies for sustainability. Two pivotal axes have been then intersected in the analytical framework proposed, for supporting an integrative rehabilitation process for Aleppo, as summarized in Table 1: a vertical one correlated to the spatial integration, starting from the architectural scale (courtyard house) to the metroplolitan area, and a horizontal one, correlated to the comprehensive planning integration and environmental and sustainabliity items, in addition to the socioeconomic and mobility tools.

	SOCIOECONOMIC	MOBILITY	ENVIRONMENT □ SUSTAINABILITY
	HORIZONTAL INTEGRATION		
METROPOLITAN AREAS	• Global and Regional levels	• Regional Traffic Transit, High Flows	• Sustainable Urban Energy Planning
SECOND TRANSITIONAL BUFFER ZONE	• City and Sectors levels	• Ring Roads , Medium Flows	• Sustainable Urban Energy Planning
FIRST PREVENTIVE BUFFER ZONE	• Neighbourhood level	• Service Roads, Low Flows	• Neighbourhood Energy Design
HISTORICAL CENTER □Architecture level□	• Local and Private level	• Private, Very Low Flows	• Sustainable Building Design

VERTICAL INTEGRATION

Table.1: Multi-scale Approach for Rehabilitation in the Old City of Aleppo

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The Fatimid Palace at Ajdabiya in Libya as drawn by the French explorer Jean-Raymond Pacho

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Abstract
Jean Raymond Pacho was born in Nice, France, on January 23, 1794. After his initial experiences travelling in Egypt he immediately showed an innate passion for architecture started working on painting important Islamic monuments that he had visited. Between 1827 and 1829 two volumes of work were published in Paris; the second of which contains illustrations accompanying the text of the first volume. Immediately after the publication he ended his life by committing suicide in Paris at the age of only thirty-five. Among the monuments of the medieval Libyan territory described and drawn by Pacho the Fatimid palace of Ajdabiya also known as *asr Lad edabiah* or the castle of Ajdabiya figured prominantely.
The Palace, typical rectangular layout, was built so as to accommodate the Fatimid Caliph and his court. It was equipped with round towers at each corner and with rectangular ones in the centre. On one of the shorter sides the only monumental entrance portico - very similar to that of the contemporary palaces of North Africa like Raqqada (9th century), Al-Qa'im in Mahdia (10th century), Ziri in Ashir (11th century) and the entrance of the Great Mosque of Mahdia (912) - was located.
In summary, the palace of Ajdabiya is as one of the first Fatimid constructions built between 934 and 946 by Amer al-Qa'im bi-Allah al-Mahdi, For this reason, Pacho's designs take on a far more important role of that of just simple architectural significance.

Keywords: Libya, Ajdabiya, Fatimid architecture, Jean Raymond Pacho, Fatimid palace.

Jean-Raymond Pacho was born in Nice in 1794 [1]. At the very early age of 8 he lost his father and was sent to a boarding school in Tournon in the Ard che. It was here that he learned about drawing, literature and botany. In 1812 he was forced to follow courses in law at the university of Aix-en-Provence, though after only two years he abandoned his studies and returned to his birthplace so as to gain the inheritance left to him by his parents. His first foreign journey enabled him to confirm that which he had always held dear: an innate passion for archaeology and architecture. After squandering most of his inheritance, he was forced to return to Paris in July 1817 where he practiced drawing and painting. After almost a year, his brother, who lived in Alexandria in Egypt, implored him to return, but his stay lasted very little. Back again in Paris, he continued painting and even wrote some articles in daily newspapers. Financial hardships were not long in coming and Pacho was forced to return to his brother for a second time. Arriving in Cairo in 1822, he immediately set about drawing the city's important Islamic monuments.

After some setbacks and a number of survey expeditions of the Egyptian oases, he returned to Cairo in August 1824. But by this time the explorer had formulated a great dream - Cyrenaica. In this new exploration, he would have the general consuls of both France and Britain on his side. He was to be joined by a young orientalist by the name of Mūller, who spoke Arabic and who had accompanied him on the exploration of the oases, and a number of rich merchants who were very curious to explore that part of North Africa - which had not yet been entirely explored up to that point. The news that was circulating up to then was of an Italian explorer by the name of Della-Cella [2]. The information was very vague and superficial, as he had not left any graphical documentation, though what he had left was a valuable legacy nonetheless. This last aspect, the lack of drawings that represented in some way that strip of North Africa, had in some way heightened the curiosity to know Libyan architecture and its landscape visually. The purpose of the exploration was to examine completely the sea between Alexandria and the coast of Sirte.

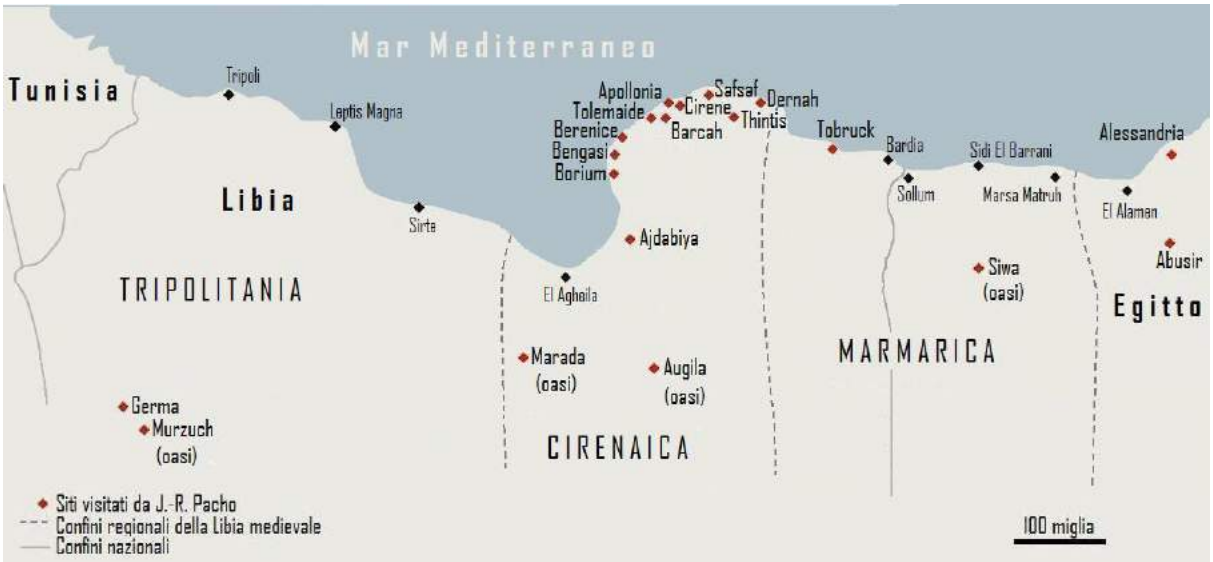


Fig. 1: Sites visited by J.R. Pacho in Libya (3th November 1824-17th July 1825).

Fig. 2: Libya, ruins of Ajdabiya palace, view from the north-east.

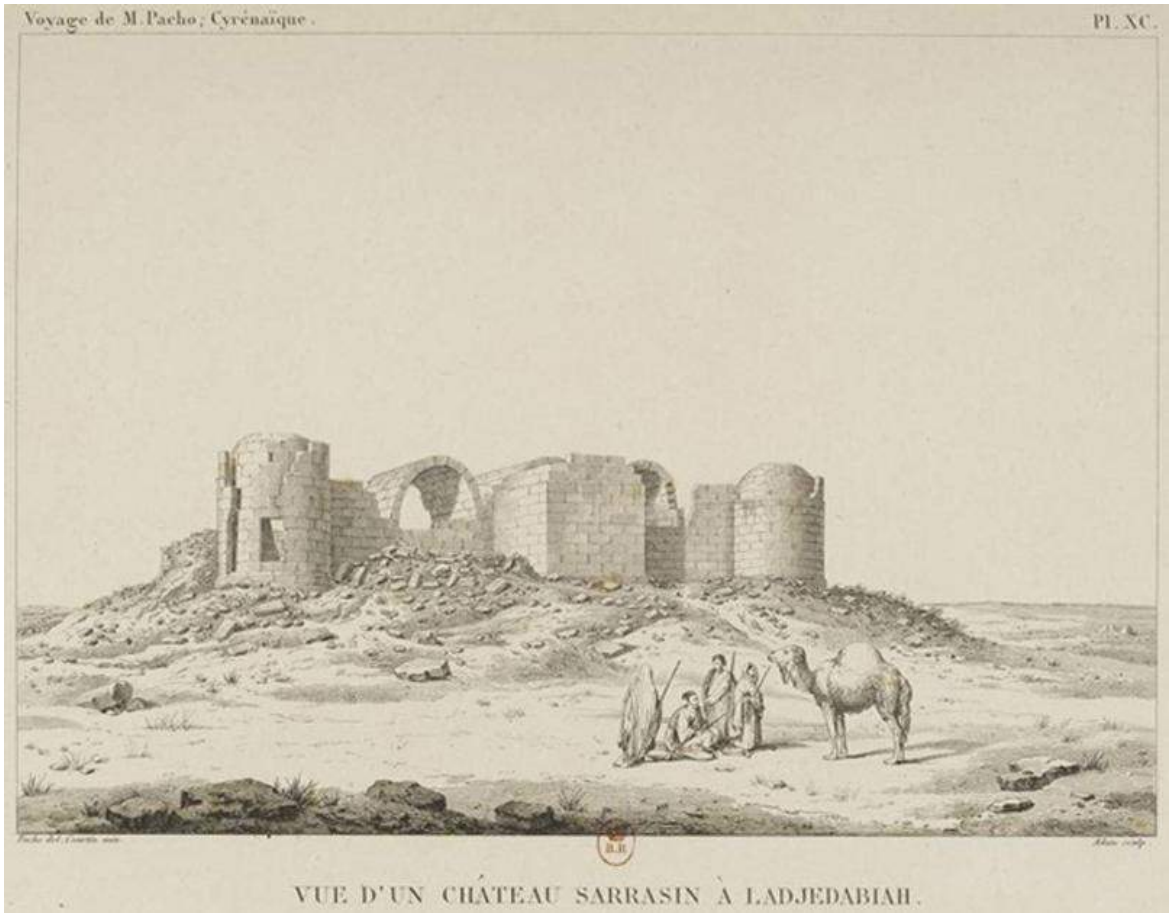


Fig. 3: Ruins of Ajdabiya Palace, from a drawing by J.-R. Pacho in 1824, pl. XC.

Fig. 4: Ruins of Ajdabiya Palace, from a drawing by J.-R. Pacho, 1824, pl. LXXXIX.

The journey started on November 3, 1824 in Alexandria and ended on July 17, 1825 with their arrival in Cairo. The sensational architectural and archaeological discoveries were collected and brought back to Pairs by Pacho some months later. The documentation was scrutinized by the Geographical Society and the The *Academ of Inscriptions* and Belles-Lettres in Paris and a special mention was given by both societies. All the honours obtained allowed the scholar to publicise his work to the French culture elite and to finally see his work published which, considering the enormous quantity of illustrations, had a very high cost. Between 1827 and 1829, two volumes of works were published of which the second contained the illustrations and accompanied the text of the first volume.
Pacho described and drew mach of the Libyan territory he visited: the cities of Cyrene, Derna and Ajdabiya and many others at the oases of Awjila, Marada and Siwa. Amongst the most representative and least known, until recently, is the medieval monument that figures the Fatimid palace at Ajdabiya, defined by Pacho as *asr Lad edabiah* or The Castle of Ajdabiya [3]. Pacho immediately had the impression of finding himself in front of a piece of Islamic architecture of particular interest underlining the «l'élégance moresque de l'ensemble de l'édifice», which was built on ancient Greek ruins [4].
In the 10 th century, the Fatimids, in preparation for their conquest of Egypt, built, in modern Cyrenaica, a series of constructions and infrastructures of significant importance which correspond to a number of strategic points on the coast and the principle camel trains that come from the Libyan desert, and are closely linked to the trafficking of gold [5]. Amongst these building projects, brought to light thanks to the exploration of the Niçois, the urban settlement of Ajdabiya deserves a special mention (the name Ajdabiya derives from the surrounding typography, that of a dry arid land) [6]. The area defined by Pacho as «la plaine qui sert de confins aux terres fertiles» [7], was sparsely covered with sand and was surrounded by rocky hills with one very important natural resource: water. The city, located in the extreme east and in the inner area of the Gulf of Sirte, «à treize lieues [8] du cap Carcora, à trois des bords de la mer» [9], turned out to be an area were refreshments could be had on the coast road that went from Egypt to the sea and, also, the end of the trans-Saharan route that connected the oases of Jalu and Kufra coming from Sudan. As early as the 10 th century, the Arab historian al-Bekri offered a description of the building even if, as we know, he did not leave with a graphic representation of the city's monuments: «Ajdabiya: a big city found in a desert of hard rock with some wells dug in the rock with good quality water. The gardens of Ajdabiya are few and dates are not plentiful, all the other tree species are missing apart from the arak tree (*cissus arborea*). This city contains a large Mosque of imposing stature built (between 934 and 946) by al-Qa'im bi-Amer Allah son of 'Ubayd Allah al-Mahdi. Its octagonal minaret is built admirably; with baths, caravansaries and a highly frequented bazaar [...] The city has a port called *al-Mahur,* which is 18 miles distance; and also contains three castles. In Ajdabiya, the roofs of the houses are made of wood; they build with bricks in the shape of a vault to resist the wind which is very strong in this location» [10].
In the 12 th century, the town of Ajdabiya was described by the Arab geographer al-Idrisi as «a city built in stone and surrounded by boundary walls of which there are only two buildings left in the desert two miles from the coast. On the outskirts of the town there is no vegetation and its inhabitants are mainly Jewish with a few Muslim traders; the surrounding villages are inhabited by Berbers» [11].
The Libyan city entered into a long period of decline after the Hilalian invasion which started in the middle of the 11th century and the fall of the Fatimid empire [12]. The ruins of the medieval city, still visible in 1824, have been excavated only in these last few decades and reconstruction has been possible thanks to Pacho's drawings [13].
The archaeological excavations performed on several occasions and published, to a large extent, by the journal "Libya Antiqua", since 1964, and "Libyan Studies", from 1969, have revealed that in the middle ages, inside the urban confines of the city, there existed a Mosque of notable architectural importance, public toilets, shops, caravanserais and a port located a few kilometres from the city.
The holy building, most lightly built in the 9th century, was partly destroyed during the invasion of the Benu Hilal tribe from the middle of the 11th century [14]. According to what has come to light from the excavations carried out in the 1980s, it was built on a pre-existing structure which served the same purpose [15]. The Mosque was planned with a central courtyard (47m x 31m), under which a cistern is located. The courtyard is surrounded by a portico with a prayer room located on the south-east side;
the minaret is slightly raised from the ground with an octagonal plan and the *minbar* is decorated with stucco and features a dome in front of it.
The building, instead, which is of a rectangular layout, was intended to receive the Fatimid Caliph and his court. It was built in stone with the aid of *pierres colossales* [16] and surrounded by a boundary wall (33,5m x 22,5m) with one metre thick walls, and equipped with circular towers at the corners and a rectangular centre. On one of the shorter sides, in a north-eastern direction, is found the only monumental porch entrance which is very similar to the ones found at the Raqqada palace (9th century), the al-Qa'im a Mahdiya (10th century), Ziri ad Ashir (11th century) and the entrance of the Great Mosque at Mahdiya (912) [17].

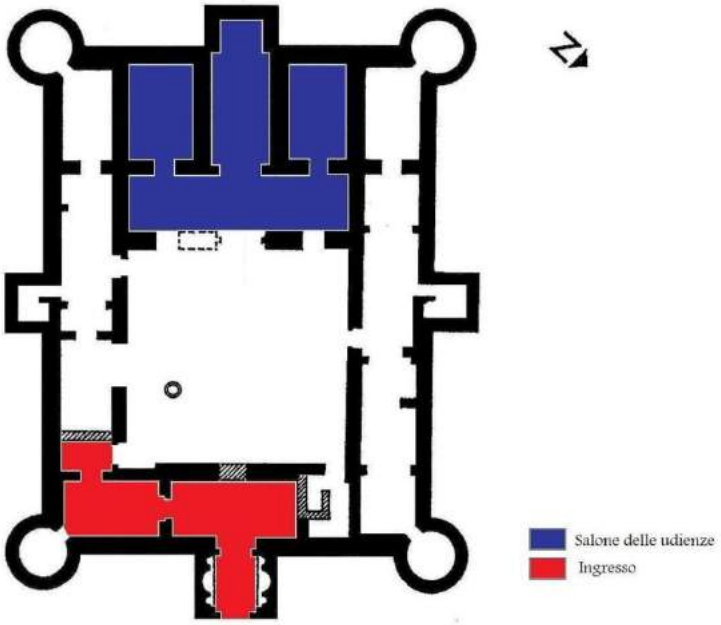


Fig. 2: Ajdabiya Palace, general plan.

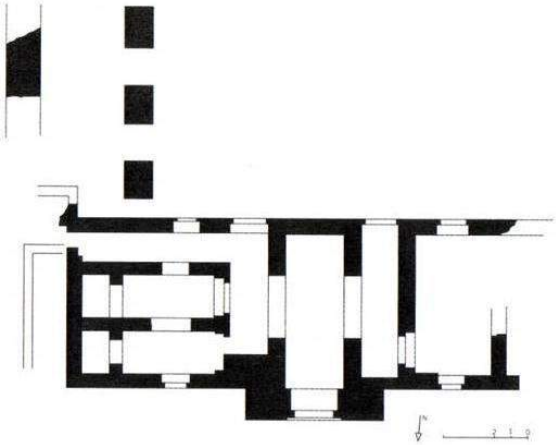
Fig. 3: Ruins of Ajdabiya Palace, entrance and forepart.

Fig. 4: Ruins of Ajdabiya Palace, throne room.

Fig. 5: Ruins of Ajdabiya Palace, low inner ward wall with round towers at the corners.

Fig. 9: Ruins of Ajdabiya Palace, general view of the site.

Fig. 10: Ajdabiya Palace, throne room.



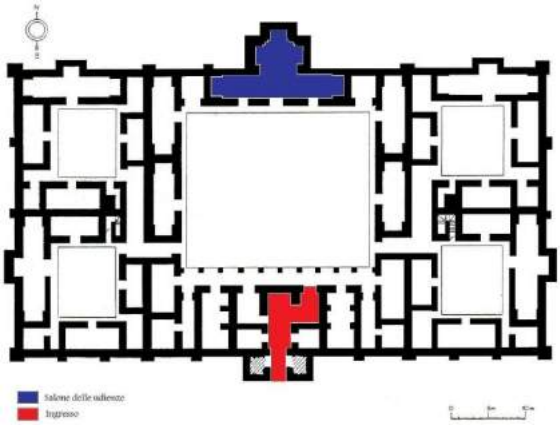


Fig. 11: Tunisia, Mahdiya, al-Qa'im Palace, plan of the entrance.

Fig. 12: Mahdiya, ruins of the al-Qa'im Palace.

Fig. 13: Algeria, Ashir Palace, plan.

Fig. 14: Aerial view of the archaeological site of Ashir.

The elbow entrance opened onto a square shaped central courtyard 14 meters on each side. On the south-west side, in line with the entrance, one would find an oblong shaped throne room closed by a 3 metre-wide apse (*īwan*), 2 metres deep and covered by a hemispherical dome supported by horns with shell motif decorations. The central hall, *īwan,* is lined on both sides by two vaulted spaces of smaller dimensions. The three rooms open onto the central courtyard with a transverse anteroom covered by vaulted ceilings and ending with three arches.
The layout of the hall has a strictly formal function, similar to the palace of Sabra al-Mansuriya (947-973) [[18]]. Ultimately, this example of the inverted T room of Ajdabiya with its form and layout seems, at least as far as we presently know, to be the oldest in North Africa.
In conclusion, the considerations that arise from this analysis identify the construction at Adjdabiya as the first Faimid residence built between 934 and 946 by al-Qa'im bi-Amer Allah al-Mahdi and, for this reason, Pacho's drawings are significantly more important than simple architectural surveys.
By analyzing the architecture of the Fatimid Palace at Ajdabiya more closely, it is possible to state that the building could be attributed to a Syrian tradition given the similarity to the castles of the desert: fortified walls, monumental entrance and an internal courtyard [[19]]. Another element that cannot be neglected is the layout of the throne room in the shape of an inverted T. This layout is typical of the Mesopotamian tradition as evident in Sassanid architecture [[20]].
We can therefore affirm that the value of the French explorer is represented by his brilliance, through the use of simple paper, in brining to light an enormous quantity of topographical, botanical, artistic, architectural and archaeological detail from the places he visited. Essentially, the uniqueness of Pacho's work consists in the ability to transport readers directly to the architectural complexes that he himself drew, accompanying them through the detailed description in a brilliant and passionate style. During the long editing process of his travel memoirs he lived in complete isolation. This isolation enveloped him in such melancholic gloom that it brought his turbulent life to a premature end. He committed suicide in Paris in 1829 at the tender age of 35. His death created deep sense of regret not only amongst the members of the Geographical Society, but also in all the Parisian and French cultural societies. He is remembered as a fine scholar who, thanks to a dangerous expedition with limited means, was able to bring back to Europe, after many years of neglect, the glorious past of the city of Cyrene and the long forgotten Libyan districts of Marmarica and Cyrenaica, for example the Fatimid palace at Ajdabiya.

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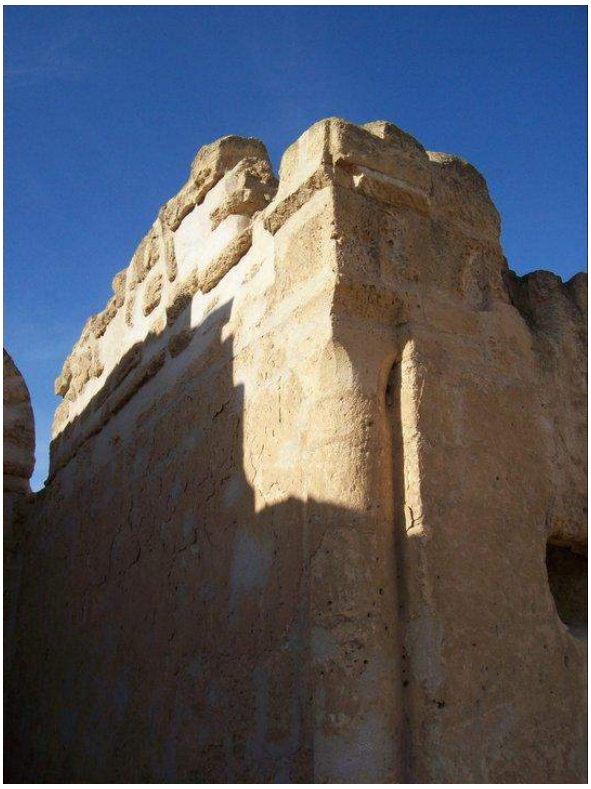

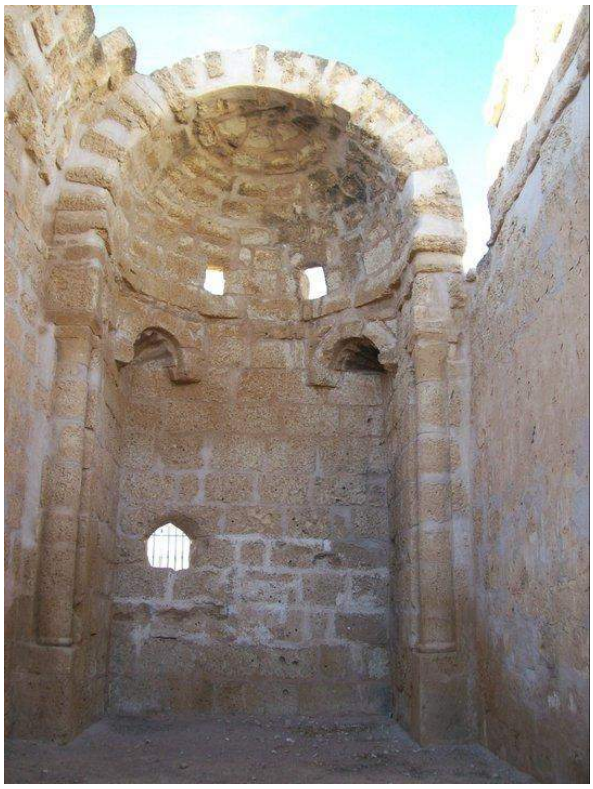

Fig. 15: Ajdabiya Palace, corner column of the throne room.

Fig. 16: Ajdabiya Palace, semispherical dome of the *iwan.*

Le Vie dei Mercanti XIV International Forum
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Renewal of Piazza Sant' Anna di Palazzo

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Abstract
The design to renew Piazza Sant' Anna di Palazzo is the result of an international competition.
The proposed design has been adjudicated the winner. The square lies at the heart of the Spagnoli district, cradled in the historic centre of Naples, a UNESCO World Heritage Site; redesigning it has been a major challenge. The key problem has been one of integration – not only with the historical context but also, and above all, with the environmental context, viewed as the sum of the requirements high-handed demands of those who use this public space every day. The project aims to make this space functional and free for use by everyone as conveniently as possible, without being 'invasive' or 'overbearing'. In such a special environmental context, the architects must find the courage to redefine/alter the spaces profoundly, to be able to offer solutions for civilised living, without neglecting the delicate balance in its surrounding urban setting. Solutions of a simplicity and beauty of form can create order, elegance and a new and functional distribution of space. These have been the design objectives to meet. Or in essence, as Master Vitruvius has taught us: Firmitas, Utilitas, Venustas

Keywords: International competition, Sant' Anna di Palazzo,

1. Analysis of the area
The ideas competition for Piazza di S. Anna di Palazzo was based around community architecture, i.e. changing a part of the city, while listening to the needs of those who use the urban space. So before the design phase, a meeting was held between the various architects involved and the main users of the public area - the shopkeepers and the residents. The principal aim was to avoid "imposing from above" a design that did not "fit" the needs of the main users of the urban space, but instead took their various requirements into account. At the moment, the piazza is completely overrun by scooters, cardboard boxes and public benches, which are moved according to 'requirements' during the day. The piazza also contains a disabled parking space, which is invariably occupied by cardboard boxes and by cars, making it impossible for the handicapped person to gain easy access. Around the piazza are various shops, each with different – and often conflicting - requirements, particularly regarding how goods are displayed and different loading/unloading procedures. The shopkeepers tend to use the piazza as an extension to their premises, and often as a place to deposit goods. Frequently, in high-handed manner, they overspill onto the road surface, creating an obstacle for traffic. Moreover, in Vico S. Anna di Palazzo, there are no fewer than seven communal refuse bins that, apart from being unsightly, are a problem of long standing for residents who in the summer months are obliged to suffer the nauseating smells.

2. The project of Piazza Sant' Anna di Palazzo
For a more liveable space, the piazza should first be cleared of the tangle of scooters and objects deposited there, so that it can be used more easily. For easier access and, at the same time, to separate the piazza from the street, the levels of the piazza have been rectified to give a flat surface. Also, to make it completely separate from the roads, a low wall is envisaged. This wall, varying in height, will delineate the piazza's new shape. As the wall runs round, it becomes lower. Rather than a wall, it would be better to think of it as a ribbon that visually defines the morphology of the new piazza. The idea of a ribbon is further suggested by finishing the top of the wall in white stone. One of the

sides of the wall will not be aligned with the front of the buildings, but will extend to the edge of the pavement. This is a very “strong” design choice in the context. As a consequence, the shops facing the piazza wall, whose product displays currently and inappropriately overspill onto the street, will have to move their goods back. The wall has been designed so that externally, on the road side, there is only space for disabled parking and loading/unloading goods. This will prevent anyone from parking illegally, as currently occurs. In this way, architecture can engender order and have real influence over “inappropriate” behaviour. There will be an ample seating area in the piazza, finished in a stone like basalt, making a striking colour contrast with the white stone of the top of the wall. The seating area is divided into two steps, one slightly sloping, which follow the line of the wall. The idea of a line/ribbon outlining the piazza suggests a concept of lightness and so it must remain for the wall in all its dimensions, even at its highest point. The exterior of the wall is decorated with azulejos, that is, colourful pieces of majolica. Such a simple decoration, but at the same time very effective. Majolica tiles have always been used as decorative elements in the most beautiful historic buildings. Here, they are given a modern slant, adding to the quality of the proposed design.

2.1 The recycling point

The issue of the waste bins has been solved by completely removing them from view. Following solutions used in historic town centres of northern Italy and northern Europe, an entirely underground recycling centre is envisaged. The system will use the current communal bins provided by ASIA (local waste and environment services). This solution is offered as a model for other parts of the city, too, not only for the historic centre.

2.2 The temporary exhibition

The piazza is also designed to host temporary exhibitions, so the flooring contains screw housings for four aluminium posts supporting a simple 4m x 4m tent canopy. The posts, wired for electricity, together with the canopy will create a pleasing covered space. This solution will avoid the usual improvised market umbrellas erected on public holidays.

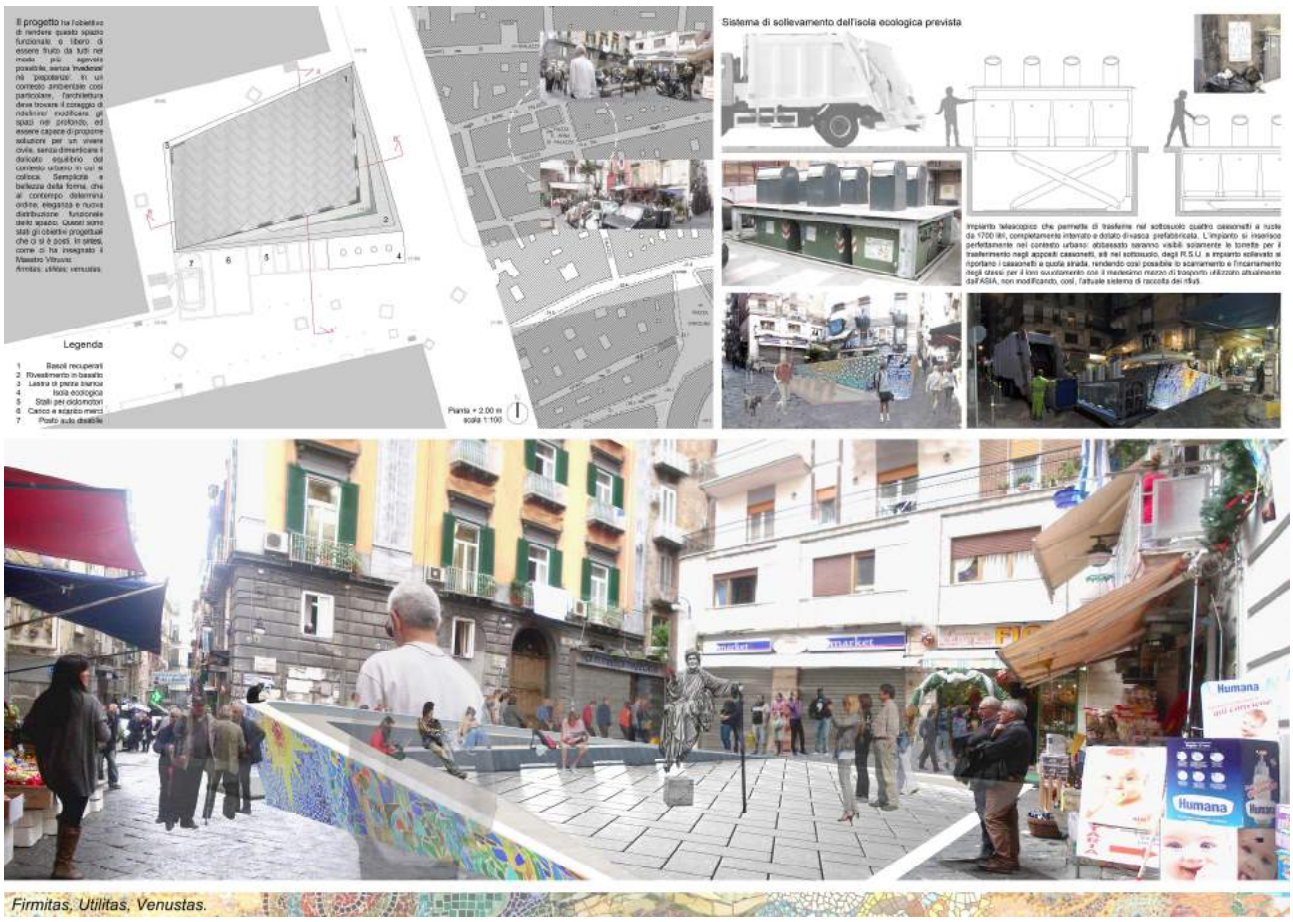

Fig. 1: Rendering project

Fig. 2: Rendering project

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A revival project for the cultural heritage of □inosa

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Abstract
The City of Ginosa, in Puglia, is characterized by an ancient urban fabric located in a ravine, like Matera and Gravina. A delicate place that gathers historical buildings and a complex hydrological system. On October 7 and December 2, 2014 the territory of Ginosa was involved in flooding of some significance that caused an immediate collapse of several buildings. Following an immediate inspection of the command of the Fire Department it was placed a ban on traffic in the area affected by the collapse and the displacement of residents.
The incident created a great damage to the community of Ginosa for two reasons:
- Actually it made a ruin inaccessible part of the ancient fabric, with obvious consequences for residents;
- It has effectively cut short an important trend to invest by private sectors important to the economic recovery of the city both in terms of tourism that manufacturing.
The 'Ginosa problem' can be solved only with a project that is able to attract the interest of capital from both community realities both from the world of private enterprise. Ginosa need for a conceptual project that tells a scenario long term towards which all actions must aim.
Polytechnic of Bari believes in a strong idea: Ginosa should promote the creation of a unique place where they have to relocate many of the Apulian excellence in the field of fooding, manifacturing and building. A place to meet the most 'high' traditions of our kitchen, the 'old' knowledge of the manifacturing and building in Apulia.

Keywords: Ginosa, Cultural Heritage, Ravine, Revival project, Hydrogeological instability.

1. Economic and cultural rebirth models: the Project as a tool
It's been almost a decade since the word *crisis* has become a ubiquitous term in any discourse about contemporary Western life. At the beginning, it seemed to be only a crisis concerning the real estate market caused by the subprime affair. Afterwards, step by step, the ensuing crisis in the financial world, the rise in the cost of raw materials, the banking collapse and the credit crisis have led to a worldwide recession that has become a continuing condition that we still live today. A recession declared by many economists as the largest, secondary only to the great depression of the early 20th century. However, with a deeper analysis, the picture looks brighter. It is not a mere destabilization of the entire world economy, a disaster itself, but something even more global. It seems to be a crisis of our lifestyle. So much so that the most spread common positions are basically two. According to someone, it is just a strong setback of a defective system and there are already people working on a recovery following a traditional capitalist scheme, a bit refreshed by a renewed humanism. According to others, it is a point of no return after which it will be necessary to build a completely new balance that will lead us to a different life, and all efforts will be pointless unless people accept the radical change. As always, the reality is more complex, and often variable, than any generalization or evolutionary theory, both with reference to large periodic changes and referring to unexpected and sudden events. Thus, gambling on a possible prediction is much less interesting than the effective attempt to try a decisive action that, although small and together with others, can indicate a path. Certainly, this is also a crisis of skills because one of the feature dominating the human reaction is

often the inadequacy to lead this historic transition. It is much more common to see attitudes of withdrawal and shelter rather than enterprising actions and reactions to problems. And this is even more obvious if we consider the times taken into account by political, technical and administrative responses. They are almost all short-term reactions and solutions developed hastily in a very limited time perspective. It is clear that the lack of trust results in an evident disinvestment in the future. Investments require planning and programming in order to implement changes that will be experienced by others, our children for instance.

"The crisis (as the etymology of the term κρίσις: distinction, evaluation, discernment) is the conscious transition from one state of reality to another, inevitably different. The crisis is a threshold, and at the same time a transformation. This requires the total and radical reconfiguration of paradigms, of the reference points that rule our perception of the world. And there is nothing like culture able to fulfil this function, in the most complete and effective way. Culture trains us to find new solutions to problems that seem insurmountable, changing the views on phenomena, making connections between events and ideas, structuring multiple levels of interpretation." As Caliandro [1] writes in his ITALIA REVOLUTION, a profound investment in culture is the only chance that can obviously provide a way to build a possible future. Instead *"Here the culture of emergency rules, which has afflicted our society for several decades. A vision (or lack of vision) wide and suffocating, which can be summarized as such: 'at this time, there are more important things to think about. We are sorry, but we cannot think to culture too".*[2]

The word 'emergency ', in fact, very often diverts the attention from the focus on the long-term planning in the coordination of effective single actions. In the name of an arisen fortuity, it is justified any action considered necessary to give quick solutions to impending problems, without worry and meditate on the general horizon towards which to strive. This attitude, now pervasive, characterizes every aspect of our life, including the processing of our territory that, today, we inherit in a highly problematic condition. Strictly connected to the financial and economic recession, the construction industry suffered from the same crisis which, as structured so far, is no longer able to be congruent with the reality we live in. In the past century, starting from the post-war until recent times, men have personally witnessed a transformation of the territory never done before. Over five decades, men have built and occupied soils with an intensity about six times greater than the entire activity carried out in the previous two millennia. Cities have expanded their extension like wildfire under the thrust of the tertiary sector, industrial businesses have occupied large areas and intensive agriculture has involved important transformations of the urban soil. Everything has been created and has become an answer to a growing economy that pushed progress, motivating it. Today, a structural crisis has turned off the engines of growth and, thus, stopped the race to the construction and transformation of the territory. Like a running train that suddenly stops, the built soil, still steaming, awaits a new destiny, which appears difficult to imagine and, above all, to implement. That vehicle, which in motion seemed efficient and fully functional, once stationary, begins to deteriorate, showing always growing problems. For instance, contemporary buildings are mostly inadequate to the earthquake safety and to new frontiers of energy saving; small and large disused industrial plants are without a destiny; antique constructions are in an advanced state of decay; territories, clumsily modified, are involved in catastrophic weather events. Increasing difficulties spread among the population, cause administrators and leaders to respond point by point to ongoing emergencies. Meanwhile, investments are insufficient on the planning of a future vision and on management models that allow to set the train in motion again, maybe on tracks other than those covered so far.

Yet, if you look at the progress of some initiatives that characterise the contemporary world of business, there are many cases where a pattern of rebirth is perceptible. A setting that today is called *'resilient'*, that is to say the *ability to cope in a positive way to traumatic events, to reorganize one's own life positively in front of difficulties, to recover oneself while remaining sensitive to positive opportunities that life offers, without alienating one's own identity*. [3] This definition of *resilience* [4] holds well together all the ingredients of what may be a proper attitude to oppose to a developed crisis, as that still ongoing. In particular, there are two aspects that make this approach a successful one. First, the confirmation that the identity is an asset that should not be lost. Decades of globalization have led to the movement of goods, people and cultures, often getting a homogenisation, or even worse, an unrecognizable *babel* of objects, shapes and pictures. In an era like this, it emerges the need to redefine identities, rooting them territorially without renouncing to a dimension of life at a global scale. No border can be restored, but identities and traditions, renewed by progress, must return to characterise the economic rebirth projects. That culture, often left in the queue, becomes the hub, the main potential in the new visions for the future.

In addition to the content, culture, indeed, is the method to be characteristic, to turn a difficulty into a resource. Before a complex and problematic situation, it is necessary an approach that is able to switch what appears with a minus, with a plus. This attitude is what Sloterdijk [5] calls a *"conversion of a defeat into a victory in another field and a disguise of an irreparable loss in an imperishable conquest".*

Fig. 1: The Viaduc de Bastille in Paris transformed into Le Viaduc des Arts: a unique showcase of handicrafts, crafts, art and design [Photo: Nicolas SCORDIA]

Fig. 2: The facade of the Viaduc de Bastille transformed into Le Viaduc des Arts [Photo: Nicolas SCORDIA]

This attitude oriented to personal liberation, the preparation to rebirth, thanks to a change of direction, the new centrality of culture and the renewed traditions that characterize places, could be said to be ineffective. However, there are entities that, instead, demonstrate the opposite.

In 1969, the Viaduct de Bastille, ancient railway line in Paris, stopped its activities. It was inaugurated by the Société de Chemin de Fer Paris Strasbourg, and became one of the many historical fragments resulted from the disposal of old railways. Ten years later, the Atelier Parisien d'Urbanisme was commissioned to redesign the viaduct in disuse and immediately it appeared clear that the intervention actions might be two, that is the demolishment of the structure, to replace with new dwelling districts, or the recovery of the structure, exploiting the nature of his bays in series to allocate a new function. In 1988, the proposal made by architect Patrick Berger, to turn the viaduct in a sequence of art atelier where artists and artisans could create and sell art, prevailed and today the Viaduct de Bastill [6] is a unique place that inspires similar experiences in many European, and not, capitals.
In the spring of 2014, a delegation of students and teachers of the Polytechnic of Bari landed in Ankara for an internship on the self-building techniques. Practical activities were carried out in a square of Hamamonu district, an elegant suburb with stone and wood houses according to an aesthetic and constructive style typical of the historical districts of the early '900 in the Turkish capital. During daytime the district, partly inhabited, had a thriving commercial activity developed on the ground floors. In the evening, many entertainment activities livened up the walking of many tourists. Only a few days later, we learned that this district, flourishing in the twenties, had gone through a long period of decline due to the abandonment of houses for the transfer of its inhabitants towards new districts. The district fell in poverty and in the grip of fire and became an abandoned and desolate place. In 2007, with an important recovery plan, the area was completely redeveloped. Today, the historic buildings have been restored and have been given new life with shops, markets and hotels. The streets have become pedestrian areas with a lively creative atmosphere, as happened once. [7]
The relationship with history and culture becomes a constant factor in redevelopment projects, up to a crystallized representation of an era to live again. It is the case of Colonial Williamsburg [8], a restored historic district that annually hosts more than a million visitors from all over the world.

Fig. 3,4,5: Ankara, quartiere Hamamonu [Photo: M. Akif ERSOY Meydan, Sarhang G.HARIRI, ersin SAHIN]

The city looks like a living history museum where you can appreciate the origins and the values that built America, even before the Constitution of the United States. A real park where, led by the dominant motto *'what the future may learn from the past'* [9], the colonial American city is rebuilt, recovering many authentic buildings and reconstructing others in order to recreate the atmosphere of the time as background to actors who work and dress according to colonial fashion and use colonial grammar and diction. In this case, it's clearly expressed the intention of a reconstruction of a cultural programme to preserve and revive in its authenticity. The same target has been chosen by the outdoor theme Museum Skansen, in Stockholm, which exposes, to its full extension, the preindustrial Swedish culture and traditions. Founded in 1891, the park gathers together all the settlement systems of the region, from the Lappish village in the far North - *Samevistet* - to the typical Sk□ne farm in the South - *Skånegården*. The park encompasses, in a natural framework with wild and tamed fauna, many shops where artisans produce and sell products of quality. Among glassblower, potters and bakers the visitors move around, observing the production and purchasing directly after packaging. [10]

Clearly, in the projects that govern the creation of these parks, a major role is played by the adoption of a driving cultural theme and the location of the intervention. In the Viaduc de Bastille the centrality of the recovered complex, in a city like Paris, ensures the result that is also achieved through a recovery aiming at bringing together art and handicrafts with artistic vocation. The possibility to pass by many shops of great excellence improves the value of the whole, compared to the same if taken individually. In Hamamonu district, even if the urban location of the settlement endures, the historical value becomes determined for the project aimed at setting up a redevelopment process. The historical value becomes even more fundamental in the parks of Colonial Williamsburg and Skansen, such to realise a geographically isolated park compared to most densely populated urban areas. The adoption of artisan traditions is constant as a cultural vehicle needed to create a precise cultural theme. In some cases, however, a single productive tradition becomes protagonist of the birth of complexes dedicated to the tale of the same tradition. The county of Napa Valley [11], North of San Francisco, probably is the entity that mainly demonstrates this strategy. A wine-making area that produces more than 60□ of Californian wines through the work of about two hundred wineries. Here, the history of the wine production, from the cultivation of the vine to its harvest and production of the final product, make up a story on the road that characterizes the tourist offer of the park. People sojourn at the cellars or in near the cultivated areas.

They cover the entire territory through a completely dedicated system of roads and railway that leads the visitors to know all the techniques used in the grape cure that allow the production of wines that are tasted and bought before leaving the valley. As in California, the Austrian Burgenland [12] proposes a territorial offer that allows an analogous experience around the wine but with a more rooted and ancient tradition. It is interesting to note that Napa Valley began its investment in the wine industry since the 1960s, so in a relatively recent period than the other major geographic areas with highest level productions, such as France and Italy. This means that the management model, the ability to attract and build the visitor experience constitute a decisive discriminating factor in the fate of such a project.

The recovery model of abandoned historic structures through the settlement of artisanal activity is, in our country, already existing. This is demonstrated by numerous cases, including the project to restore the former Consorzio Agrario of Latina, about two years ago. The project has transformed a historic structure of architectural significance into the cultural centre of the city, becoming an aggregative space that aid the enhancement of the artisans' artistic production. There are many examples where such an approach is applied to a large historic residential structure. This is the case of Artinfiera [13], organised in the ancient village of San Sebastiano Curone, where, against the trend of depopulation, a project has been launched to re-settle crafts excellence. Or, the revitalization of Lucca's ancient centre where, through the upgrading of the Carmel Market, a good part of the centre has undergone a recovery plan aiming at fostering the settlement of all the most significant and original souls of artistic crafts. An even more significant case is the village of Solomeo [14] recovered by Bruno Cucinelli for the settlement of his clothing line manufacturing and packaging. Actually, the Umbrian designer, entrepreneur and philanthropist, has founded here a veritable school of arts and crafts which hosts high-level courses on tailoring and masonry. The educational approach of the school is humanistic and tends to interpret the craft as a research source of beauty and knowledge. It is no longer the preservation, almost mummified, of a tradition of the past to narrate, rather it invests in a manufacturing tradition that produces goods occupying a large section of a high-level international market. Therefore, a product compared also to innovation but that does not renounce to preserve its origins in terms of tale, keeping machines and methods intact, unsuited to contemporary craft market.

Ultimately, the planning of a conversion often results in a matching of the aspects of a reality which, if observed individually, appear to be ineffective. Nevertheless, a simple analysis of the context, under various angles, will never be enough to a requalification process as described so far. Only a project, in its visionary dimension, may be able to propose a new beginning to be attained with properly

programmed actions. In most cases, however, an invariant is always shown, which is related to the themes adopted in the recovery projects: the culture that comes from the tradition. In particular, many times it is the artisan culture that constitute the engine of many of the redevelopments told so far. The memory of a know-how that comes from the past and is anchored to places that strongly characterize a membership. Today, this is undoubtedly a pulling factor, maybe because it is ontologically innate as opposed to identity dispersion, produced by recent years of globalized economy. [15]

2. The project for □inosa

It's been almost a decade since the word crisis has become a ubiquitous term in any discourse about contemporary Western life. At the beginning, it seemed to be only a crisis concerning the real estate The City of Ginosa is among the towns of Puglia to be on the border with Lucania, in the province of Taranto. As all Apulian municipalities, it has an old fine structure, but with one important feature. The historical part, ancient and medieval, is positioned in an important ravine similarly to cities like Matera and Gravina. A pleasant place to live in, where historic buildings and a complex hydrogeological system, as that of a Lama (erosive cracks, typical of the Apulian landscape), coexist.
On 7th October and 2nd December 2014, the territory of Ginosa, and much of the surrounding area, has been involved in severe floods that caused an immediate collapse of several houses in both the bottom and on the top of the ravine.
Following an immediate inspection of the Province of Taranto Fire Department, the access to the area affected by the collapse has been prohibited and the residents have been evacuated.
The incident created a great disservice to the community of Ginosa. Firstly, it has reduced a portion of the ancient town to an inaccessible ruin, with obvious consequences for residents. Secondary, it has abruptly interrupted a significant trend of investments, by private bodies, in sectors of importance for the economic relaunch of the city, both in terms of tourism and manufacture.
Today the problem is big and difficult to handle. On the one hand, there is the need to remove the dangerous condition of the restricted area, through the dismissal of the numerous ruins found in areas difficult to reach by normal means for removals. On the other hand, an assessment is required on what is still standing, which does not ensure safety and structural stability. In addition, there is the need of actions that prevent similar incidents from occurring during future floods, through rehabilitation and consolidation works of the slopes of the ravine. Needless to say, the long-standing problem of local businesses which have invested in the area and now are facing a new start that cannot carry independently because of environment problems.
The conclusion of this brief analysis is the discouraging acknowledgment that the whole Italy is subject to disasters of this type and to emergencies similar to Ginosa. The capacity of public intervention is now clearly insufficient and ineffectual in resolving problems of this kind.

Fig. 6: Ginosa. The collapse occurred in the historical center after the floods of 2013.

The 'Ginosa problem' can be solved only in a perspective based on a planning mentality, in the broad sense. Ginosa needs a 'big' project, able to draw capitals from both EU realities and from the private business world.
Ginosa needs a conceptual project that tells a long-term scenario towards which all actions must aim.

The urgency of a comprehensive intervention is obvious. As the real condition of the buildings appears and considering the situation from a technical and administrative point of view, it should not be denied that the case of Ginosa lives an impasse that is not easy to solve. The problem is not local but rather systemic. The object is a part of the city, and substantially depends on the availability, and I would say in the 'unavailability', of a multitude of subjects between private and public. For those who have a minimum of experience, both technical and administrative, it is easy to understand the stalemate of the case and the difficulty of starting a recovery.
Ginosa, therefore, need an idea intended as true design of the mind. An idea that contains intuition, vision and strategy. An idea that allows to bet on the success of securing, redevelopment and recovery of the ravine.
After a discussion with the local, administrative, business and civic realities, the DICAR (Dept. of Civil Engineering and Architecture) of the Polytechnic University of Bari, has believed in a strong idea. The process of rebirth and redevelopment of Ginosa and the hydrogeological reorganization of its ravine, should promote the creation of a single place where many of the Apulian excellences in food, manufacturing and building must be relocated. A big broad place where the 'highest' traditions of our cuisine, the 'ancient' knowledge building art, and the 'fine' Apulian manufactures can be found. The ravine will be a rebirth of workshops in which, door after door, the best Puglia can be met. With consideration at training, it will not just be a place where people make and sell, but also a place where abilities can be taught, so to avoid the oblivion of those great traditions, which the place is dedicated to. So, a big 'souk' and a large 'school', joined together in the view of a growth that solves the problems of the past, supports the present and projects the future towards a plan with unique characteristics.
The whole side built against the ravine with his bed will host the new Park of manufacturing excellence of Puglia, a park that will house the most important craft traditions of our region into a single harmonic context.
The project includes the reconstruction of the life in a ravine, by building a lift system for different functional levels, from the bottom toward the built ridge.

Fig. 7: A revival project for the cultural heritage of Ginosa. Axonometry. [Research group: Prof. Arch. N. Parisi, Prof. Arch. A. Di Roma, Prof. Arch. F. Ruggiero, Dott. Arch. D. De Mattia with C.G. Fusillo, R. Pastore, G. Genchi, C. Colangiulli, E. Polignano]

The most delicate part, according to a hydrogeology perspective, is the valley of the ravine, where the stream flows during floods with such impetuosity to sweep away everything in its path. Here, up to a certified level of flood, only a natural park can be allocated, with the interweaving of natural cycle and pedestrian routes, surrounded by gardens of medicinal herbs, essences for the extraction of natural colours, herbs and the most used vegetables in the traditional Apulian cuisine. Mainly, small shrubs that do not create obstacles to the natural flow of water.
A system of walls and embankments, formally lying and of the same shape of the bottom of the ravine, will separate the bed from the first settlements in the cave which, together with the leaning rural buildings, distinguish spaces used as storages and to collect products resulting from the farms on the ravine bottom and from the surrounding countryside. Here you can observe, accumulated, products from the land before being processed, such as vats full of grapes, sacks of olives, medical herbs, boxes full of vegetables, forming a fine show colouring and perfuming the ancient caves and stones.
On the first level of more structured building, places for food production will be created. Small millstones and ancient olive presses will show the transformation of the products of the land in the precious treasures of Apulian gastronomy. The wines so produced will age in barrels in cellars open to visitors. The scent of the fresh pressing will ascend from the places where the oil rests. The visitor and the dweller will see the creation of jams, the extraction of essences useful to the pharmaceutical industry and to the craftsmanship. They will stun their smell with the countless fragrances of aromatic plants while packaging.
Once on Via Matrice, the park shows its true soul, putting together the able hands of regional manufacturing into a single narrative that reflects the great potential of a tradition of craftsmanship renewed and enhanced by technical means and scientific research. From Via Bacco, and towards the mother-church, there will be a continuous succession of extraordinary shops where art will be the centre of the tale. Diving into the deep caves of artisans, every tradition will tell itself. The school and the transmission of creating art, the secrets of the production, the packaging the product and its sale will be narrated in their natural evolution. Anyone will be able to linger and observe how excellent tailors teach the art of mending to apprentices, or how young ceramists, from major traditions of the past, innovate the design lines through the use of new CNC machines. The passing tourist will purchase a well-exposed valuable piece while, an interior designer will carefully choose ceramics for the set-up of his own creation. Curious people will spend the whole day immerging into different craft traditions and observing the processes that lead to the finished product, maybe grasping some of the secrets underlying the arts.
On Via Matrice, the natural landscape of the ravine will be counterbalanced by the quality of our ancient and renewed manufacture. Then, arriving at the area affected by the collapses, you will see the series of renovation works that have transformed it into a great natural amphitheatre, a large panoramic place addressed to theatre and entertainment.
From this position, moving on the roof, you will access to the new district, dedicated to restaurants and to places where people can taste traditional dishes renewed by important and famous chefs. From the roof gardens, going into taverns, restaurants and entertainment places, you will be in the area dedicated to the great Apulian cuisine.

The development of this project must be sponsored by a real action plan aiming at realising the entire project with a great final goal, supported by essential mid and short term targets that give the right motivation to reach it.
The goal can be achieved if:
- the actors of the project will be representative of all the territorial bodies;
- the project will be able to draw private investments, both local and not;
- the project will be able to persuade regional, national and European bodies in order to obtain development funds;
- the project will be followed by a proper communication with a high-level profile, managed by people with acknowledged competence;
- a 'control room' is established to supervise, guide and help all actors to act in the best way possible.

Therefore, after the realisation of the preliminary conceptual project by the DICAR, that exposes briefly and convincing the overall proposal, we propose a road map so structured:

1. Establishment of a 'control room' involving local administration, Polytechnic University of Bari, representatives of civil society and associations and representatives of the business community which, from the sharing of conceptual preliminary project, 'take the vessel to the port';

2. Organization of a school event and presentation of the project, so to adjust training in the renovated traditional construction, manufacturing and food sectors. A great event during which the preliminary draft will be presented and assigned to the Gravina Tre Summer School: architecture, craftsmanship and slow food. This is a summer school open to the participation of national and international partners, in order to promote the project beyond the border;
3. Proposition of the project to one or more actions of the new Horizon 2020 program and/or other national and regional programs, to obtain developing funds through direct and indirect calls;
5. Participation promotion, by private subjects, to the actions destined directly to the SMEs in the manufacturing and tourism sectors;
6. Scheduling of long-term activities that make the ravine populated throughout the realisation period of the project.

Fig. 8: A revival project for the cultural heritage of Ginosa. Architectural plan. [Research group: Prof. Arch. N. Parisi, Prof. Arch. A. Di Roma, Prof. Arch. F. Ruggiero, Dott. Arch. D. De Mattia with C.G. Fusillo, R. Pastore, G. Genchi, C. Colangiulli, E. Polignano]

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Historic Building Information Modeling: from historical database platform to fully suitable and multidisciplinary design instruments

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Abstract
The aim of the research intends to provide innovative solutions to the more and more hard challenge of organizing in a virtuous manner the information concerning the architecture patrimony: the realization of complex parametric models could guarantee a formal, architectural and relational coherence, inside a shared virtual system. The HBIM (Historical Building Information Modeling) represent virtual models for cultural assets, essential supports to archive, compare, manage and design heterogeneous data that constitute the building: its analysis give the possibility to interpret it in a sort of "as-is" model, made by deductions coming from information derived by archivist, geometrical and topology data contained into the virtual model. The report will focus particularly on the case study of the V Pavillion made by Riccardo Morandi nearby the Torino Esposizioni exhibition building cluster: built using the pre-stressed technology on concrete lowered arcs, it passed very fast from being an iconic building of the excellent Italian engineering school of the post-war period, to a debatable and malfunctioning municipal garage. For this reason the virtual model could be helpful to collect on one side a fully shared information database capable to transfer all the historical path of the building, and on the other the efficient and multidisciplinary instruments supporting future design interventions on the next period.
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Keywords: Cultural Heritage, HBIM, database, V Pavilion, Morandi

1. Introduction: towards virtuous multidisciplinary approaches (MLT- EB)
This paper aims to explore the possibilities offered by a new design method called Building Information Modeling, as a wise relationship between drawing and database. This virtual environment organizes geometrical data, material performances and quantity take off. These data are associated with AEC components to virtually simulate the construction (or restoration) phase of the building. In recent years, the systemic approach to a new way of conceiving the building process is rapidly spreading both in the scientific community and in professional practice, thanks to the recent international guidelines that promote the BIM adoption as the proper methodology to be used, with legal consequences related to the reliability degree of the model.
It is worth mentioning that the adoption of BIM methodologies in many foreign countries (Northern Europe and US among others), together with the tendering reform approved by the European Parliament indicates a growing demand for the use of BIM methodologies in designing operations in the public construction sector [1]. This methodology can be considered virtuous practice but increasingly widespread for new construction, especially for interventions of great importance; surely the practice applied on Cultural Heritage buildings is less explored. No guidelines are now available to define a

workflow useful to preserve the permanence of the information and to wisely relate the entire dataset, starting from the survey up to the new proposals for the construction project: this procedure could be designed using a single virtual environment shared by individual professionals. As often happens, the research seems to be at the forefront of professional practice: in this regard we briefly show some authoritative eminent samples classified as HBIM [2].

2. The status of art (MLT)

The features of a BIM-based approach can be effectively used for the investigation on existing buildings, through a catalog, hierarchical and implementable, that recovers the heterogeneity of the information related to Cultural Heritage, starting with the amount of data that must be organized for a survey: original drawings, historical and recent pictures, inspection and degradation analysis, to name a few. The BIM database is able to recover such information and constitute an indispensable resource for different professionals that could be involved in the protection, intervention or management of the building.

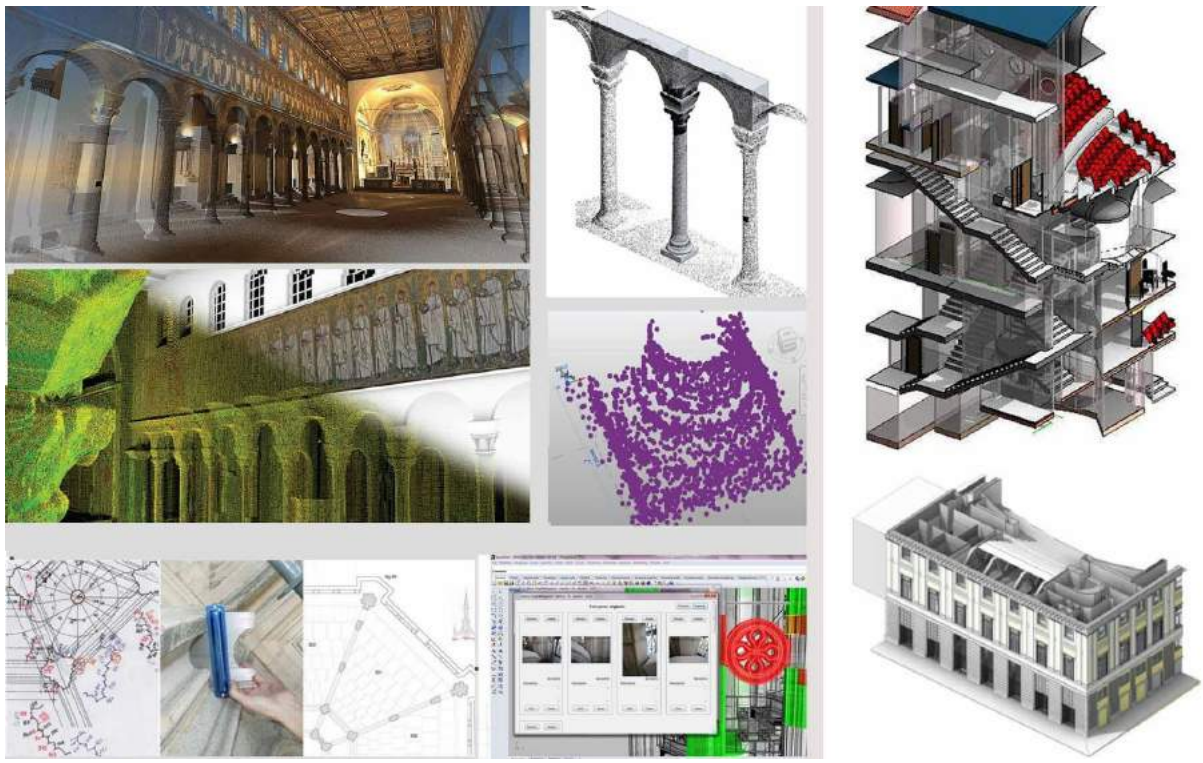

Fig. 1: On the right: BIM model of the Teatro Lirico, in Milan. On the left, above; point clouds and virtual reconstructions of the church of Sant'Apollinare, in Ravenna. On the left, below: survey procedures and database implementation connected with 3D Modeling of the Gran Guglia del Duomo, in Milan.

A virtuous example is the restoration project of the Teatro Lirico in Milan, achieved by combining BIM and laser scanning to establish an important precedent for the government. It is a complex and innovative process, which is essential to check the actual building conditions, even for those environments difficult to be measured that have been modeled in a virtual form using geometric information acquired from the point clouds.

A second example is the intervention on the Veneranda Fabbrica del Duomo, in Milan: the SITECH3D group (Surveying Information Technology for the Environment and Cultural Heritage) has set up a 3D BIM WEB consistent with the contents of a 1:50 scale, through a strong integration between laser scanners, topography, photogrammetry and direct survey. The previous restoration works were made by Ambrogio Nava in 1844 and Carlo Ferrari da Passano between 1962 and 1967); in recent years it is taking place the third intervention at the Guglia Maggiore of the Duomo; but this is the first major restoration that will leave a very detailed documentation for future references. In fact, using the special scaffolding built just for the restoration, it was taken over each part of the Gran Guglia, from the lantern to the Madonnina statue, modeling every single part with Rhinoceros. All virtual models are NURBS surfaces that enable more efficient evaluations and simplify calculations rendering.The image database contains a photo collection of each object, to keep track of the interventions done [3]. Another case study that demonstrates how this approach can be successfully applied on the existing architectural heritage is

the research work on the church of Sant'Apollinare Nuovo in Ravenna: the virtual reconstruction of the Byzantine church was made through the revision of the point cloud imported into the parametric platform, too; but unlike the other case studies a plug-in has been designed to convert portions of point cloud into reference points (recognized by the BIM software as editable objects) more effectively used to make a virtual reconstruction semantically reasoned [4]. A similar experience concerns the conversion of the old heating stuff of the Politecnico di Torino into new classrooms, where we personally investigated the transition from the point clouds and the BIM model [5].
Finally, it is worth considering Maurice Murphy's work [6], perhaps one the first to deal specifically with Historic Building Information Modelling. He Defined his PhD work as a novel prototype library of parametric objects, based on historic architectural data, in addition to a mapping system for plotting the library objects onto laser scan survey data. Briefly, this HBIM sample process begins with remote collection of survey data using a terrestrial laser scanner, then followed by the processing of the laser scan survey data to generate ortho-image and segmented point cloud data for mapping of library objects. The next stage involved the design of new shape and parametric rules for the construction of a library of objects that are based on 18th century architectural pattern books. Finally, HBIM can automatically generate conservation documentation in the form of survey data, orthographic drawings, schedules and 3D CAD models, both for the analysis and for the conservation of historic objects..

3. The historical strata of the V Pavillion of "Torino Esposizioni" as multidisciplinary case study (EB)

The V Pavillion of Torino Esposizioni is an underground exposition building, designed between 1958 and 1959 by the famous prestressed Italian Engineer Riccardo Morandi [7] (better known for his realization of the iconic bridge of Maracaibo bay in 1957) and the Director of that time of the Office "Servizi Costruzioni e Impianti Fiat" Vittorio Bonadè Bottino. The project was carried on by the Society "Torino Esposizioni" owner of the near and huge spaces already drawn between 1949-1950 by the other great protagonist of the Italian experience in concrete structures, Pier Luigi Nervi [8] and Ettore Sottsass. "Torino Esposizioni" Society was searching since the middle Fifties new spaces for its annual car exposition, attracting every year many people all over the world in Turin, presenting itself as key economic player in car industry.
The difficulties in founding big open areas around Nervi's project, prompted the Torino Esposizioni Society looking at the near void areas of the "Valentino" Park, where the license gave in 1934 to the "Società Ippica Torinese" for its horse riding activities was expiring in 1958, proposing to the Mayor of the City Amedeo Peyron a new economically profitable utilization of the areas, creating an exposition cluster of different pavilions.
The utilization of these areas addresses the question of the stratification of the historical purposes of a transforming industrial city like Turin that, since the Nineteenth Century, trying to expresses itself as the main industrial player of the country, has obviously changed many times its urban image. This process has occurred by continuous demolitions and new projects submissions, intending the peripheral area of the "Valentino" Park as spaces for consumption more than the nowadays theoretical framework of patrimonialization, forgetting the historical layers delivered to us.
For this reason is necessary to understand the background of the "Valentino" Park that has hosted between Nineteenth and Twentieth century, exactly in the area of the V Pavillion, many international exhibition (in 1884, 1898, 1902, 1911 and 1928), showing itself more as an creative hub than as a natural resource for the city.
For example in the specific area now occupied by the V Pavillion since 1872 to 1933 persisted an artificial lake made up for winter skating and rowing leisure during the hot seasons [9]. This utilisation had many interruption due to the International Exhibitions, transformed and covered due to miscellaneous purposes. The nearby university of the Polytechnic of Turin, using its water for hydraulic experiments, compromised its function and in 1933 was substituted by the above mentioned "Società Ippica Torinese" that was formed in 1932.
The history beyond the site of the V Pavillion suggests a research that, despite compressed in less the one hundred years, recalls an archaeologist approach. In the practical operation of reviving all the different utilizations, it's possible to reconstruct also the reasons why the city has always sees this area intending leisure in a consuming way.
In this way, at the beginning of the 1958, emerged a contraposition showing on one side the "Torino Esposizioni" Society, Fiat Company and the city local government supporting the new initiative for a new exposition building, and on the other the Agency for the Historical preservation that officially neglected the permission for a new construction. "Torino Esposizioni" Society was searching for a concession from the local government that, at that time, was giving its political support. The opposition was carried on by

the former Director of the Agency Arch. Umberto Chierici, that expressed a negative judgement based on the necessity to preserve the natural landscape of the Park that could have been completely destroyed its identity by reducing the available green areas. The political and institutional battle around the construction assumed hard tones and, in front of the difficulties on carrying on the project, the Director of the Society “Torino Esposizioni” even faced the possibility to move to other cities the annual car exposition with a certain economical effects for the city image. But an important effect that emerged by this contraposition is the effort made by the Società Costruzioni Impianti Fiat, in overcoming the position of the preservation agency in proposing different solutions for the new building, finding consensus through different architectonic image. In this way there were proposed five solutions that, starting from a building over the ground, gradually moved to a completely underground space, defending the green spaces. Thanks to these attempts in 1958 the “Torino Esposizioni” Society found a positive counsel from the Ministry of Education (responsible at that time for landscape and heritage matters), despite at local level persisted an hard opposition. The final response, achieved with a long political discourse at national level, combined all the contradictions over the underground project, acceptable for maintain the image of the landscape, but risky in its long term economic vision [10].
Obtained the approval the engineering machine, that combined both the twenty years of experience of Riccardo Morandi in prestressed construction and “Servizio Costruzioni e Impianti Fiat” sitework organization and methodology, the project was built in the record time of six months, employing 250 people per day, and just in time for the opening ceremony of the 41th Turin car exhibition. The pavilion is the top expression of Riccardo Morandi in managing the structural grid of the balanced beam where, after twenty years of applications in many infrastructural projects, it’s applied into a building open to the public [11].
But despite the considerable elements in history of engineering and concrete construction [12], some causes generated a slow decline in the utilization of the V pavilion, emptying it of its core businesses in the following decades. Above all the inauguration of the Italy ’61 area for the celebrations of the first 100 years of the Italian reunion shifted the exhibition zone outside the Valentino Park towards a new peripheral area. Another reason has to be searched in the economical decrease of the whole industrial compound of the city, passing from the enthusiastic tones of the Fifties and the Sixties to the necessity of figuring out a post-industrial rehabilitation, where huge containers like the V Pavillion have difficulties to be maintained. In addition has to be considered the underground disposition of the building that, excluded from an integration into the urban landscape, appeared secondary to the nearby building of Torino Esposizioni facing the main streets: its dark and not so tall interior aspect resembles it more like a garage [H] than a wide trade fair centre, excluding it from many possible activities.
Remembering important fairs like FLOR ‘61 in 1961 or fixed annual event of the Mountain Exhibition since 1970, the building decline stopped in 1989 when the Society “Torino Esposizioni” didn't renovate its concession and passed the property to the City of Turin. The first decision of its transformation into public parking lot, despite its marble pavement, deeply necessitated to reconverts its spaces. The project, operated by the local transportation company ATM (now well known as GTT) in 1998, completely distorted the original image of the building, inserting new walls and covering the concrete surfaces according to fire protection laws, and closing 11 skylights on the rooftop that reduced the natural illumination of the whole building. Another important implementation came out in 2003 when it was intended to transform the covering surface of the pavilion in order to be used with public amenities. Despite some conceptual solutions thought for sports and kids gardens the final result, in order to be finalized for the Winter Olympic games in 2006, showed only the presence of a plastic green surface on the rooftop, completely not integrated with the surrounding green areas and distorting the original idea of an underground building in order of maintain untouched the surrounding park landscape [13].
The parking lot imagined during the Nineties, despite could have resolved many traffic congestion of the district, was not used enough forcing at the end GTT Company to close it to the public. This stagnation opened the debate inside the city government to find a comprehensive new utilization. The occasion resulted in 2013 when “Politecnico di Torino” and the City signed an agreement for a preliminary investigation around the topic of creating a creative cluster for a public library and the Campus for the school of Architecture in the former spaces of “Torino Esposizioni”. The intentions have to be seen in the volunteer to create along the Po river an urban axis working as collector for cultural and natural activities, an urban regeneration supported by the presence of iconic buildings searching for a post-industrial sustainable utilization. Taking into consideration the UNESCO site of the “Valentino” Castle, the former “Torino Esposizioni” building designed by Sottsass and Nervi, the V Pavillion drawn by Morandi and the many others infrastructures inside the park, they constitute a net of functions that could be reconvert in order to become strategical in enhancing the image of Turin as a cultural capital city. Politecnico di Torino, called to present a specific study for the project, inserted it in its “2014-2018 University

Strategical Plan", while a public competition promoted by the City has terminated in mid February 2016 in order to assign its development to the best architectural firm.
The recent events, following the overlapping transformation occurred on the site since the building decline, suggests the researches to focus on the creation of a strong knowledge base occurring before any modification. Only a deep consciousness on the many aspects of the different historical layers could give mean to the maintenance of identity shared with the (pursue?) of new profitable functions. Crossing fieldworks professional surveys and archive research on the processes beyond an iconic building like the V pavilion not only could scientifically preserve the modern heritage, but also gave to the future decision-maker a fully comprehensive instrument, immune from rhetorical abuses and capable of representing the intervention limits.

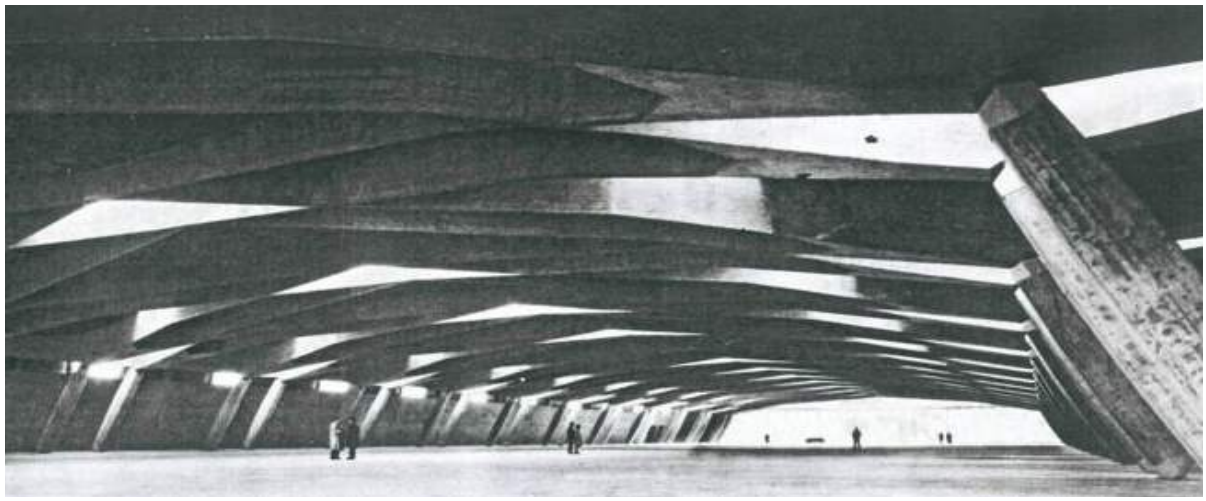

Fig. 2: Internal view of the V Pavillion in its original composition just after having finished the sitework in 1959.

4. The knowledge approach for Cultural Heritage in the Digital Age (MLT)

The process aims to critically evaluate whether the BIM approach of geometric/relational nature can contribute to the knowledge and the enhancement of Cultural Heritage, often overlooked and today involved in a dynamic upgrading work. The work consists of two parts: the first one deals with analyzing the various project proposals for V Pavilion, to define an expertise useful to better understand the design choices made by Morandi. The second part relates to the virtual reconstruction of the building following a critical path, implementable and easy to be consulted [14].

4.1 From the simulation of different solutions ....

The historical analysis began with the modeling of five solutions (with associated sub-options) proposed by the Servizio Costruzioni e Impianti Fiat in 1958, before the Morandi's solution that outlined the present structure of the room. This was done to understand which was the process that led to the genesis of the final version: through the analysis applied by a BIM model, it is easier to understand the inspiring reasons of that structure. The modeling of different solutions has been carried out on the basis of design drawings kept in the Maire Tecnimont archives. These are five solutions for a total of eight different design options, shown through a comparison between axonometric and internal perspective views. The first and the second solutions have three and two choices respectively. The first solution provided for the creation of a single level glass prism overground with three variations of the external windows.
From the second solution on we attend to a progressive mimesis of the pavilion with the Valentino park. The mimesis can be considered complete with the proposal of a completely underground hall (third solution). It was used the Light Analysis for Revit plug-in to quantify the internal natural lighting, defining the geographic location of virtual models and material consistency of the building elements.It was set the simulation of different lighting conditions, using a specific parameter taken from the LEED system by identifying the percentage of gross floor area subject enlightened, between 300 and 3000 lux at 9 am and 3 pm, during the equinoxes. The analysis was integrated with lighting conditions at the solstices, simulated by a setting range between 100 and 750 lux for the illumination of workplaces (two values derived from the Italian norm UNI EN 12464-1) to evaluate the average levels to ensure. The obtained results shows the overexposure of the first solution and the gradual reduction of the percentage of the other ones, however, contained into acceptable ranges.

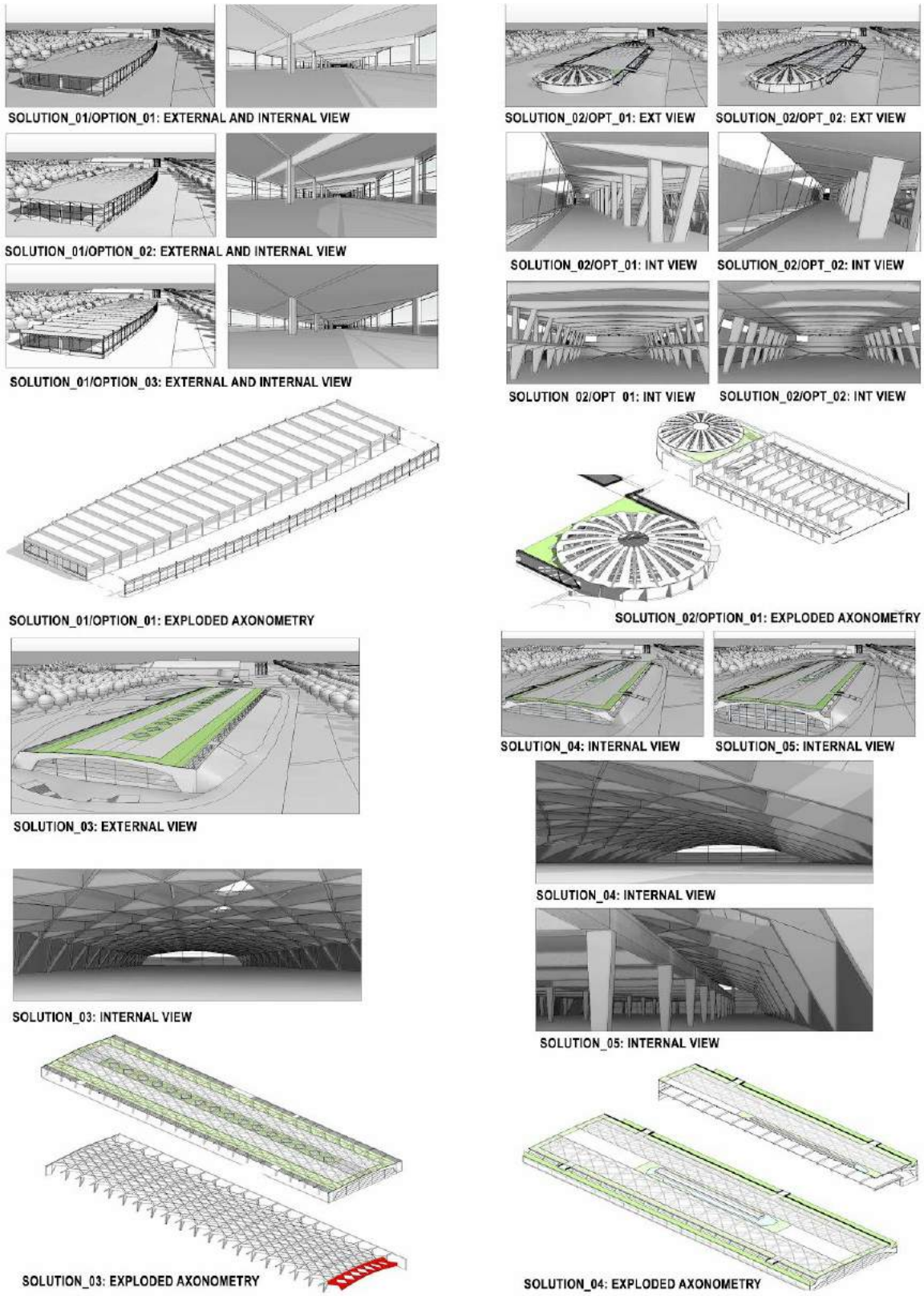

Fig. 3: The different solutions (and options) compared together using bird's eye views, internal perspectives and isometric views derived from a single BIM model able to collect such data.

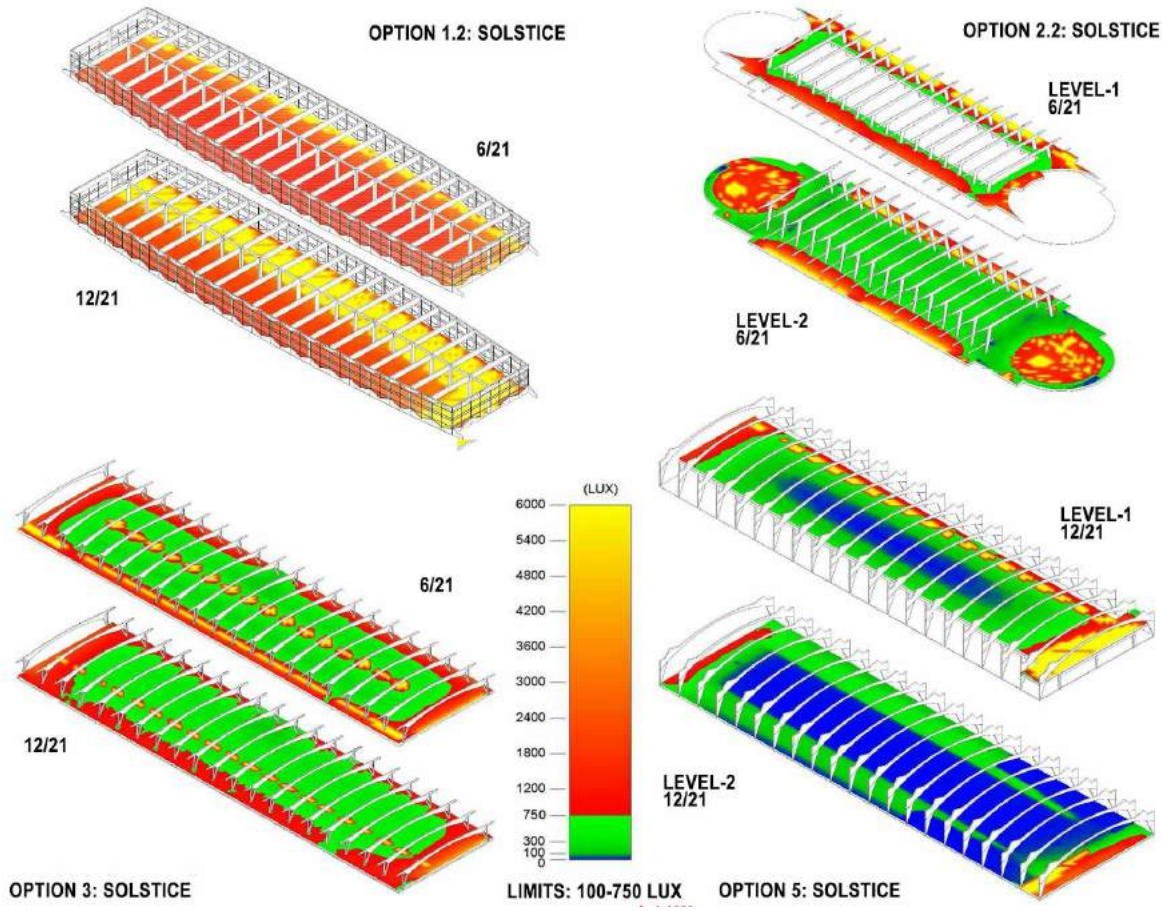

Fig. 4: Lighting analysis of the interior of some proposed design solutions.

4.2. .... up to the modeling of the status of art

The survey of a typical structural span has been conducted to model the actual state of the pavilion, relying on symmetry and the modularity of the building, through digital photogrammetric techniques [15]. They were taken 175 photos, divided into four series (at increasing distances and variable angles) related to the selected span. The frames were then processed with Agisoft PhotoScan software that interpolates set of three frames to extract the common points. Each point is characterized by three spatial coordinates and the RGB code. The software showed a 0.56% error: this percentage is contained within the graphic error; so, it can be considered acceptable for the level of detail used in the representation scale 1: 200 [16].

The obtained point cloud represents the spatial reference for modeling: for the inclined connecting rods it was made a comparison with the measures of the original drawings. The references have been imported into Autodesk Revit: using several elevations above the floor level, the silhouettes have been identified, allowing to create the volume of the connecting rods. The measures confirm that the slope of the connecting rods is identical to which indicated in the original drawings, while it was registered a difference of 4 cm in the distance between the support surface of the pillar and the one at the hinge. This error (equal to 0.9% of the entire length) can be considered an acceptable value because of the adopted representation scale. Regarding to the measurement of the width of the hexagonal generating silhouettes of the connecting rod, it also highlights a variable deviation between 1 and 3 cm: this value is comparable to the thickness of fire-retardant foam with which the GTT (Gruppo Torinese Trasporti) in '96 has plastered the pavilion structures to make them fire resistant. A similar process involved the modeling of the roof beams: the point cloud was overlaid on digitized original drawings: referring to the indicated sections were defined 19 different sections, and for each section it was analyzed the correspondence between the original drawings and the spatial coordinates of the point cloud to define the elevation of the soffit of the beams. Particular attention has been paid in the modeling of the hedge element, subjected to multiple interventions over time. The BIM model allows to relate the digital model with three time phases, corresponding to the most significant interventions that involved the pavilion: the project of 1959, the transformation and the related functional adaptation in the car park and the municipal reorganization in 2006. In each view (graphic or alphanumeric) the number and type of the elements provided for a given operation can be displayed, highlighted and counted: for example the closure of low skylights only

appear in schedules of 1996; the same for the iron grills that allow natural ventilation created by the GTT and for the transformation of the skylights: the original drawings were used to understand the technological details of the low skylights closed in '96 and those defined as "high", for each stage of processing; as known, the BIM platform allows to assign a creation and a demolition phase to each modeled component. The study of the levels of internal lighting of each transformation of the V pavilion followed the same criteria described for the analysis of previous solutions; in fact, this drew attention to a substantial decrease of lighting levels after GTT's adjustment works: the closure of more than half of the skylights has significantly decreased the internal visual comfort.

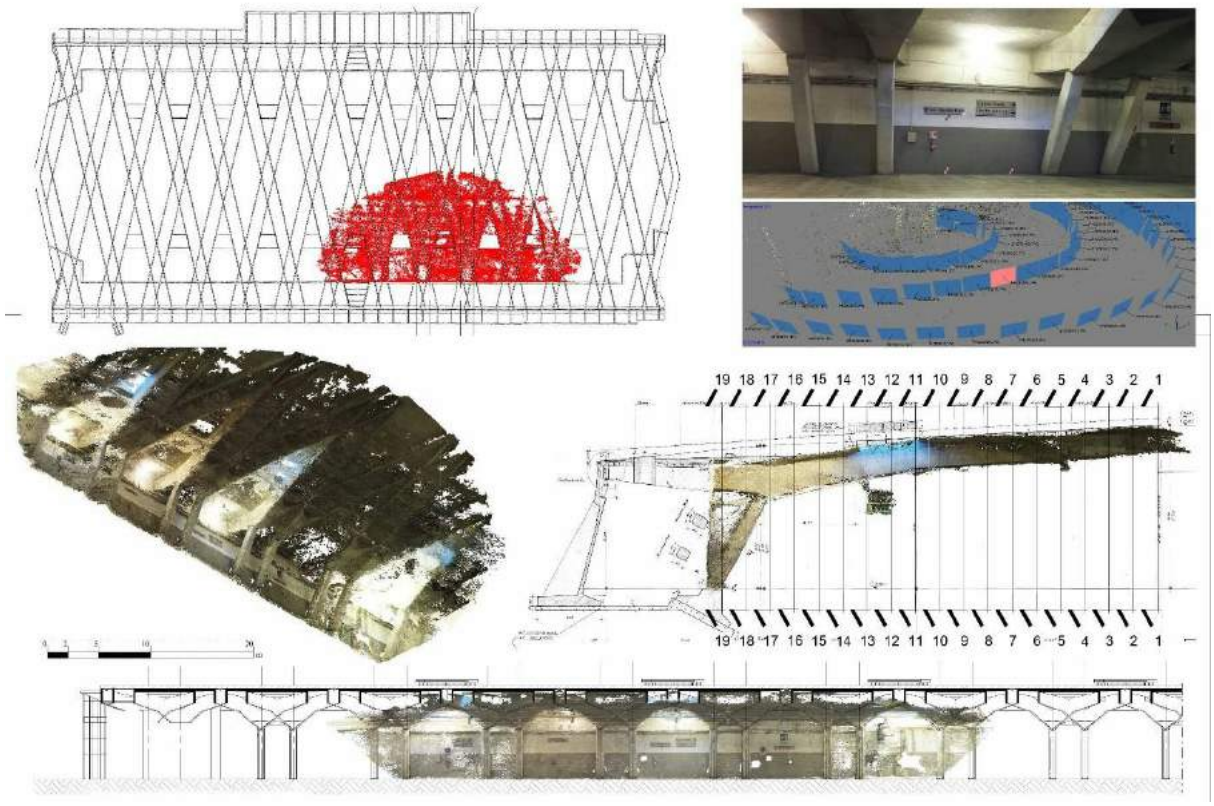

Fig. 5: A summary of the selection and measurement of spatial coordinates with reference to the inclined connecting rods of V Pavilion.

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5. The new central role of Drawing: ideas for future research (MLT - EB)

At the end of the modeling process we have worked on the database to organize the different information gathered. All documents used for modeling, in fact, have been linked to their virtualized components, associating an image parameter to the different elements categories. This implementation allows to link together in a unique virtual environment the various original sources, often kept in institutions or funds not always available. The virtual reconstruction permits multiple queries and the production of thematic drawings (such as the identification of the different measurement instruments, the evaluation of the types of degradation, the fourth dimension control, etc...). The ideal development of the research work will help to create a sort of maintenance booklet, useful throughout the building lifecycle; in addition, the next transformation of the Pavilion will be certainly more aware and compliant if compared to the previous interventions.

From the operational point of view it is easy to foresee a significant improvement on data management, through procedures able to make effective the collection of several information, from earlier stages of design and construction (vertical integration) up to processes that belong to different areas of Facility Management (horizontal integration services). The aim is to make even closer the relationship between the maintenance schedule and the set of design and construction documents tools for the definition of new government rules of the building process [17]. At this regard it seems feasible to figure out some future integration between the documents produced by the examined digital techniques and the current methods of cataloging and management of cultural heritage, with a particular reference to the guidelines defined by the Istituto Centrale per il Catalogo e la Documentazione.sponsored by the Ministero dei Beni e delle Attività Culturali e del Turismo, that is the responsible for the definition of standard protocols for this specific topic.

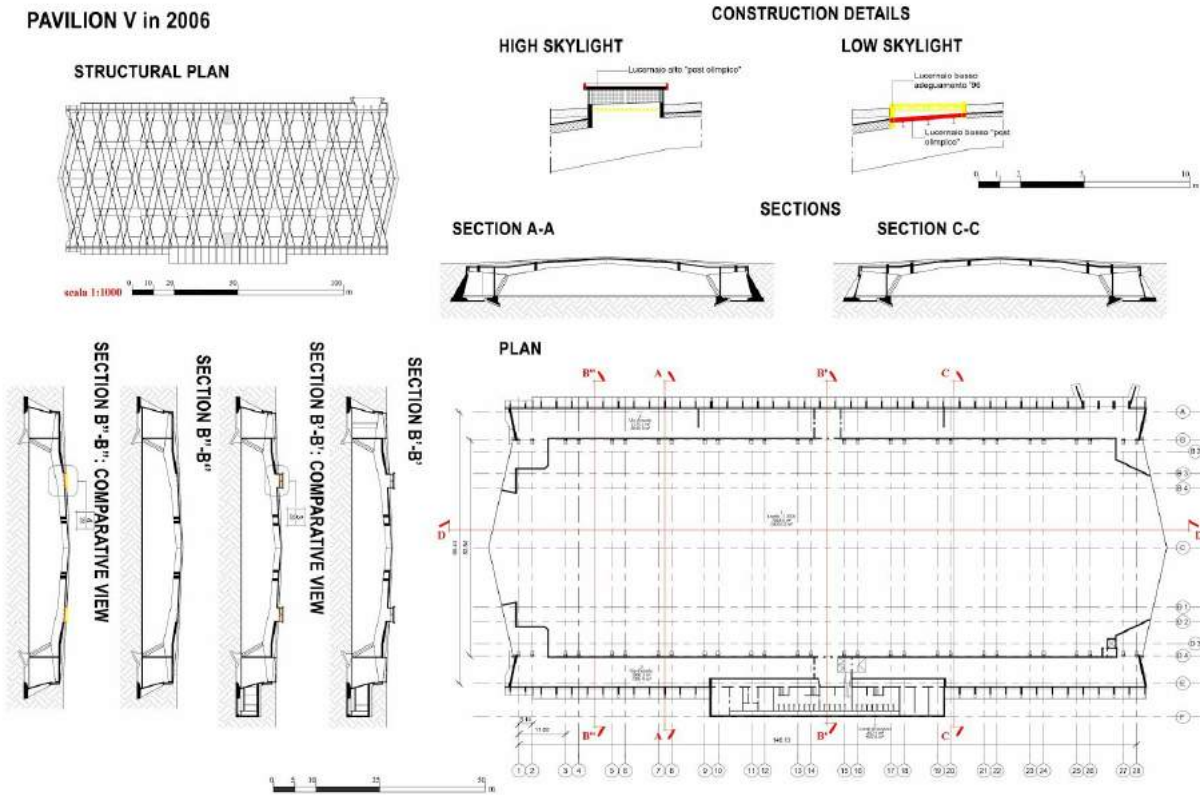

Fig. 7: Digital reconstruction of V Pavilion in 2006: plans, sections and construction detail filtered by thematic views (red: new constructions, yellow: demolitions) obtained by the BIM model.

The cataloging system currently used is based on the use of schedules that contain documentary, geographical or technical informations, linked in a dynamic way to other more specific ones, together with more digital and archival contents. A parametric model is able to contain multimedia and documentary information, allowing to relate them to three-dimensional objects that can be compared with the actual building: an update of the architectural heritage schedules could make use of a link useful both to a virtual exploration of the building and to relate together graphical and tabular documentation obtained from the 3D model. Data accessibility and communication may finally be rationalized according to different profiles, from purely educational purposes to the most specialized procedural uses. According to this, it is crucial to make a general thought on the methodological accuracy: at this regard, the London Charter [18], defines the principles to be followed for the three-dimensional representation of the Cultural Heritage, in line with the values of transparency, communicability and repeatability of the methods and results of this modeling process. We agrees to state that "*knowledge is the first stage of conservation*" [19] and the conducted research corroborates this assumption. The opportunity to set up database in situ, even by less experienced users, significantly reduces the costs (of survey, drawing, design, construction and maintenance) because the data is not duplicated on the various applications and the information is no redundant, since it is a simple query of a shared virtual space. So, this guarantees a repeatability of the scientific process where the variable element is the data, the fixed one is the process [20]. From a more scientific point of view, the application of these principles will allow to address and define a methodology for the knowledge (and the representation) of the Cultural Heritage that makes the virtual reconstruction, the processing and communication of data more transparent. It is therefore proposed a reflection on the infographic drawing, leading to a new form of design, and expanding the frontiers of our discipline. The concept of cultural dimension is thus a greater formal qualification in a permanent relationship between architectural space and information space.

Acknowledgements

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Le Vie dei Mercanti XIV International Forum
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Strategies for the Sustainable Renovation of Existing Residential Buildings: a Case Study of an Industrialized Public Building in the Florence Area.

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The European Directive 2010/31/UE requires to intervene on the existing buildings, hugely polluting and with a low energy efficiency. Indeed the building sector accounts for about the 40 of total energy consumption in the Union. In Italy 70 of existing buildings presents a low record of energy efficiency, hence a high rate of saving can be achieved especially through the redevelopment of the building envelope and installations. Our work is focused on some possible strategies to be applied on a particular class of existing residential buildings. The class chosen for the study is representative of our environmental context and emblematic in the application of industrialized and prefabricated building techniques in Tuscany, especially in the Florence area. The object of this work is a public residential building located in Prato built with industrialized techniques during the '80s. This building is representative of a large number of interventions made by IACP Institute for residential public buildings in Florence from 1979 to 1987. This paper shows the results in terms of energy saving and internal comfort after the application of strategies meant to fit the climate and the main building features. More in detail the strategies will be focused both on the reduction of the energy demand for heating and the overheating during summer. Taking the latter into account we tried to consider the real behavior of the occupants in windows opening and how this can influence the internal comfort.

Keywords: social housing retrofit, prefabricated and industrialized techniques

1. Introduction

The problems inherent in buildings restoration are particularly felt in the suburbs of most Italian cities. The huge quantity of public housing built from the '60s to the '80s, in response to a pressing need to create housing quickly and with limited financial resources, is now in urgent need of redevelopment. Moreover the living conditions of these buildings, at times realized using poor materials and techniques, require adjustment in order to obtain higher internal comfort conditions and a better energy saving. In the redeveloping project, the designer is not allowed to intervene in some aspects, such as the choice of the site or exposure and also the choice of the layout of rooms, doors and windows, because the urban context is already pre-established and the constructions are existing.
In addition, constraints and limitations imposed by local regulations further reduce the possibility of transformation. From the energy point of view as well, the active and passive strategies, that can be realized to achieve better energy savings, are reduced compared to "ex novo" construction, as well as the technical solutions. The renovation of the housing stock is therefore a complex issue in which technological and operational, architectural and urban, economic and political aspects converge.
In Europe many renovation works in residential public complexes were carried out, starting from the rehabilitation at the neighborhood scale, then at the building scale, until arriving at the flat scale [1]. The majority of these interventions aims at reducing the energy demand and heat losses in Winter, improving the performance of the envelope adding an insulation layer on the facades, changing the windows with better performing ones, replacing the internal implants and the passive and active exploitation of the solar energy (solar greenhouses, solar thermal and PV system, etc).

This paper analyzes some renovation strategies at the building scale of public residential building located in Prato, Florence area, made with industrialized techniques. This work is a part of a study conducted by the building technology research group of the Civil and Environmental Engineering Department of Florence aiming at validating a design procedure for the sustainable refurbishment of public residential buildings realized with prefabricated and industrialized systems, located in Tuscany, and built during the '70s and '80s [2]. The choice of these buildings depends on the great documentation about these constructions coming from the 'Casa SpA' Archive and also on the possibility to extend the research results to the contemporary constructions built on private initiative, that present the same characteristics of the sample cases.

2. Methodology

The methodology followed in this work is structured according to these points:

- analysis of the case study:
  - study of the environmental and technological system of the building in exam with the aim of identifying typical characteristics and issues;
  - analysis of the building behavior in terms of energy consumption, paying particular attention to the internal comfort conditions (BASE CASE);
- application of the best strategies considered the most suitable according to the results that came to light from the BASE CASE analyses:
  - STEP A: improvement of the envelope thermal performance: application of an insulation layer on the facades and windows replacement;
  - STEP B: changes in the number of air exchanges (natural ventilation due to the windows opening by the user) in the Energy Balance, in relation to the user types (we consider the "new" envelope from STEP A);
- synthesis of the results and comparison between the BASE CASE and STEP A-B.

3. The case study

The intervention area is located in Iolo, in the city of Prato, and consists of two linear buildings situated on a secondary street perpendicular to the main roads connecting the suburb to the city centre.

3.1 Analysis of the environmental system

The buildings are oriented mainly along the east-west axis, perpendicular to the main roads, as well as other neighboring properties. The constructions are linear with the classical rectangular shape, placed symmetrically to the central appurtenance zone axis. They differ mainly by size: building A has an extension of approximately 65m, while building B has a length of 53m, but both present the same depth of about 11m. The entrances to buildings occur from the central courtyard, in which two strips of parking places are placed along both buildings and a private road marked by two green spaces that separates both traffics (vehicles and pedestrians). The areas behind the buildings are reserved to private green areas. The housing accesses occur through the stairwells situated on the main and secondary front of both buildings.

Fig. 1: photo on the left**:** Building A. Picture on the right: general plan on which the buildings and their denomination are highlighted.

In this paper only Building A will be analyzed in detail. It hosts 32 apartments arranged on 4 floors with 8 units on each one. It features the ground floor used as cellars, porches and entrance areas. The free areas are located at the ends of the building and at the main front, in correspondence of 2 blocks of 8

cellars each one and to which we may access through passages created on the lateral walls of the stairs case.
The building presents 4 stairwells that connect the 4 floors. The type of structure used allows an easy distribution of units. Each stairwell is used by 2 units of different sizes: accommodation type A (4 users, about 70m^2), accommodation type B (3 users, about 60m^2).

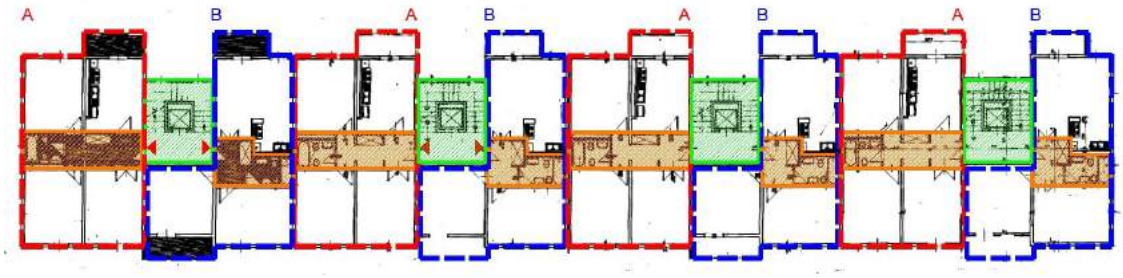

Fig. 2: Typical Floor Plan – Building A.

3.2 Analysis of the technological system

The structure adopted for the buildings in question is made with the tunnel forming method [3] which consists of reinforced concrete walls and reinforced concrete slabs (lightened with polystyrene), both of them casted in situ with an industrialized system of formworks. This method is characterized by the use of a particular type of metal fixtures and consists of large formworks with a "reversed U" shape (entire tunnel), or even a "reversed L" (middle-tunnel) that will then be coupled to form the U. The external walls are made up of reinforced concrete with 15cm of thickness and an internal counter-wall thick 5cm of type PLACOMUR (polystyrene insulation glued to the supporting wall and plasterboard panel coating). The interior partitions in plasterboard are 10cm thick and all interior plaster are made up of gypsum. The insulation is also included within the staircase and attic walls. The lower surface of the reinforced concrete slab (15cm thick) between the first and ground floor consists panels of ERACLIT (mineralized wood wool insulation panel) with thickness 3.5cm and scratched plaster finishing, glued to the intrados of the slab. The attic floor is made up of reinforced concrete slab 15cm thick and completed with the insertion of concrete LECA (lightweight aggregate of expanded clay) thickness 5cm, above the slab itself. The roof consists of concrete slab covered with slate tiles like Eternit. The slab is placed on hollow clay planks supported by small walls, placed on the attic floor, following the slope direction. The heating system is autonomous with a predisposition for a methane boiler for each single apartment and a simple distribution system of radiators.

3.3 Energy analysis BASE CASE

The energy analysis of the building was conducted in dynamic conditions (performed on an annual basis with an hourly computational step). The simulation software used for this purpose is TRNS S-Trnbuild. This simulation tool allows to evaluate the energy behaviour of a building and the relevant plant system. The building model was obtained by splitting the construction into 3 different types of thermal zones: cellars (no heating system), stairwells (no heating system) and flats (heating system). Each thermal zones has different boundary conditions. In order to carry out the building model it was necessary to evaluate the input data (see Tab.1): climate data, internal gains due to the occupants and lighting, thermal capacity of the building elements, along with their surfaces and infiltration values (number of air exchanges due to both windows opening and air leakages of the envelope).

Climate data	Weather files IGDG	
Internal gains	100 Watt per person	
Thermal capacity of the building elements (and surfaces)	External walls	U-value: 0.687 W/m^{2}K
	First floor slab	U-value: 0.694 W/m^{2}K
	Attic floor slab	U-value: 0.850 W/m^{2}K
	Windows	U-value: 2.830 W/m^{2}K
Infiltration	N vent 0.5 n/h of air exchanges [4]	

Tab. 1: Input Data for the base case simulations.

From the base case simulations we were able to evaluate the comfort conditions (temperature and indoor relative humidity) inside the apartments and the energy demand for heating, through the sum of all sensible heating loads of the heated thermal zones. The evaluations were carried out for a season of actual heating, that is for the period during which it is necessary to provide heat for maintaining a temperature inside the building not lower than the project one (20°C [4]). Heat losses during the year (Q_trans: heat losses for transmission through the envelope; Q_inf: heat losses for infiltration) together with internal gains (Q_int: internal gains due to occupancy and lighting; Q_sun: internal gains due to solar radiations) were estimated in order to assess the sensible energy demand for heating during the year.

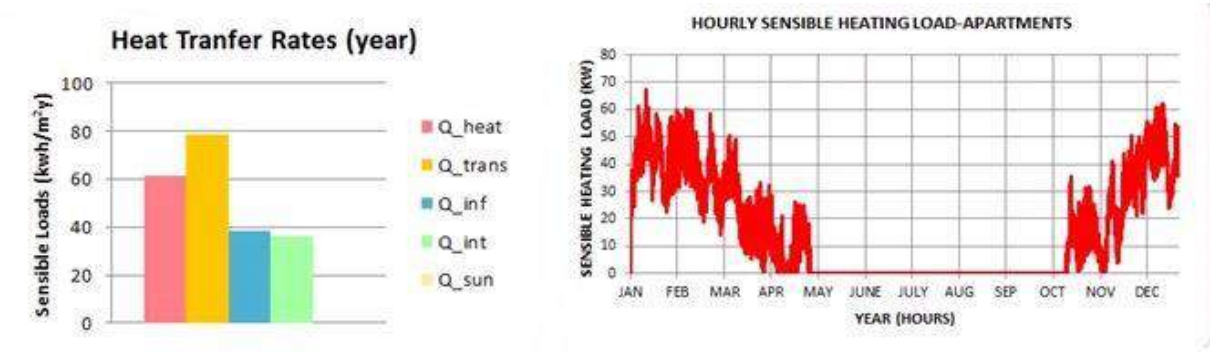

Fig. 3: picture on the left**:** heat losses, internal gains and energy demand for heating (Energy Balance during the year for the apartments). Picture on the right: hourly sensible heating loads.

The simulation results have highlighted elevated values of sensible energy demand for heating (Q_heat), due to heat losses from the envelope (building elements with a low thermal capacity) and to heat losses for infiltration (taking into account N_vent 0.5 number of air-exchanges per/hour, that is a minimum value for a good indoor air quality in residential buildings, considering the natural ventilation. For what concerns the thermo-hygrometric comfort inside the flats both the summer and winter season have to be considered. According to the European standards [5], the comfort conditions are:

-Winter: Temperature: 20°C; Indoor Relative Humidity (RH): 50 ;
-Summer: Temperature: 26°C; Indoor Relative Humidity: 50 .

In most homes, in Summer, the indoor humidity is kept within the comfort range by high levels of natural air exchange and by operation of the central cooling system and its associated moisture removal. In our case there is no cooling system, therefore it is important to evaluate both internal temperatures and RH values.

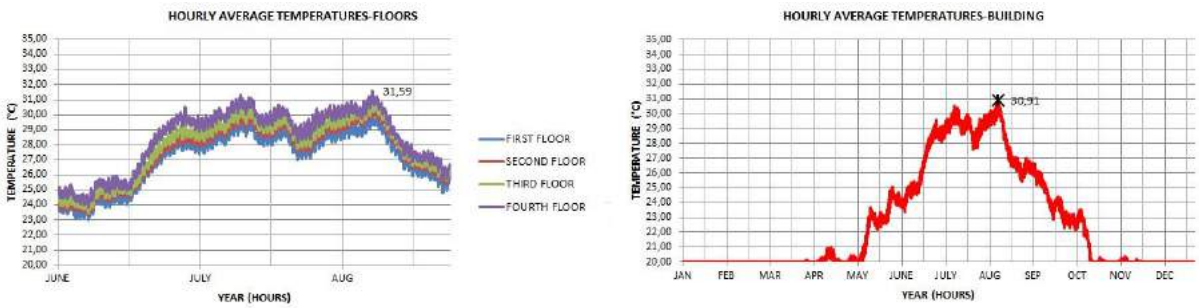

Fig. 4: Picture on the left**:** hourly trend of temperatures during summer months, averaged across all the apartments per floor. Picture on the right: hourly trend of temperatures during the year. Average values of the whole building.

BUILDING T□VALUES□BASE CASE										
	FLOOR□T □□C□								BUILDING	
	1		2		3		4			
	mean	max	mean	max	mean	max	mean	max	**MEAN T □□C□**	**MA□ T □□C□**
JUNE	25.2	31.5	25.5	30.5	25.8	30.6	26.4	31.5	25,7	31.5
JUL□	28.4	32.2	28.9	31.8	29.2	31.6	29.8	32.4	29.1	32.4
AUGUST	27.8	32.2	28.3	32.1	28.6	31.1	28.9	**32.7**	28.4	**32.7**
mean □ hours T□26□C (year)	45.6□		50,6□		52.4□		**55.7□**		51.1□	
mean □ hours T□28□C (year)	26.2□		31.8□		34.9□		**38.7□**		32.9□	

Tab. 2: Temperature values averaged across all the apartments for each floor during the three worst months during summer.

As we can see in the tab.2 the worst internal conditions are at the fourth floor, arising values of almost 33□C in August. The mean temperature values vary during Summer (we consider the worst months during Summer, June-August, according to the climate zone in exam) between 25□C and 28□C. Moreover we evaluated the proportion of the year with indoor temperatures above 26-28□C. The floor with the highest value of hours above 26-28□C is still the fourth. Almost the 60□ of hours during the year has temperatures values above 26□C (obviously this occurs during summer period). We then assessed the average indoor relative humidity inside the apartments and the proportion of the year with indoor relative humidity above 60□ and 70□, as this is the primary metric used in the literature to evaluate humidity problems and interventions, as well as the proportion of the year with RH below 30□, when the air is too dry for human health.

	May-Sep	Jan-Apr Oct-Dec
MEAN □ HOURS□RH□60□	37.9□	25.8□
MEAN □ HOURS□RH□70□	9.3□	11.8□
MEAN □ HOURS□RH□30□	/	11.7□

Tab. 3: Average proportion of the year with RH□60-70□ and RH□30□.

The percentage of the year with levels of RH□60□ or less than 30□ is not high. These are average values across all the apartments during Summer and Winter, and the worst value is in Summer, as we could expect, but the highest mean values of RH occur during the shoulder seasons (May-June, September-November). It means that a possible installation of a cooling system and its associated moisture removal, not being in operation in these months because internal temperatures are still too low, it would not contribute to solve the issue of indoor humidity by the way.

BUILDING□RELATIVE HUMIDITY□VALUES□BASE CASE					
MONTHS OF THE □EAR	FLOOR□MEAN RH □□ □				BUILDING MEAN RH □□ □
	1	2	3	4	
MA□	59.12	60.57	59.35	56.30	**58.83**
JUNE	63.10	63.57	62.00	58.86	**61.88**
SEPTEMBER	62.53	62.62	61.40	59.60	**61.54**
OCTOBER	61.97	62.79	62.00	60.69	**61.86**
NOVEMBER	57.05	59.02	58.46	57.03	**57.89**

Tab. 4: Monthly average RH values of the building.

In summary, the issues highlighted previously are:
- in Winter: a high value of the buildings energy demand for heating;
- in Summer: high temperatures inside the apartments, compared to the actual comfort standards.
This suggests that these buildings, as well as having high energy consumption in winter, also require cooling in summer.
The recovery strategies, suitable to the building, have to solve different issues according to the two different seasons:
-in Winter: to minimize heat losses, due to both the transmission through the envelope and due to the infiltration/windows opening;
-in Summer: to ensure a good cooling in order to improve the thermal-hygrometric internal comfort, trying to increase natural ventilation avoiding the use of cooling systems, paying particular attention to not worsen the indoor humidity. Indeed the increase of air exchanges between outdoor and indoor, can transport water vapor into or out of the home, depending on the difference between the level of outdoor-indoor humidity ratio (the ratio between the actual mass of water vapor present in moist air to the mass of the dry air) [6]. If it is more humid outside than inside, providing more air exchanges lead to moisture transport into the house; on the contrary if it is more humid inside than outside, the increase of air from outdoor leads to moisture removal from the house, that is good when inside it is too humid, but not when it is already dry.

4. Renovation strategies

According to the BASE CASE results, the next sections will be focused on the strategies suitable to solve the energy issues of the building.

4.1 STEP A

The first step was the application of an insulation layer on the facades and the substitution of the windows. The choice of these measures depends on the fact that they are the most common strategies used for the recovery of this type of buildings because of their simplicity in the application and their minimum costs compared to other complex strategies (we are dealing with social housing).
The insulation chosen for the recovery was an EPS (expanded polystyrene) panel 10cm of thickness.
The building model in Trnsys was updated with the new type of external walls and windows:

	Before the recovery	After the recovery
External walls	U-value: 0.687 W/m^{2}K	U-value: 0.213 W/m^{2}K
Windows	U-value: 2.830 W/m^{2}K	U-value: 1.400 W/m^{2}K

Tab. 5: New U-values of the building elements after the intervention.

The number of air-exchanges considered in the model was still 0.5/h, taking into account an average value for a good indoor air quality inside the apartments (according to the European legislative standards). This first strategy has solved the issues of heat losses and has enhanced the performance of the buildings envelope. The fig.5 shows the Energy Balance of the flats during the year. highlighting a decrease of heat losses due to the transmission through the envelope (Q□trans), but an increase of heat losses for ventilation (Q□inf). Indeed the addition of an insulation layer on the facades leads to an increase of indoor temperatures, in Summer, (see tab. 6), raising the difference between outdoor and indoor temperatures and consequently the heat exchanges for ventilation/infiltration (Qinf) [4], in the annual balance:

$$Q_{inf} = H_{ve} * (\Theta_{int} - \Theta_{ext}) * t \quad \text{where} \qquad (1)$$

Hve□ global heat exchange coefficient for ventilation for each thermal zone (W/K);
Θint□ indoor temperature (□C);
Θext□ outdoor temperature (□C);
t□ computing time (h).

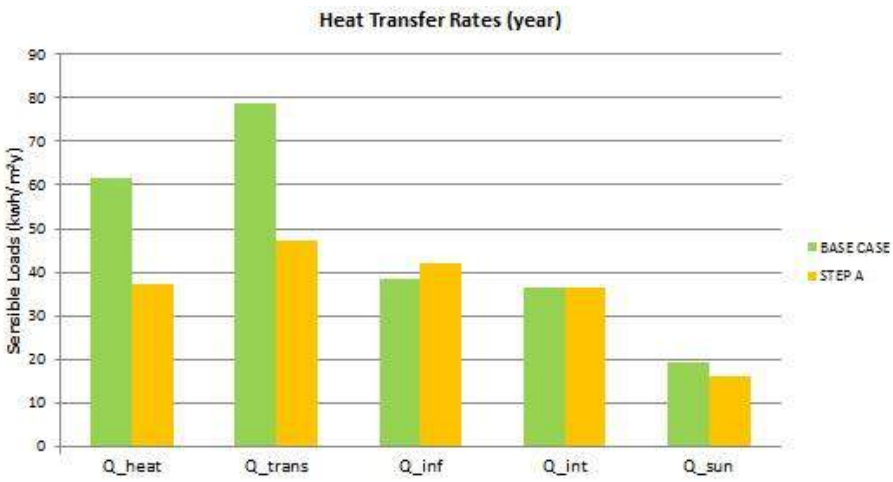

Fig. 5: Comparison between the energy demand for heating in the BASE CASE and STEP A. (Energy Balance during the year).

On the other hand, it has not improved the thermal comfort inside the apartments. Indeed the proportion of the year with temperatures above 26-28□C suffered an increase of almost 20□, and the mean temperature values an increase of almost 2□C, with the maximum value, despite the previous case, on July at the second floor (34.2□C against 32.2□C measured at the same floor in July).

BUILDING T□VALUES□STEP A										
	FLOOR□T □C□								BUILDING	
	1		2		3		4			
	mean	max	mean	max	mean	max	mean	max	MEAN T □C□	MA□ T □C□
JUNE	26.5	33.3	27.1	32.4	27.4	32.1	27.9	32.6	27.2	33.2
JUL□	29.9	**34.2**	30.7	33.5	31.7	33.3	31.6	33.7	30.8	**34.2**
AUGUST	29.4	34.1	30.3	33.6	30.6	33.7	30.9	**33.9**	30.3	**34.1**
mean □ hours T□26□C (year)	61.6□		69.9□		72.9□		**75.3**□		69.9□	
mean □ hours T□28□C (year)	39.8		49.4		51.8		**53.6**□		48.7□	

Tab. 6: Temperature values averaged across all the apartments for each floor during the three worst months during summer.

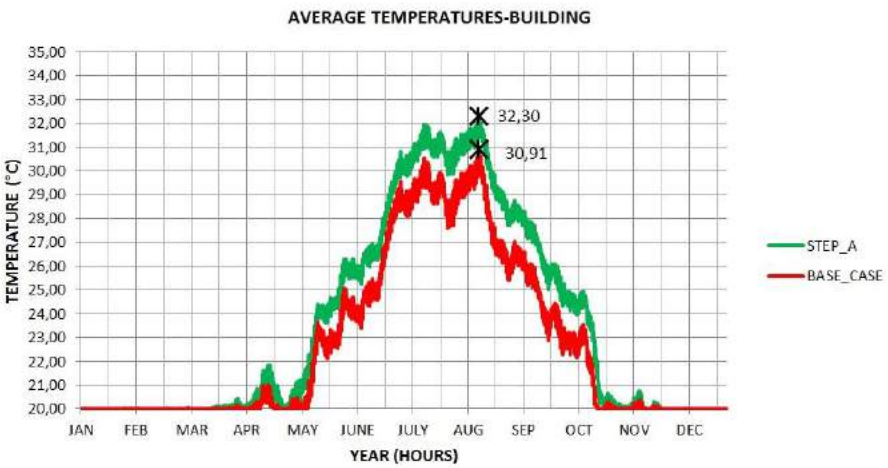

Fig. 6: Comparison between the average temperatures during the year in the BASE CASE and STEP A.

For what concerns the levels of indoor relative humidity we have an improvement especially during the shoulder seasons, with a decrease of the mean RH.

MONTHS OF THE □EAR	**BUILDING MEAN RH BASE CASE □□ □**	**BUILDING MEAN RH STEP A □□ □**
MA□	58.83	54.35
JUNE	61.88	56.32
SEPTEMBER	61.54	54.75
OCTOBER	61.86	57.10
NOVEMBER	57.89	57.07

Tab. 7: Average RH during shoulder months in the BASE CASE and STEP A.

4.2 STEP B

The results from the previous analysis led us to manage strategies to lower indoor temperatures. As mentioned before, we used an average value for the number of air exchanges (N□vent□ 0.5 n/h).
For this purpose, aiming at reducing the overheating during Summer, we tried to vary this value related to the 'real' behavior of the occupants in windows opening. We considered two different users: USER 1: occasionally at home; USER 2: always at home. Therefore we created different hourly profiles of number of air exchanges (N□vent) for both of the users and differentiated according to the seasons. The values considered for the users were the same, the variable was only the hour when this value was taken into account, depending on the different occupancy levels:
-MAX VALUE: N□vent□ 2 n/h (in Summer);
-MIN VALUE: N□vent□ 0.2 n/h (in Winter).
These schedules were assigned to the different apartments in the building model, after interviews with the occupants, so that to simulate a more realistic building usage.

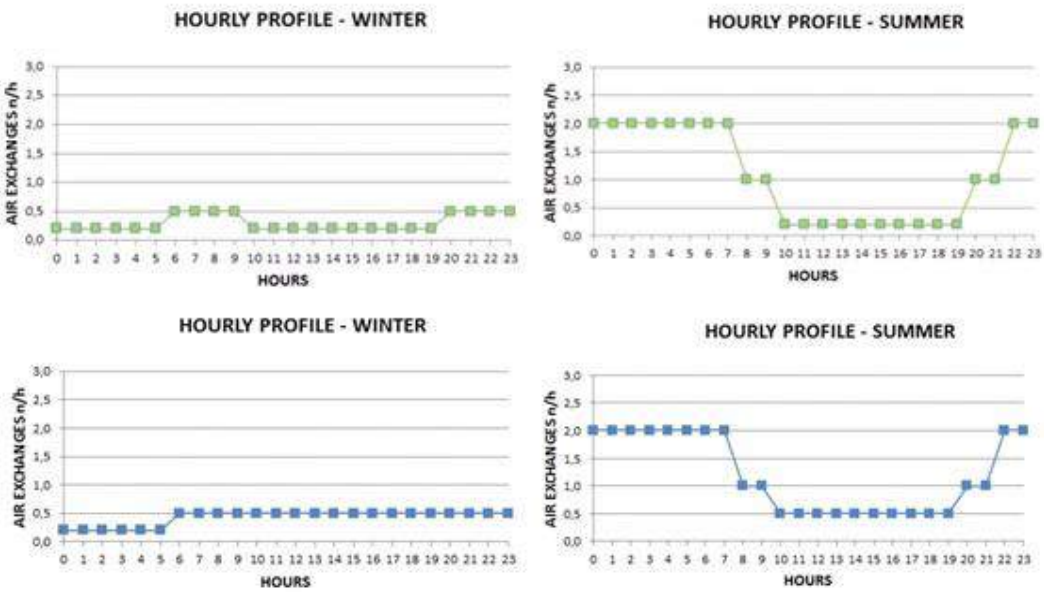

Fig. 7: In green hourly profile of N□vent of USER 2 and in blue hourly profile of N□vent of USER 1.

The average value of air exchanges during the year, considering these hourly profiles, is around 0.7 n/h that is close to the legislative standard (0.5 n/h).

	N□vent SUMMER (mean value)	N□vent WINTER (mean value)	N□vent □EAR (mean value)	Global mean value N□vent
USER 1	1.15 n/h	0.43 n/h	0.79 n/h	**0.72 n□h**
USER 2	1.00 n/h	0.31 n/h	0.66 n/h	

Tab. 8: N□vent differentiated according to seasons and users.

The energy demand for heating decreases compared to STEP A (almost 6KWh/m^{2}y). This is due the lower value of air-exchanges in Winter that decreases the heat losses for ventilation.
On the other hand the heat losses for transmission through the envelope decrease. In this value there is the contribution of the summer season. Indeed Q□trans is calculated by means the equation (1), where instead of global heat exchange coefficient for ventilation for each thermal zone, there is the global heat exchange coefficient for transmission (Htr), but the difference between outdoor and indoor temperatures is lower than in the previous case, further reducing the heat losses through the envelope (taking into account the Energy Balance during all the year and therefore considering the Summer). Instead, the heat losses for ventilation are almost the same in both cases, even if the number of air exchanges is bigger in Summer, but on the contrary it is lower in Winter.

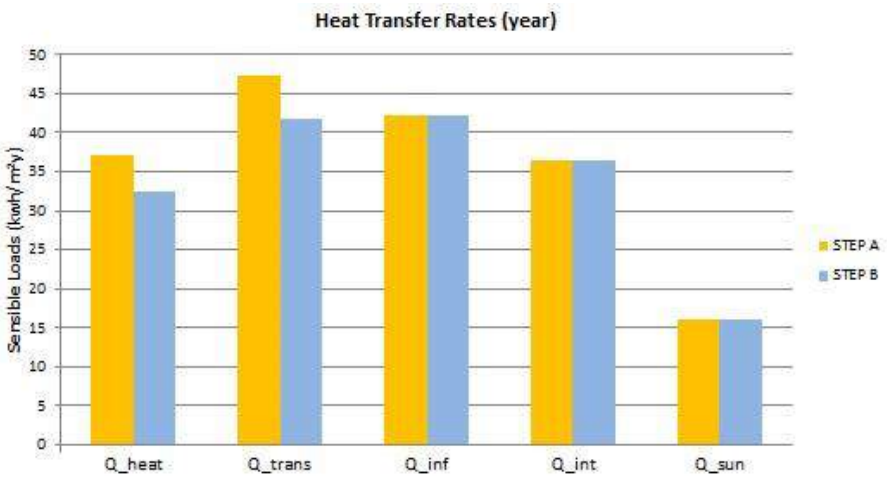

Fig. 8: Comparison between the energy demand for heating in STEP A and STEP B. (Energy Balance during the year).

The mean temperatures during Summer decrease of almost 1□C, but the indoor relative humidity increases because of the more frequent air exchanges and the inlet of moisture from outside.

BUILDING T□VALUES				
	STEP A		STEP B	
	MEAN T □C□	MA□ T □C□	MEAN T □C□	MA□ T □C□
JUNE	27.2	33.2	25.6	32.5
JUL□	30.8	**34.2**	28.7	33.2
AUGUST	30.3	34.1	28.3	**33.3**
mean □ hours T□26□C (year)	69.9□		48.8□	
mean □ hours T□28□C (year)	48.7□		28.7□	

Tab. 9: Comparison between average temperature values during the three worst months in summer obtained in STEP A and STEP B.

5. Summary and results

Summarizing the results discussed in the previous sections, the improvement of the envelope thermal performance (STEP A) led to a decrease in the energy demand for heating, but a great increase of indoor temperatures compared to the BASE CASE (therefore raising the energy demand for cooling). The evaluation of different values for the number of air-exchanges, keeping the same envelope characteristics adopted in STEP A, led to even more improved conditions during Winter and to better conditions, in Summer, compared to the previous step, though not so enhanced in comparison with

the BASE CASE. On the contrary in this last strategy the percentage of hours with RH□60□-70□ had an increase during Winter.

		BASE CASE		STEP A		STEP B	
T	MEAN□T (□C) (June-July-Aug)	27.7		29.4		27.5	
		SUMMER	WINTER	SUMMER	WINTER	SUMMER	WINTER
RH	mean □ hours□RH□60□	37.85□	25.76□	17.51□	6.87□	30.31□	40.81□
	mean □ hours□RH□70□	9.29□	11.76□	2.34□	7.59□	6.09□	21.31□
	mean □ hours□RH□30□	/	11.74□	/	12.53□	/	6.44□

Tab. 10: Comparison between RH and temperature values in all the considered cases.

6. Conclusions

The use of different values of number of air-exchanges leads to improved indoor temperatures during Summer, after the application of an insulation layer as first renovation strategy. Indeed this new layer on the facades increases the internal temperatures of almost 2□C.
Given that the reduction in mean temperature values was not so relevant compared to the base case and moreover the indoor humidity levels increased in Winter, other strategies are worth developing.
In this sense the research work is moving towards the application of mechanical ventilation systems and the smart management of free cooling, still trying to avoid the use of air-conditioning systems, in order to be able to ensure a steady number of air exchanges.
Furthermore the values chosen for the hourly profiles of natural air exchanges have been chosen making several assumptions and verifying that they could have been right if the annual average was around the standards value.
Aiming at establishing the real number of natural air exchanges, it would be necessary to use a multi-zone indoor air quality and ventilation analysis program able to calculate: airflows, pressures and room-to-room airflows and pressure differences in building systems driven by wind pressures acting on the exterior of the building, and buoyancy effects induced by outdoor-indoor temperature differences.

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Point clouds from different photographic sensors for Cultural Heritage surveying

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Abstract
In this paper it has been investigated the implementation of a Structure from Motion (SfM) using a reflex camera with integrated GPS for documentation and conservation of Cultural Heritage. The SfM provides a non-invasive approach for the structure representation, without the interaction between the structure and any operator. In order to verify the suitability of this technique it has been carried out a terrestrial photogrammetry survey and compared the results with and without use of the Ground Control Points (GCP) surveyed with the total station and GNSS receiver. The study has been conducted on an ancient Aragonese watchtower of the seventeenth century, located near the Abbey of San Vito in the countryside of Polignano a Mare (in the province of Bari, Southern Italy). The elaborations have been carried out in Agisoft PhotoScan and CloudCompare softwares. The first one has been used for extracting the point cloud and the second one for comparing the point clouds: point cloud from integrated GPS and point cloud from GCP. The use of reflex camera with integrated GPS can release 3D modeling but the results can be applied for small scales of representation and not for monitoring or metric analysis.

Keywords: Digital Photogrammetry, Structure from Motion, 3D modeling, global transformation, point clouds comparison.

1. The study area and historical information
The site subject of this study is located along the Adriatic coast about 3 km north of the town of Polignano a Mare, in the Bari province (fig. 1). Summer destination of many bathers, the small beach of San Vito has been for centuries a flourishing center of commerce. There are visible signs of a defensive system against invasions from the sea: the outer walls, the tower farm of the sixteenth century into the walls and the coastal tower outside (fig 2). Such a tower of sighting, defense and communication are dotted about much of the Adriatic coast of Southern Italy and are often very interesting from architectonic point of view [1]. These towers belong to the wide defensive network founded by Pedro de Toledo. This fortified farm (called "Old Sheepfold") was a real external defense system for the Abbey of San Vito. While the abbey was founded around the XI sec., the construction of the tower dates back to the sixteenth century and presumably completed, or at least made accessible within 1569. The aim of the tower's construction was to establish a defensive system of the abbey against Saracen invasions. In archaeological literature, the site is well known because it was an important node within a wide network of terrestrial and sea commercial traffics.
The monastery area corresponds to the ancient Απανεστε that is a resting area along the Traiana road.

Fig. 1: Hamlet of Saint Vito. In this image there are: the abbey, the tower and the quarry stone.

Between the V and VII centuries, the Saint Basilio's monks settled here, however it has been under the leadership of the Benedictine monks that the tower's construction began. They decide to build high walls to reinforce the security of the abbey.
The subsequent construction of the coastal tower has been designed by the Viceroy of Ferdinand "the Catholic", Consalvo of Cordova (1453-1515), who planned the construction of several towers along the whole perimeter of the Naples Kingdom coasts.
From an archaeological perspective, beside the tower, there is a quarry stone that has been exploited during Roman domination and between the medieval and the modern age (fig. 2).
The erosive activity of the sea allowed to discover, under the arable land, an archaeological deposit that seals the quarry. The beginning of the mining of the quarry started during the first imperial age and there are not any other oldest finds in the archaeological deposit. Under the archaeological deposits signs of the quarries have been preserved. They consist of grooves carved in the bedrock which testify the preparative work for the extraction of stone blocks. The quarry, abandoned in Roman age, has been re-opened several centuries later, in medieval and modern age for extracting small block stones for the construction of the St. Vito abbey, and other less important buildings like the costal tower.

Fig. 2: The coastal tower, the ancient quarry stone and the corner stones of the north side.

The tower has a square plan, on two levels, with a sloping base and three machicolations per side. The defensive nature expressed in the architectural solution is emphasized through the full crowning parapet, equipped with large corbels. On the right of the entrance, there is a tombstone. The access to the building has been made possible only through the trapdoor on the roof. The tower is characterized by stone blocks. In particular, several blocks of tufa – constituted by recovered abandoned pieces of the ancient quarry - have been reused for the corner stones (fig. 2). [2]

2. Introduction to the Structure from Motion techniques

The photogrammetry is a technique used to extract the metrics information of objects starting from the interpretation of photographs. The technique assimilates the photographic images characterized by central projections and defines the position of a point through the intersection of homologous straight lines following the principle of collinearity The growth of this technique belongs to three main factors:

the evaluation of the geometrical properties of the objects without any need of direct contact with them, the acquisition of a high number of information at the same time and the repeatability of the measurements in post-processing phase of the images.
In the last few years photogrammetry evolved both in the imaging mode, with the introduction of digital cameras and new platforms, that in the processing techniques.
The output that can be obtained today, is a digital 3-D model viewable through point clouds or points in the virtual space, linked to spatial coordinates, and furthermore to RGB values. The cloud points (keypoints) represent the pixels extracted from the alignment of digital images.
The Lowe method has been used. It implements a horizontal prioritization process in fully automatic mode by applying multiple algorithms defined as Structure from Motion techniques.
Through the algorithm for translational, rotational, scale (SIFT) it is possible to extract (detectors) and to "describe" (descriptors) features of stereoscopic images for the detection of homologous points (keypoint) of larger regions of the image (region detector), overcoming the problems of occlusion and distortion of perspective.
For each identified keypoint, it is defined a descriptor (array of numbers) that can describe the radiometric gradients around the point of interest regardless of rotations, scale variations and changes in lighting. Considering the Euclidean distance between these n-dimensional vectors, it is finally possible to identify keypoints homologous between images.
The most important feature of the operator SIFT that cannot be found within the other operators, is the robustness to extract and to associate points of interest.
The matching operation proposed by Lowe does not ensure robustness in the definition of homologous pairs. So remain the problem related to the gross errors (outliers) remains. they need to be removed by appropriate techniques before of the bundle block adjustment procedure.
The robust estimation strategies allow a reduction in processing time.
After the identification of the pixels that are equivalent to the homologous points of the shots, the process detects the position of the cameras at the time of the acquisition by the Bundler algorithm (2008) considering the point cloud that has been created (called "sparse cloud").
The extraction of the points follows an incremental way. It starts from a couple of shots and then gradually adds other shots to the couple. From this process depends the success of the calculation.
Through these already determined correspondences, it is possible to estimate the orientation parameters and to implement the real reconstruction of the object even if camera calibration parameters are unknown. In this way, it is possible to reconstruct the camera positions (Motion) and the geometry of the scene (Structure). [3] [4]

2.1 Photogrammetry acquisition

The photogrammetry survey has been carried out by a reflex camera NIKON D5300, moving around the object and maintaining the grip distances roughly constant. The camera is equipped with an integrated GPS receiver and mounts a 24 mm focal length, with a size of 6000x4000 pixels, geometric resolution of 300 dpi and 24-bit is the radiometric resolution. Forty-eight images have been acquired, some of which represented in the figure 3.

Fig. 3: Photographic images of the tower.

3. Topographic survey

On the walls of the tower, some targets (fig.4) have been positioned and by means of a topographic survey performed with a total station and a gnss receiver have been determined the target coordinates in the UTM-WGS84 reference system for georeferencing the entire point cloud. The tables below shows the values of the target coordinates in the local system (tab.1) and in the UTM-WGS84 (tab.2).

ID	Point Class	X	Y	Z
100	Reference	0	59,41	-0,835
101	Measured	-14,535	25,242	1,269
102	Measured	-15,203	25,009	6,713
200	Reference	0	0	0
201	Measured	-8,988	18,828	0,874
202	Measured	-10,203	14,136	1,966
203	Measured	-10,001	14,311	5,647
204	Measured	-9,096	23,152	9,059
300	Reference	-45,412	41,68	-0,686
301	Measured	-19,005	24,843	2,242
302	Measured	-19,321	21,833	1,419
303	Measured	-19,532	16,089	2,921
304	Measured	-18,861	22,078	7,843

Tab. 1: Coordinates of the targets in the local reference system. The values are expressed in meters.

ID	Point Class	Est	Nord	Ellisoidical height
100	Reference	684401,873	4542745,833	44,394
101	Measured	684374,604	4542720,632	46,499
102	Measured	684373,899	4542720,693	51,943
200	Reference	684377,506	4542691,643	45,249
201	Measured	684377,030	4542712,501	46,123
202	Measured	684373,999	4542708,720	47,218
203	Measured	684374,254	4542708,796	50,896
204	Measured	684378,705	4542716,489	54,308
300	Reference	684353,185	4542748,287	44,543
301	Measured	684370,364	4542722,101	47,471
302	Measured	684368,841	4542719,485	46,647
303	Measured	684366,293	4542714,333	48,150
304	Measured	684369,361	4542719,521	53,072

Tab. 2: Coordinates of the targets in UTM-WGS84 reference system. The values are expressed in meters.

Fig. 4: Targets on the walls of the tower and GNSS survey.

4. The point clouds

The captured images have been processed in Agisoft PhotoScan software. In the figure 5 are shown the alignment phases and the extraction procedure of the dense cloud. The first step (Align photos) has been performed by setting a high accuracy level (High) and setting a maximum limit of points amounting to 40,000. The second step (Build Dense Cloud) has been achieved on high quality and with use of the in aggressive mode depth filter.

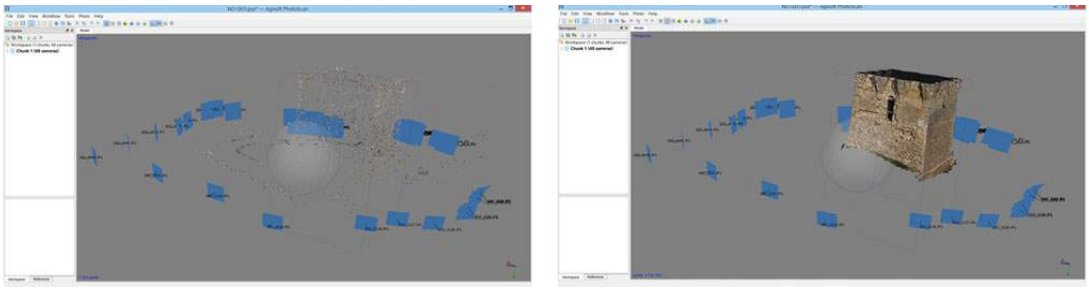

Fig.5: The alignment phases and built dense cloud.

The algorithm of PhotoScan [10] is similar to the well-known SIFT approach but uses different algorithms for a little bit higher alignment quality. In fact the first stage PhotoScan detects only points in the source photos, which are stable under viewpoint and lighting variations, and generates a descriptor for each point based on its local neighbourhood. These descriptors are used later to detect correspondences across the photos and it solving for camera intrinsic and extrinsic orientation parameters. PhotoScan uses a greedy algorithm to find approximate camera locations and refines them later using a bundle adjustment algorithm (similar to Bundler). For dense surface reconstruction, the software can use different algorithm process depending to the modality of elaboration.
The phase alignment has returned a sparse cloud of about 2000 points in a time of about 10 minute, for the 48 images. The small time of the process is attributable to the knowledge of the gripping positions of the points as provided by the integrated GPS receiver that has provided the coordinates of the centre of image, the extraction phase of the dense cloud has returned approximately 7.5 millions points.
A processing part has been devoted to editing of point cloud, implemented through an improvement in the ability of reproduction of reality, having regard to the presence of disruptive elements, carried out in manual mode.
The point cloud obtained has been imported in “.las” format and referred to as "point cloud not marker". Subsequently the georeferencing process has been performed with introducing markers measured topographically and also for it has been exported the points cloud in “.las” format and referred to as "point cloud with marker".

5. Results and comparisons

The processing results have been released two clouds of points differently spaced as shown in figure 6.

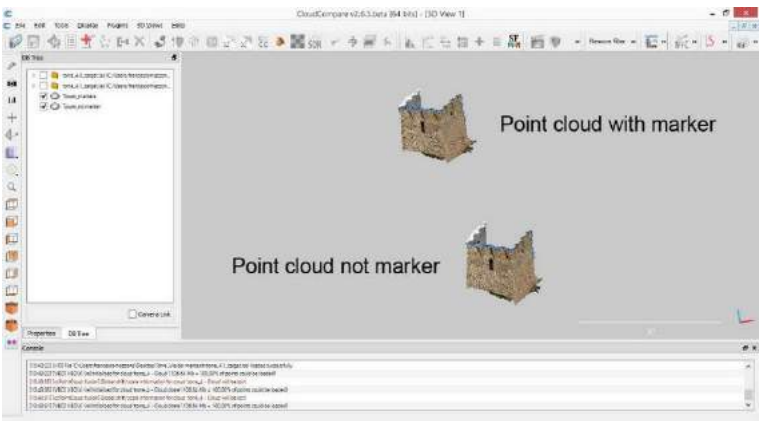

Fig. 6: Comparison between the two point clouds in CloudCompare.

The estimate positions of the markers, therefore, have been determined by the first cloud with the "view estimated" by Agisoft PhotoScan software and compared with the survey coordinates. The following table shows the substantial differences with significantly higher values in the elevation coordinates (tab. 5).

ID	Est	North	Ellisoidical height
201	684377,030	4542712,501	46,123
202	684373,999	4542708,720	47,218
301	684370,364	4542722,101	47,471
302	684368,841	4542719,485	46,647
303	684366,293	4542714,333	48,150

Tab. 3: The marker coordinates from topographic survey. The values are expressed in meters.

ID	Est	North	Altitude
201	684387,617	4542712,674	13,189
202	684384,640	4542708,424	14,275
301	684380,027	4542722,265	16,033
302	684378,565	4542719,568	15,053
303	684376,119	4542713,808	16,425

Tab. 4: The marker coordinates estimated by Agisoft PhotoScan. The values are expressed in meters.

ID	∆E	∆N	∆Altitutde
201	-10,587	-0,173	32,934
202	-10,641	0,296	32,943
301	-9,663	-0,164	31,438
302	-9,724	-0,083	31,594
303	-9,826	0,525	31,725

Tab. 5: The marker coordinate difference. The values are expressed in meters.

Targets	Point cloud "not marker"	Point cloud "marker"	Errors
201-202	5,302	4,968	0,333
201-301	12,557	11,765	0,792
201-302	11,530	10,775	0,755
201-303	11,999	11,079	0,919
202-301	14,695	13,868	0,827
202-302	12,716	11,951	0,766
202-303	10,306	9,579	0,727
301-303	9,325	8,796	0,529
301-302	3,220	3,137	0,083
302-303	6,407	5,941	0,466

Tab. 6: The marker coordinate difference. The values are expressed in meters.

This result is in agreement with the poor accuracy of the GPS receiver (confirmed in the camera datasheet) and the difficulty of control of the measurement. Furthermore, it must be highlighted that no

calibration operation has been performed and the planimetric values are compatible with the type of instrument and the acquisition methodology.
In order to compare the methodologies adopted, two point clouds have been processed in CloudCompare software using the Iterative Closest Points (ICP) [5] [6] [7] algorithm. In this step, one point cloud, the “reference model” (red colour in the figure 7) is kept fixed, while the other one, the “compared model” (yellow colour in the figure 7), is transformed to best match the reference. The algorithm iteratively revises the transformation (combination of translation and rotation) needed to minimize the distance from the source to the reference point cloud. In CloudCompare the users can choose some parameters for this procedure.

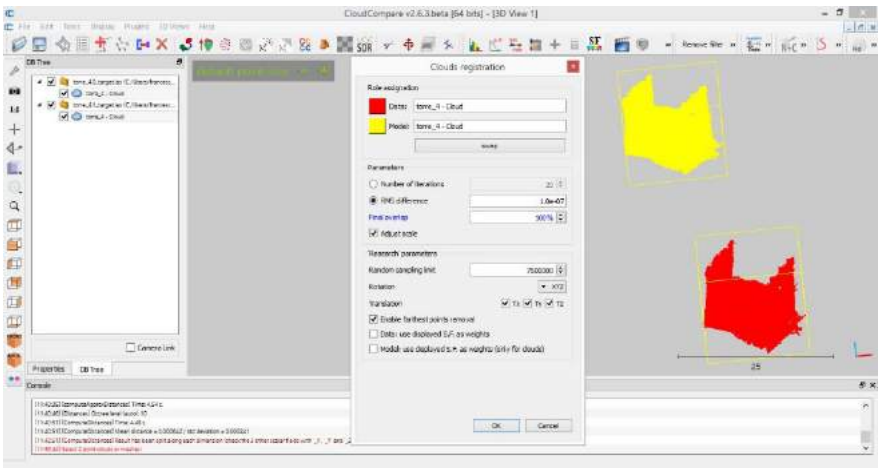

Fig. 7: Iterative Closest Points (ICP) in CloudCompare. The values are expressed in meters.

In this case, the “model reference” is the “point cloud marker” while the “compared model” is the “point cloud not marker”. Through the above algorithm a transformation (rotate, translate, scale and sharing transforms) taking as a reference the "point cloud marker" has been performed. In the figure 8 the 4x4 matrix values are reported.

$$\begin{pmatrix} 0{,}932 & 0{,}055 & -0{,}071 & -4{,}345 \\ -0{,}049 & 0{,}932 & 0{,}079 & 3{,}917 \\ 0{,}075 & -0{,}075 & 0{,}930 & 28{,}195 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

Fig. 8: The 4x4 Matrix.

It highlights different deformations along the three axes and the anisotropy of the transformation; the translation parameters denote the presence of a high value for the elevation component, as expected. After the transformation by ICP algorithm, a comparison between the two point clouds by Cloud to Cloud (C2C) [8] method has been performed (figures 9 and 10).

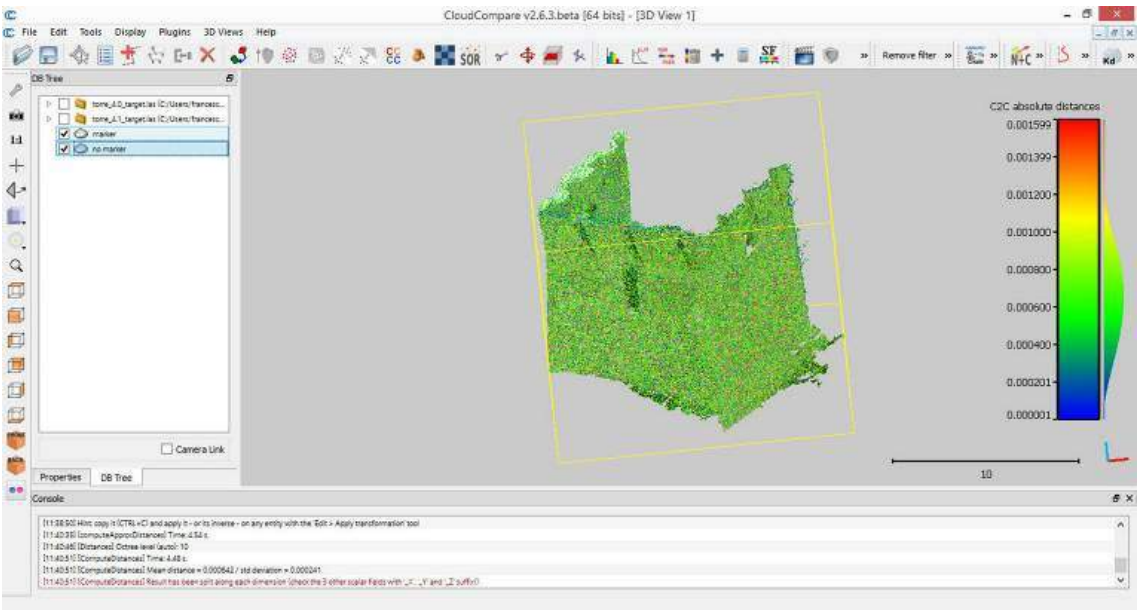

Fig. 9: The computed distance between point clouds by Cloud to Cloud method.

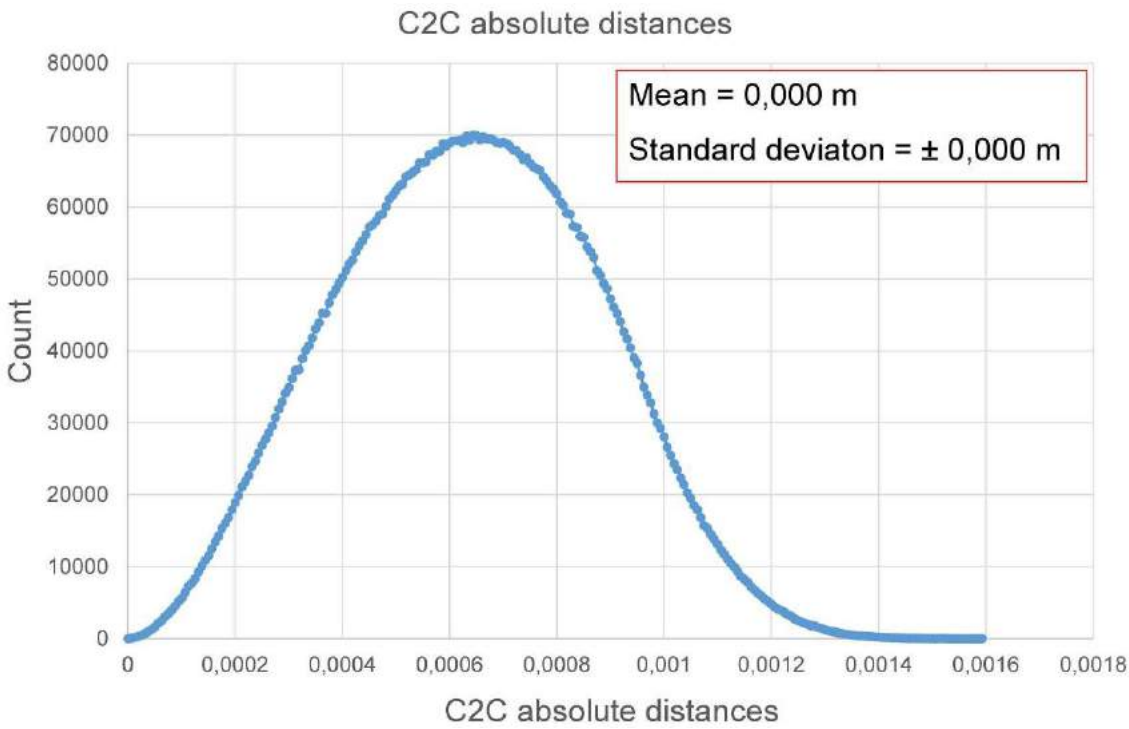

Fig. 10: Histogram values of euclidean distances: mean and standard deviation values are nulls.

6. Conclusions and future prospects

In this work, two Point Clouds of the same object - but differently georeferenced - have been compared. The first point cloud has been georeferenced using integrated GPS within the camera, while the second has been georeferenced using coordinates from topographic survey.

The use of a camera with integrated GPS can reduce the time of images alignment, however the results can be used for three-dimensional representations in small scales, and definitely not for structural monitoring. For these aims it is necessary to measure GCPs and some CheckPoints for the validation of the results.

It is possible to find into the field-specific literature some algorithms for improving data from different systems such as GNSS, INS, but they are not always universally compatible. [9]

In the future, it could be useful to implement an algorithm in order to provide a robust calibration of the integrated GPS camera considering the possible anisotropy of the model and to develop appropriate filters for improvement of the results.
As a matter of fact, the use of calibrated sensor can ensure higher quality results and the implementation of more robust algorithms for the alignment process may reduce the deformations. These improvements related to the filtered model of subtraction could ensure even larger applications.

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Brick staircases at the heart of Ancient Naples Building restoration

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Abstract
The research is based on the brick staircases at the heart of Ancient Naples. The staircases are among the most interesting expressions of a building, in which architectural and structural functions come together in a wonderful marriage from which springs a variety of types of staircases that require a knowing approach, which differs from the traditional classifications.
This study is based on these considerations and aims to provide elements for a correct reading and typological classification of brick staircases. However, its field of investigation is limited to the heart of ancient Naples.
The great powers of expression of the masonry and the technical skill of the workers of the past have given rise to a vast array of staircases, which are truly a challenge for modern architecture of reinforced concrete that is still anchored to the small number of rigid patterns of traditionally types.
Unfortunately, these fine structures of the past are often threatened by severe degradation conditions, which also affect their stability, often requiring emergency measures that end up not taking into account the extraordinary complexity of these building elements. On the other hand, the remedies proposed by the recovery and consolidation manuals are limited to a few types (scale with central partition and scale to open pit). Therefore, they are completely generic. This study focuses on the typological and technological knowledge and on the possible maintenance and consolidation of these scales of the ancient plant.

Keywords: brick, staircases, building restoration

1. The heart of Ancient Naples

The choice of studying the heart of Ancient Naples was not only dictated by the need to limit its field of investigation, but rather by the need to collocate one specific homogeneous territory for physical characteristics.
In the old city, the Ancient Center of Naples, we can find ancient layers capable of tracing the city's history back to its origin (Fig. 1).
The boundaries of the Greek and of the Roman city have been identified by the Professor Roberto Pane in Foria street to the north, S. Giovanni a Carbonara to the east, Umberto I street to the south and Monteoliveto street to the west.

Fig. 1: Table drawn on the basis of the topographic map of the city of Naples, made by Giovanni Carafa, duke of Noja, in 1750. It was published in 1775.

Although more known staircases (Fig. 2) are outside the Ancient Center of Naples, it still offers exceptional episodes of architectural structures that characterize the different historical periods of the city.
The history of the Neapolitan Palace as a representative symbol of the aristocratic power, starts during the Aragon's domination period and had a great influence on the architectural forms as well as the city's tradition folklore.
Therefore, many foreign architects arrived in Naples like Francesco Sagrera and Luciano Laurana and Francesco di Giorgio Martini Giuliano from San Gallo. These architects came from Arag□n and Florence. Among the stonecutters masters who worked at that time, the influence of the Renaissance for the Neapolitan Palace was high, however it was still highly attached to it's roots which was the Gothic tradition. (Fig. 3).
In the seventeenth century the Baroque style in Naples had developed. It was mainly manifested by new and rich decorations on most of the architectural remains of the city.
The new style covered all the buildings like the religious ones, to give the city a nearly uniform formal look.
According to Dorfles the wonder of the Baroque is the negation of the enclosed space. In the Ancient Naples, since there were not enough space for large facades, the new style was manifested by magnifying the portals and by the internal courtyards of the Palaces.
While the Renaissance was the architecture of the buildings, the Baroque is the architecture of the great artists. The same Professor Roberto Pane describes the Neapolitan Baroque stylemes deepening the production of its best artists, such as architects that came mainly from Northern Italy as Fontana, as Cavagna, as Fanzago and as Picchiatti. Only in the beginning of the eighteenth century local artists such as Vaccaro and as Sanfelice were born. In addition, the extraordinary invention of the open staircase, which the most notable examples are outside of the Ancient Center was attributed to Sanfelice.

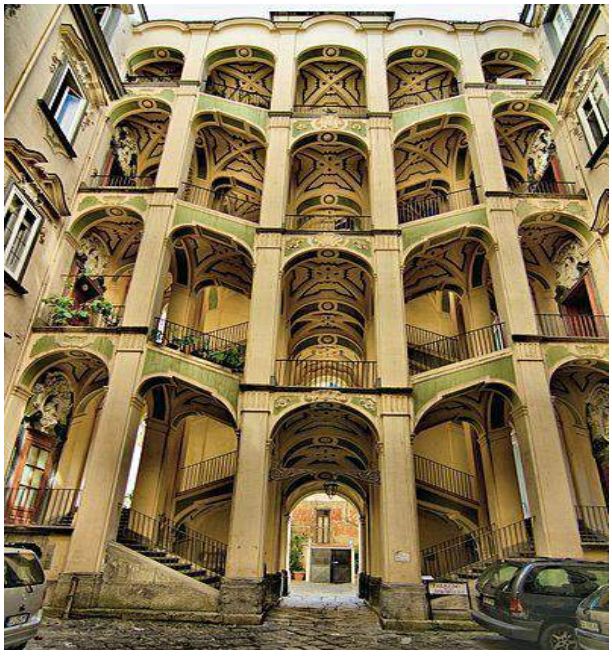


Fig. 2: Spagnuolo Palace in Sanità district. Open staircase behind courtyard of Ferdinando Sanfelice.

Fig. 3: The courtyard of the Diomede Carafa Palace in Tribunali Street. Behind the Renaissance facade, the vault ends from the hall to the courtyard with a piperno-lowered arch supported by slender columns, which highlight the Catalan influence in the compositional structure of the entrance - portal system.

The Sanfelice, great designer of party machines and religious buildings, realize staircases of residential buildings, which shows a highly original character.
A significant example are the stairs of the Caracciolo of Brienza Palazzo in S. Paolo n. 5, in Ancient Naples (Fig. 4).
The audacity of the stairs of Sanfelice makes it difficult to understand the property amenities even to a trained professional, causing a sense of uncertainty in the perception of those elements. But the structural boldness of the Sanfelice stairs, despite having defied centuries of vicissitudes, are still standing and show all their splendor.

2. Brick staircases at the heart of ancient Naples

Growing up on itself, over the centuries the Ancient Center of Naples has found a strong local connotation because of the need of its architecture to adapt to the plot of these parallel streets and orthogonal roads (decumanus and cardinus) that defines the urban morphology. Typical examples of adaptation of the architectural styles in the context of the Ancient Center of Naples are the aristocratic residential palaces.
Due to the limited width of the streets, the Neapolitan Palace lacks the perception of the facade that expresses itself throughout the composition between solids and gaps. For this reason, the dominant element of the Neapolitan facade becomes the portal, which captures the gaze of the passer and invites to continue to visit through the portal's optical cone - hall - courtyard – open-air staircase, and discovering unexpected spatiality. The new spatiality is gained with the courtyard and with the open staircase. In this way, it becomes a second and more important facade.
Neapolitan stairs show daring forms and present a facade that opens onto the courtyard, a choice dictated by both the clarified plan of the first project, and by the specific needs of lighting.
The prospects of the stairs become a completion of the courtyards scenes, and they became meeting squares full of life of the Neapolitans. Thanks to its clever but transparent structures, the staircase is also a visual filter between the courtyard and the gardens behind them, often found in the palaces of the most prominent noble families.

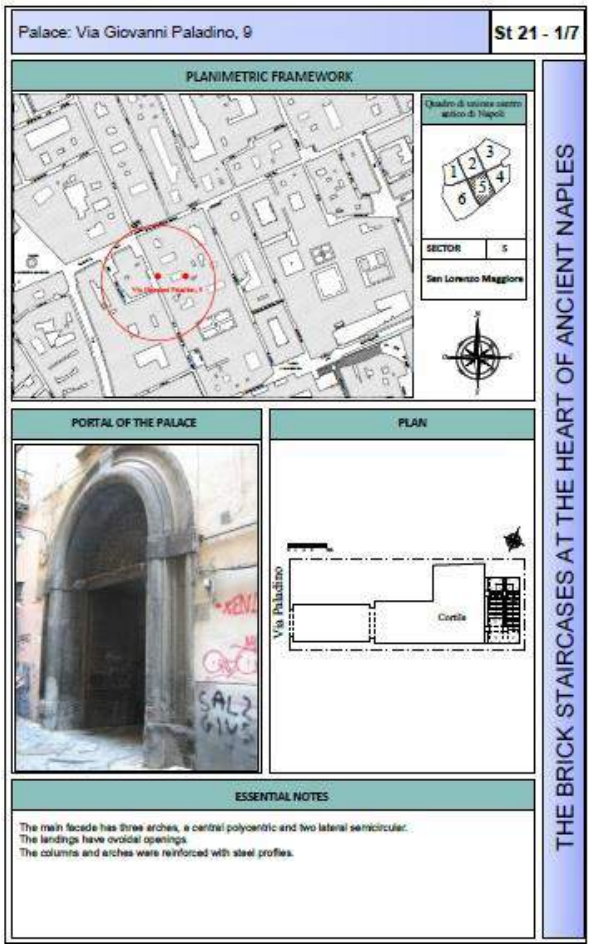
Fig. 4: The stair of the Caracciolo of Brienza Palace in the Ancient Center of Naples. The nucleus of the staircase opens into the courtyard with a polygonal shape while rampant develop pincer on an octagonal plan. The external face presents polygonal openings, offset from each other and embellished with pargets decorations, while the internal part is covered by the same ornaments that outline the structure of the time. Elaborated piperno decorations are on the entrance of the stairs.

3. Structural systems' types of the staircases of Ancient Naples

The structural types of staircases form has required the knowledge of vertical connection of the structural elements. Such knowledge was acquired with a sample survey (one hundred and four staircases), which has reserved many surprises. We found out many extraordinary varieties of structural types present there.
The structural types have been divided into three subsystems: vertical, horizontal and rampant.
The vertical structure covers both the external ambience and the internal one.
The first is made up of system of walls and columns, together with the openings to the ramps, the second, however, is the set of elements that define the core or the stairwell.
The stair body can present in the vertical structure generated openings, in most cases, by a single arch to the entire light or by multiple arches on columns.
The vertical structural system of internal ambience can be classified as the core, the stairwell, the double core, the double stairwell or the spiral; they are used to distinguish whether this vertical structure is realized with a central septum, with one or more columns or without any vertical element (core and well stair free).
The rampant structure and horizontal structures are identified by the arches and vaults in the ramps and in the landings. The arches of the rampant structure can be of three types: circular rampant, gooseneck rampant and rampant with the straight element. The vaults have eight types: barrel, half barrel, cloister, half cloister, groined, half groined, pendentive and basin.
For the horizontal structure, there are four kinds of arches: a round arch, low arch, polycentric arch and with straight element; and eight types: barrel, half barrel, cloister, half cloister, groined, half-groined, pendentive and basin.

4. Guide to reading to compiling the generic form

The next phase of the study has led to the creation of a functional form which catalog all the possible variants found in phase of measuring of the staircases, of plan metric architectural, of structural, of material as well as the state of degradation.
The form, for each stairs, is made up of seven sheets, whose contents are organized for thematic boxes and the recording of the data in it.
The criteria by which you have structured the various thematic box is closely related to the preliminary phase of knowledge of the predominant features over the centuries.
The study area was divided into six main sectors, delimited by the city's main arteries that cross the Ancient Centre: the Major Decumanus; Superior Decumanus, or today Sapienza, Anticaglia, St. Joseph of Ruffi St., Donna Regina St. and SS. Apostles St.; Inferior Decumanus, or today Benedetto Croce St., S. Biagio dei Librai St.; Cardus corresponding to the current streets Duomo, Giovanni Paladino, the Nile, Atri and San Gaudioso.
Each sector was classified by a code (S1, S2, S3, S4, S5, S6), as well as with the name of a building of historical and artistic value within the present specific sector. In particular, taken as reference, the most representative churches with an architecture significance are the following names that have been associated to: S1 Sector - S. Maria della Sapienza; S2 Gerolomini church; S3 sector - Duomo; S4 St. S. Agostino alla Zecca; S5 San Lorenzo Maggiore; S6 Santa Chiara.
For the purpose of a simpler catalog, each sector is also identified by color differentiation of the form: S1. S. Maria della Sapienza, green; S2. Gerolomini, red; S3. Duomo, yellow; S4. St. Augustine the Mint, blue; S5. S. Lorenzo, heavenly; S6. Santa Chiara, magenta.



1/7 Sheet

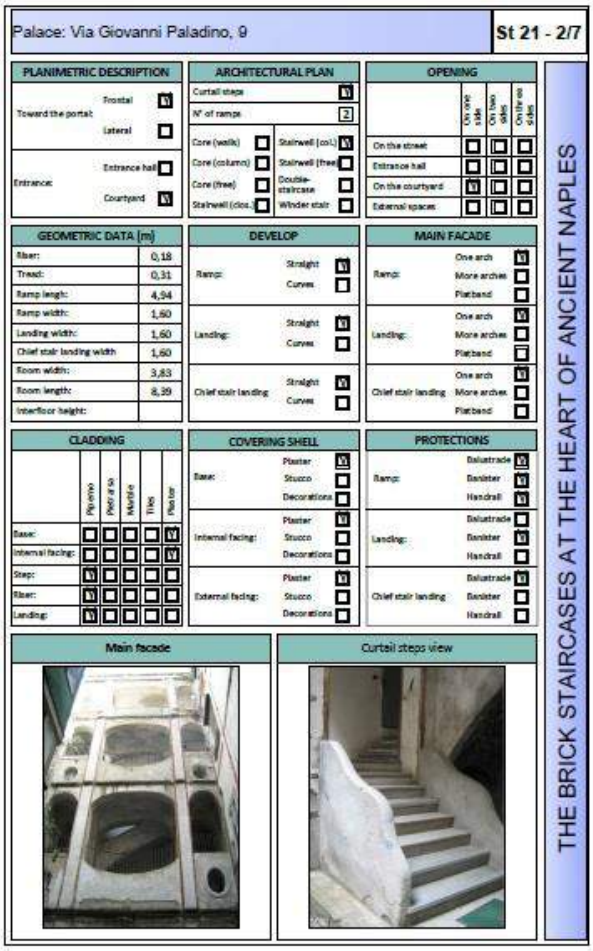
Each thematic form is identified by a code of type Sc n-n1 / 7.

With Sc we indicate the stair, while the number n is related to the number assigned to the stair in which it falls.

The number 1/7 specifies the number of sheet compared to the seven that make up the file on each tab.

In the following two thematic boxes a portal view that access to the palace are placed, and one of the architectural design plans where the vertical structure and the vaults that support the ramps are highlighted. These elements were still defined in other sheets.

Complete the paper with the essential notes box.



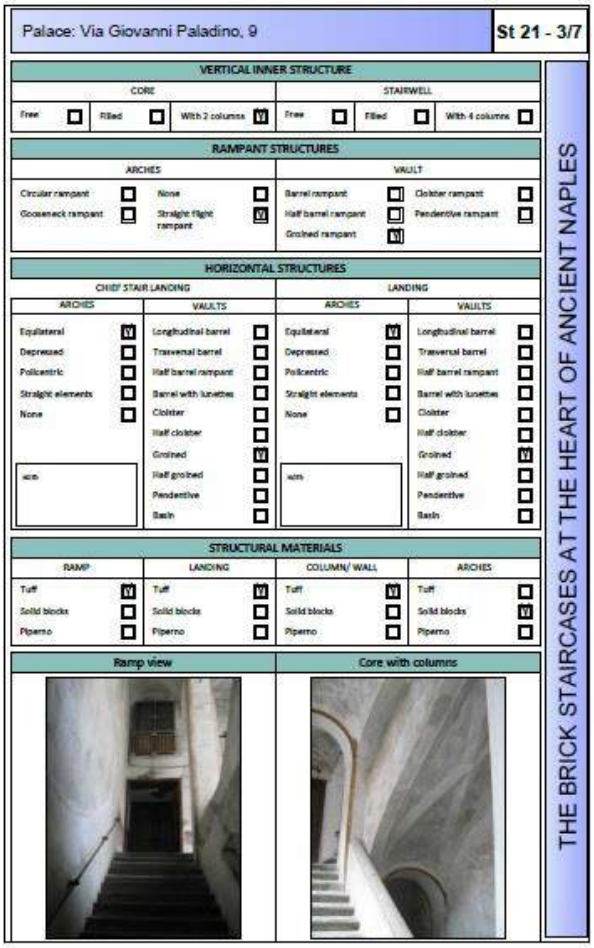
2/7 Sheet

The 2/7 sheet consists of several thematic boxes. The first box "THE PLANIMETRIC DESCRIPTION" defines the dislocation of planimetric stair, whether it is placed in front or side position with respect to the portal, and if you access it from the main entrance or the courtyard.

In the "ARCHITECTURAL PLAIN" box, the type of stair examined are as indicated: Stair with core with walls, with two columns, with free core, free stairwell, with full stairwell and with four columns, double staircase and winder stairs.

In the "OPENING" box the reported data allow to deduce the relationships that the stair have with the surrounding areas, whether they are internal or external to the building.

The following box shows the "GEOMETRIC DATA", the planimetric organization of the ramps and landings, the architectural composition of the facade, the materials used for the covering shell. Completing the pictures from the sheet that are of the facade and the curtail steps.



3/7 Sheet

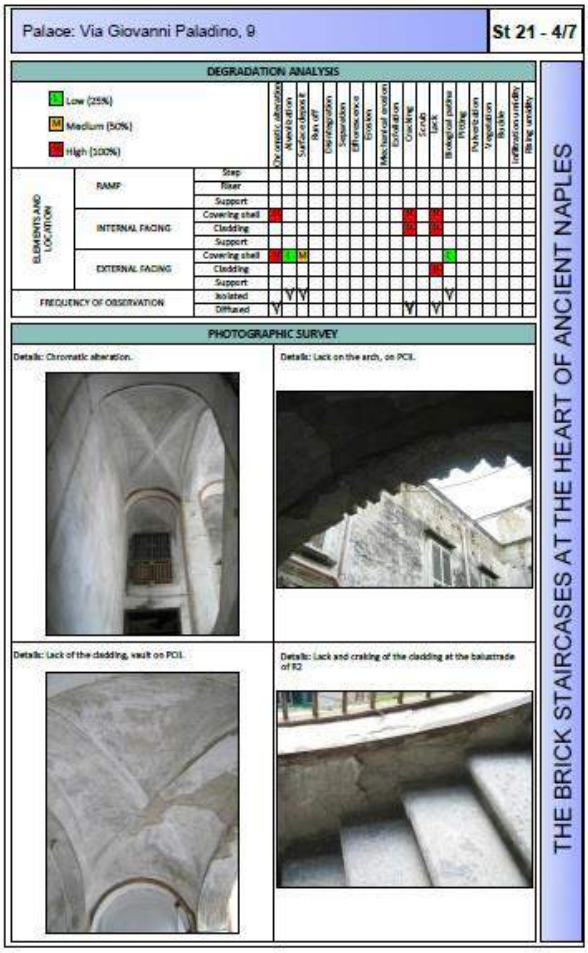
The 3/7 sheet shows the essential data of the structural organization of the stair.

The first box specifies the type of structure: to core (free, full, with two pillars) or stair well (free, full, with four pillars).

The next boxes specify the type of structure rampant, the type of horizontal structure and structural materials.

The vault for rampant structure are: barrel rampant, half barrel rampant, groined rampant, cloister rampant and pendentive rampant.

The vault for horizontal structure are: barrel, half barrel, cloister, half cloister, groined, half groined, pendentive and basin. The form ends with two significant pictures of the structure.



4/7 Sheet

The 4/7 sheet shows the data relative to the degradation of the stair of specific materials. Degradation analysis are provided in the Table.

The palace pathologies examined are those of the UNI 11182 “Cultural Heritage - natural and artificial stone materials. Description of the forms of alteration. Terms and Definitions” (April 16, 2006).

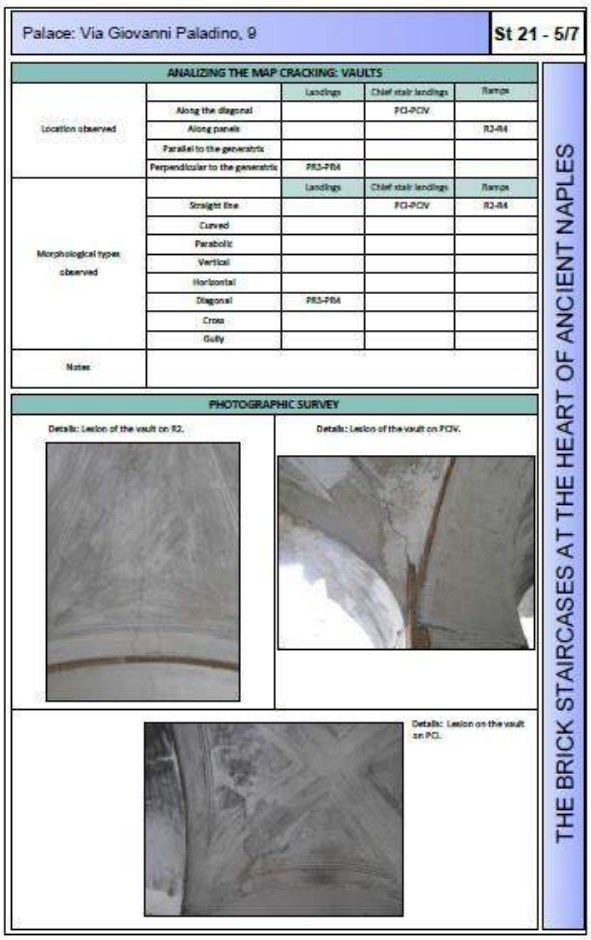
For a quantitative assessment of the degradation, a simplified coding was adopted:

Low, if the phenomenon affects up to 25□ of the total surface of the element considered;

Medium, if it is from 25□ to 50□ of the total surface of the element considered;

High, if it is from 50□ to 100□ of the total surface of the element considered.

Completing the sheet some photos of significant stair degradation.



Palace: Via Giovanni Paladino, 9 — St 21 - 5/7

ANALIZING THE MAP CRACKING: VAULTS

		Landings	Chief stair landings	Ramps
Location observed	Along the diagonal		PCI-PCIV	
	Along panels			R2-R4
	Parallel to the generatrix			
	Perpendicular to the generatrix	PR3-PR4		
		Landings	Chief stair landings	Ramps
Morphological types observed	Straight line		PCI-PCIV	R2-R4
	Curved			
	Parabolic			
	Vertical			
	Horizontal			
	Diagonal	PR3-PR4		
	Cross			
	Gully			
Notes				

PHOTOGRAPHIC SURVEY

Details: Lesion of the vault on R2.

Details: Lesion of the vault on PCIV.

Details: Lesion on the vault on PCI.

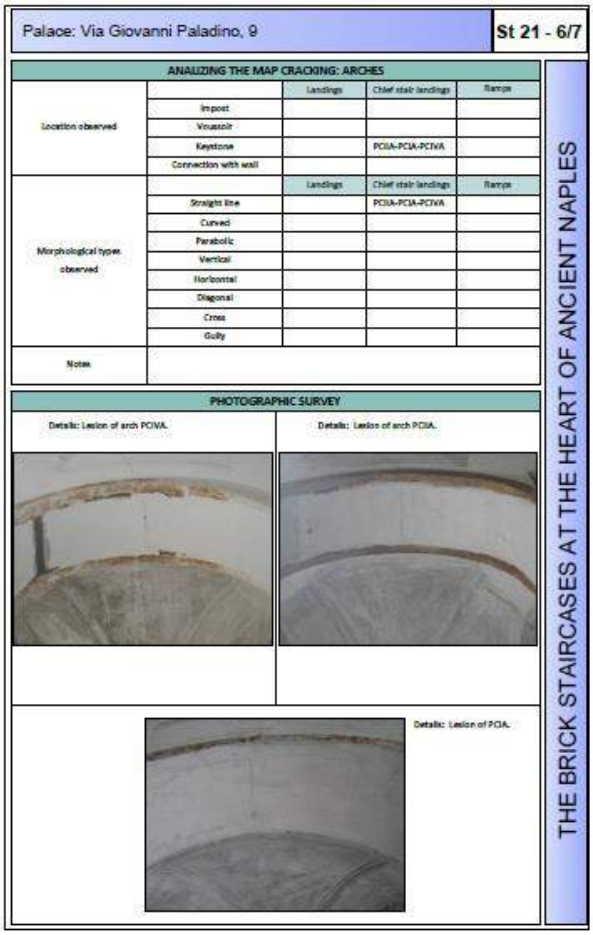
THE BRICK STAIRCASES AT THE HEART OF ANCIENT NAPLES

5/7 Sheet

The 5/7 sheet analyses the map of the lesions that influence the vaults, their location and their morphological characteristics.

In particular, examines the ramps, the landings and chief stair landing.

A complete photographic documentation is in the sheet.



Palace: Via Giovanni Paladino, 9 — St 21 - 6/7

ANALIZING THE MAP CRACKING: ARCHES

		Landings	Chief stair landings	Ramps
Location observed	Impost			
	Voussoir			
	Keystone		PCIIA-PCIA-PCIVA	
	Connection with wall			
		Landings	Chief stair landings	Ramps
Morphological types observed	Straight line		PCIIA-PCIA-PCIVA	
	Curved			
	Parabolic			
	Vertical			
	Horizontal			
	Diagonal			
	Cross			
	Gully			
Notes				

PHOTOGRAPHIC SURVEY

Details: Lesion of arch PCIVA.

Details: Lesion of arch PCIIA.

Details: Lesion of PCIA.

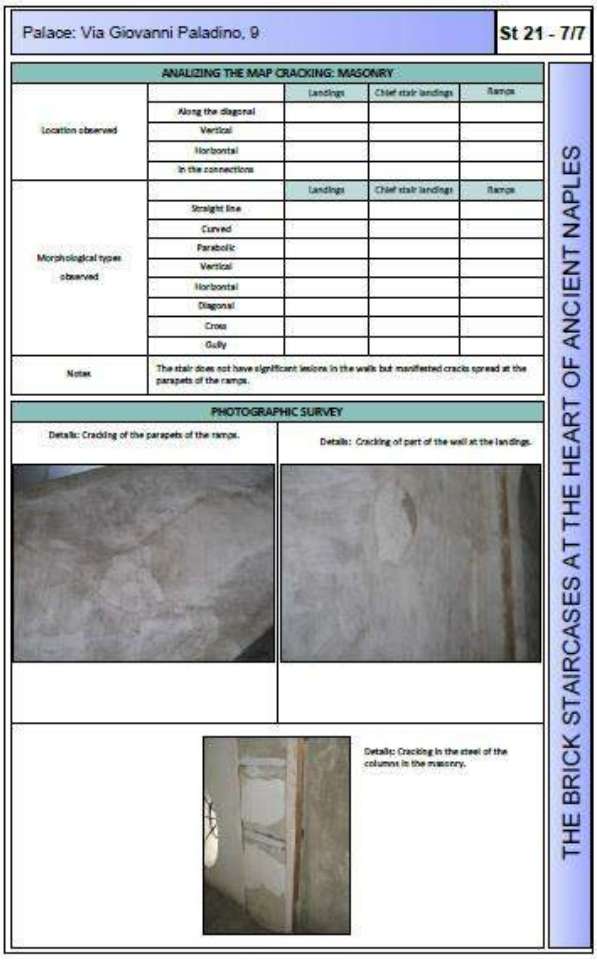
THE BRICK STAIRCASES AT THE HEART OF ANCIENT NAPLES

6/7 Sheet

The 6/7 sheet analyses the map of the lesions that influence the arches, their location and their morphological characteristics.

In particular, examines the ramps, the landings and chief stair landing.

A complete photographic documentation is in the sheet.



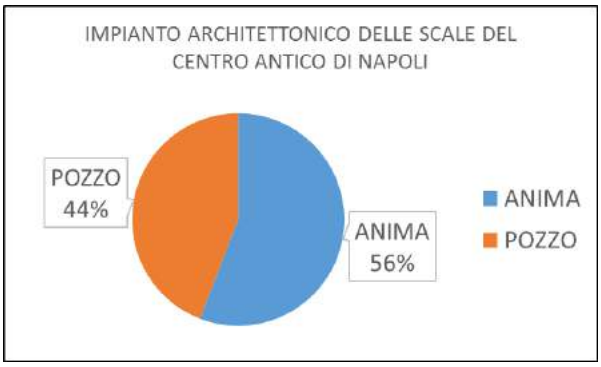


Fig. 5: Incidence percentage of architectural system

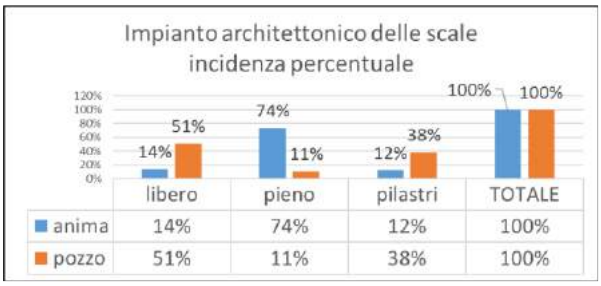


Fig. 6 – Architectural system of Ancient Naples

7/7 Sheet

The 7/7 sheet analyses the map of the lesions that influence the masonry, their location and their morphological characteristics.

In particular, examines the ramps, the landings and chief stair landing.

A complete photographic documentation is in the sheet.

5. Examination of types

By the reading of the sheets of brick staircases in the Ancient Center of Naples we can see that, in relation to the architectural system, there are more core types compared to the stairwell types, recording 56□ against 44□ (Fig. 5).

The stair cores have a planimetric organization for the 14□ free, 74□ full, 12□ with 2 columns.

Instead, the stairwell have an organization the 51□ free, 11□ full, and 38□ with four columns (Fig. 6).

Ramp structure

With regard to the ramps organization, it is found that for the stair core the structure is 16□ with half barrel rampant; 67□ with barrel rampant; 16□ with cruise rampant; 2□ with gooseneck rampant.

The stairwell, however, is: 36□ with half barrel rampant; 24□ with barrel rampant; to 31□ with cruise rampant; to 9□ gooseneck rampant (Fig. 7).

The structure of the chief stair landing

Relatively structural organization of the chief stair landing for stair core is: structure with half cloister 4□; structure with half-barrel 0□; structure with barrel 25□; with groined 51□; structure with pendentive 21□.

The stairs well, however, are: the structure with half cloister 0□; structure with half-barrel 4□; structure with barrel 44□; with groined 42□; with pendetive structure 9□ (Fig. 8).

The structure of the landing

With regard to the structural organization of the landings on the stairs core structure with half cloister 4□; structure with half-barrel 0□; structure with barrel 23□; with groined 49□; structure with pendetive 25□. The stairs well, however, is: the structure with half cloister 24□; structure with half-barrel 4□; structure with barrel 24□; with groined 31□; pendetive structure with 16□ (Fig. 9).

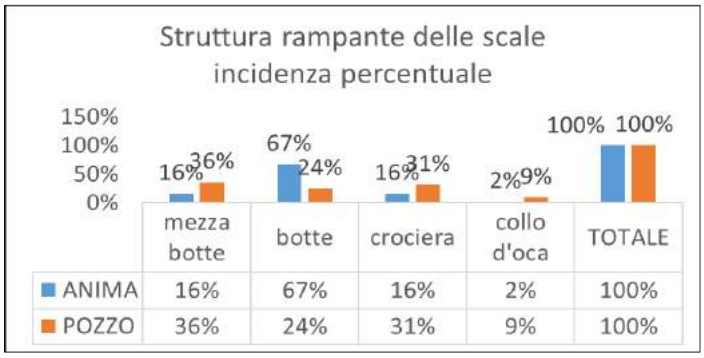


Fig. 7 – Incidence □ of rampants

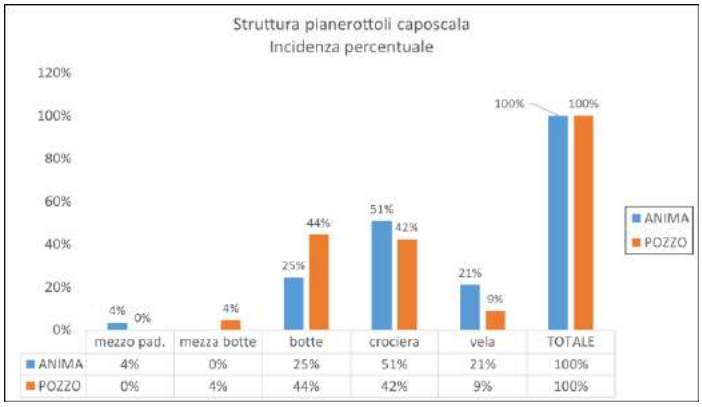


Fig. 8 – Incidence □ chief stair landing

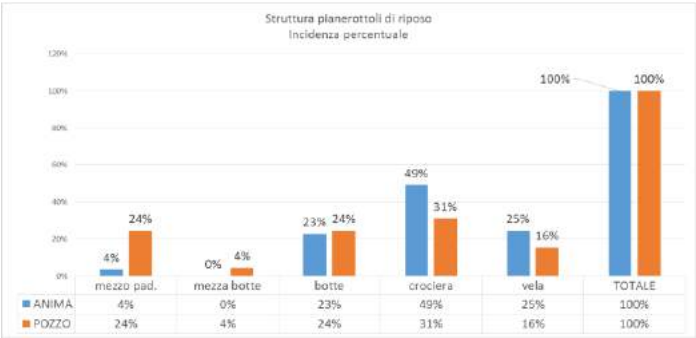


Fig. 9 – Incidence □ of landing

6. Conclusion

The objective of this study is to provide an operational tool for renovation which is useful to the operators to evaluate the performance levels of the individual components of the stair organism and choose the intervention compatible with the specific type.
This database has found immediate practical value to the extent that it has resulted in synthesis tool and rapid management of knowledge gained in direct surveys.
This research aims to provide a guide of rennovation of staircases of ancient Naples for the engineers and architects. They must use this as a reading instrument, as a classification of the structural systems and as an analysis of the evident structural movements. The study will allow them to choose technically the most appropriate types of static instability intervention; to verify the compatibility of the chosen intervention techniques with the specific structural type in question; and finally, identifying the operational guidelines to be adopted to the severity of the structural damage.

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Evolution of the historical use and degradation of the Reales Atarazanas of Seville (XIII-XX century).

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Abstract
The Reales Atarazanas of Seville are an industrial building of great capacity and size, built in the thirteenth century with the function of shipyard, which remained active, with different uses over the years, until the last century.
The recent research work on the building, consisting of a cleaning of the contemporary plaster walls, has brought to light a structure that does not seem to have suffered damage with time.
Its long use is a magnification of the building's capacity to survive, almost completely, although very transformed, through the centuries. This responds to a logic of solidity that made possible, diachronically, the incorporation of new buildings in its historical evolution. In the eighteenth century Charles III was able to establish the Real Maestranza de Artilleria in this building without it suffering static and structural problems. Therefore, we cannot deplore a degradation of the building, over time, which remained whole thanks to the constructive and functional versatility and the high quality of the materials with which it was designed and made.
This paper aims to analyze the features that saved the arsenal from degradation: those constructive, evolutionary and economic logics intrinsic to this building that made it an emblematic and profitable site for the Crown of Castile from its construction until the end of its activities in the twentieth century.

Keywords: Heritage, medieval archeology, medieval industrial architecture

1. Historical evolution of *Reales Atarazanas* in Seville: a series of fortunate events.
The *Reales Atarazanas* of Seville (Fig.1), thanks to their architectural modernity, although with big changes and structural reductions, have survived for centuries coming to our day in which are presented as an archaeological living book where you can read the history of Seville in them reflected (Fig.2).
The features that have made the dockyard an emblematic monument and closely linked to the historical evolution, social and cultural development of the city are:
- The place: its location in *Arenal*, outside the city walls and closely bound to the river and port, essential activities in the historical development of the city.
- The form: the rational design and original edification spatial versatility that have allowed for centuries the existence albeit with many functional and fragmentation redefinitions. This factory pattern allowed easy conversion by limited operations of adjustment and optimization of installations in several changes of building use (dockyard, warehouses, military barracks).
- The function: its original destination shipyard forced him to maintain a direct relationship with the Guadalquivir and, therefore, changed its functionality depending on the activity mainly carried out in the river by the Sevillian society over the centuries.
- The owner: the building was from the outset owned by the Crown, which, rearranged it through time in order to use it and convert it to derive the greatest benefit from the factory, monetary and / or strategic depending of the historical events that influenced the development of the city.
Fernando III also known as the holy king and conqueror, was the one who, during the thirteenth century, welded permanently the destiny of the kingdoms of Castile and Leon. He conquered Andalusia pacifying the old patrimonial territories, and expanded the kingdom like no other of his ancestors had done. His plan of conquest was to unify the ancient territory and give the Kingdom of

Castile an exit to the sea, essential for the growth and expansion of the kingdom and take advantage of the weakness of the Almohad Empire at this historic moment to advance towards the reconquest of valleys of the Guadalquivir and get to Seville. After two years of siege in Seville the monarch understood that he could not conquer this city without receiving aid from the sea. It was then when instructed Admiral Bonifaz to arm a fleet of the Cantabrian ships thanks to which he was able to face, destroying them, various Muslin unity in the Guadalquivir estuary. After his victory, in 1248, Fernando ordered Bonifaz building dockyards in Sevilla, Santander and Castro Urdiales (Cantabria). Sites where he worked tirelessly until the total union of the Crown of Castile.

Fernando III was creator and guide of the Royal Navy of Castilla and decided that the basis of his army was to be Sevilla; the birth of the splendor of the city began when, in the mid-twelfth century, the Almohad Empire decided to convert it to capital of Al-Andalus and the conquest of it was the key to the unification and expansion of the Christian kingdoms.

It was a rich city, surrounded by thousands of hectares of fertile agricultural land, with a well-developed urban fabric, a rich system of infrastructure both towns that commercial and military and already established business relationships. But the most important thing was the strategic location of the city that developed at the side of the Guadalquivir River, navigable river that made her Atlantic and Mediterranean port, allowing her to purchasing of raw material coming from inland areas as iron and wood. The fact of being on the banks of a navigable river and 90 km from the mouth make Seville an internal port of easy communication with the sea completely safe from the attacks of enemy ships, the condition of immense value during the Middle Ages.

But the city lived the greatest development in the reign of Alfonso X, and it was thanks to its political initiative and privileges that granted claimed that its role as the southern metropolis.

It was Alfonso X who in 1252 ordered the construction of Royal Dockyards of Seville, with the goal of building a fleet to fight against the Moors. As architectural models they served Almohad arsenals but copied with extraordinary magnitude and grandeur, revealing the importance given by the king to his ultramarine companies. They were built outside the wall fence, between *Postigo del Carbon* and *Postigo del Aceite* (city gates), resting on the wall, near the bank of the Guadalquivir, in the place known as Arenal (beach), place chosen by Admiral Bonifaz. Dockyards were located in the corner formed by the wall of the city and an important wall that came right to the edge of the river, in the *Torre del Oro*.

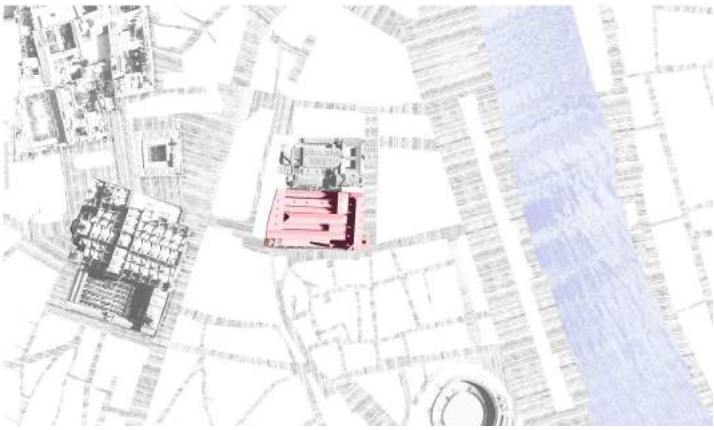


Fig. 1 View of Reales Atarazanas (Vazquez Consuegra)

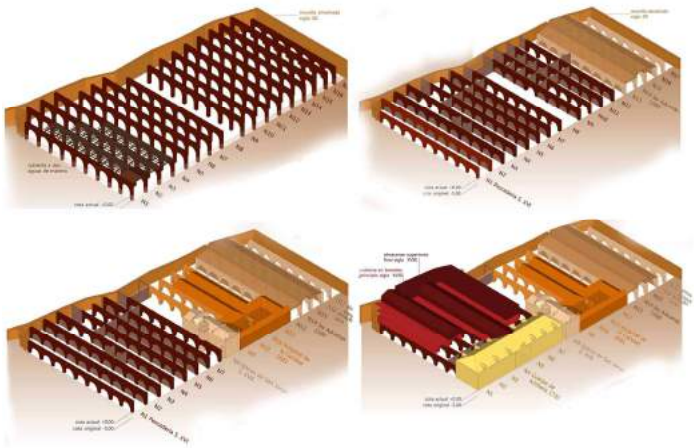


Fig.2 3D of structure evolution (Debenedictis D.)

1.1 13th-15th Centuries. The military arsenal: origins and development of the building

It's still possible read the foundational tombstone once located in the Tower of La Plata and now housed in the Hospital de la Caridad:

"Res tibi sit nota, domus haec, et fabrica tota, quam non ignarus, Alphonsus sanguine clarus, rex Hispaniarum fecit, fuit iste suorum actus in Austrinas, vices servare carinas, arte micans plena, fuit hic informis arena, era millena, vicentena, nonagena"

The new building has an arsenal used for the construction, maintenance, and storage of weapons of war galleys and all activities closely related (such as weapons manufacturing, processing of raw materials, etc.) and, also, the real stock of the spoils of war . The building is a huge structure of 100 m. in length and 10 m. of brick height containing inside a diaphanous space divided into 17 parallel lanes, where each lane has a width of 9 m. These are lanes formed by large arches of 10 cross rooms in which the Almohad walls lean against, resting sometimes the first pillar on the Barbican.

An indispensable condition that the building had to perform was the direct relationship with the water, to facilitate the entry and the exit of the boats. In Seville, the difference between the share of the lanes and the river just came to a meter since the *Arenal* was slightly sloping.

The architecture of the dockyard is example of the important influence of art Almohad Medieval architecture in Seville, in this case the influence veins especially in the technical aspects of the building. The roof was made in order to enter rainwater and it is funneled in the arches who owned a collector channel and slide for water; basically every row of arches worked as an aqueduct.

The *Reales Atarazanas* is a building of huge dimensions which, according to the collected historical documents could contain between 30 and 32 galleys.

Such dimensions and so much grandiosity, which meant excess fortune and the survival of the building, are a symbol and strategy of political propaganda enacted by Alfonso X. Wise King continued what his father, Fernando III, had begun, dealing with the expulsion of Muslims and Christian repopulation of the city, the reorganization of the territory and finally, the preparation of the crusade against the Muslims both in North Africa and the Kingdom of Granada. He claimed to be emperor of Spain and claimed the succession to the title of Emperor of the Holy Roman Empire and no city met many favorable conditions as Seville to be the seat of the royal court, the abode of the king and, according to the Royal Navy Castilian. The dockyard was the means to accomplish the crusade against the Muslim empire, creating and arming in it a large fleet of galleys destined to defeat once and for all Muslim troops still occupied the land and the coast of Algeciras and be crowned emperor by Pope. The presence of the arsenal exerted a strong influence in the organization and planning in the political structure, administrative and social Seville. The arsenal, the base of the Royal Navy of Castile, was built in just 4 years, until the fifteenth century makes its military function and creates a new image of the bank of the river, its port and the heavily militarized cities since then and up to XX century.

To meet the demands arising from the maintenance and operation of a port and military center so developed it needed a huge civil and military contingent. It was formed during the XIII and XIV centuries the *Barrio del Mar* (Sea area), consists of all those people who were doing business in the arsenal, for the arsenal and with the galleys. At the administrative level the arsenal was ruled by a governor -*Alcaide*- who resided in the *Alcazar* and was appointed directly by the king. The alcaide looked after the management of the dockyard and the *Barrio de Mar*, he appointed the officers and workers who became part, he had voice and vote in the election of city government and had to deal with the preservation of the mountains from which came the wooden commissions. Of dockyard's income directly occupied the Alcazar (and therefore the Crown) and not the city government.

As I mentioned in the second half of the eighteenth century until the second half of the fifteenth century in the dockyars were arm the galleys required by the kings for their wars against the Arabs, Portugal, the kingdom of Aragon and other enemies.

In addition the arsenal building served as a space where were realized assemblies and public acts, where it kept the spoils of war and which served as a prison for prisoners of war and persons of high rank disgraced. The dockyards was a field of royal power in Seville. A staff of the Crown owned space in which he could gather a large number of people and that it was comparable to the Roman basilicas.

With the progress of the fifteenth century the dockyard activity begins to diminish and the rooms begin to be rented from private individuals. Gradually spaces remain unused and the building begins to decay. The main cause of the abandonment of the dockyard is that the Crown of Castile already unified, did not need an arsenal in which to arm and prepare the galleys and therefore not agreed to reverse their wealth in the maintenance arsenal. From the fifteenth century documents we read that the king orders a restoration of structures cause arsenal in 1475 appear decaying and abandoned and that housed boats are suffering a slow process of degradation, so much so that must sell them to raise money to restore in the years 1478/1479 the roof of the building by adding vaults, starting with the first lane and proceed with cleaning of spaces.

1.2 From ship store to America store; the XVI-XVII centuries.

Thedockyard should appear finally abandoned in the 80s of the XV century when in 1493 it is transfered in the first lane of the building the Fish town. With the beginning of the sixteenth century the rooms of what was the arsenal take on new meaning and function.

In a document dated 1502 it is mentioned the building implication in the occupation process of the Americas. Seville, with the discovery of America and the start of ocean routes, becomes the largest and most important port in Europe, so that is referred to as "Puerto de Indias" as the home of the American trade monopoly.

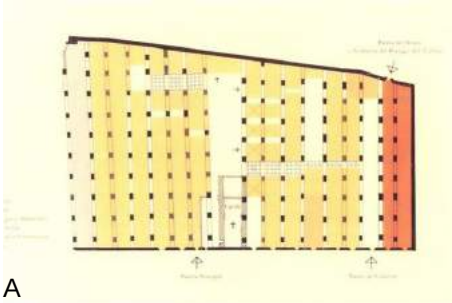
Again the Guadalquivir and its exit to the sea mark the fate of the city of Seville and strengthen the city/sea constraint and the dockyards infrastructure capable of taking on this new challenge.

Even if dockyard doesn't work in build galley, the port is in full activity and the river busy by commercial ships, the city from military fortress turns into large square market and the building again is reflection of this social change; large rooms that once served as the armament of ships is re-convert into excellent spaces for the storage of goods from America. Thanks to the modernity of the architectural design of this huge body of the building consists of large spaces diaphanous survival is ensured and it is extremely easy and not expensive its conversion as a port store. Thanks to the construction of walls, are created closed areas of different sizes made for rent to merchants. The building lost the name of arsenal and the Crown began to rent the lanes to foreign merchants to obtain new profits. A document of 1575 perfectly describes the partition of the environments and the list of renters with the name, time and cost of rent (Fig.3A): the first lane continues to be public fish, the other lanes were divided between private stores and shops , also create small pathways or passageways to circulate better inside the building in the eighth lane there were the church of St. George and *Alcaide* offices, also it has a small square and, in the last two lanes Customs and the *Casa de Contratacion* (two offices of the sixteenth century the Crown, the first in strictly related to trade with the Americas serving recover tax money on products). The structure of the medieval arsenal carries out its function of port infrastructure throughout the sixteenth century and in the seventeenth century.

In the seventeenth century the building underwent its first major transformation: the foundation of the Hospital de la Caridad, religious structure that is implanted in the central part of the building, occupying five lanes, from the eighth to the twelfth, the place where previously stood the chapel San Giorgio.

From this point on, the only part which remains almost intact ancient structure that was the arsenal are the first seven lanes and original unity was forever lose.

Again the dockyard is a reflection of economic and social conditions of the city, devastated by the plague (the two most serious epidemics have in 1600 and in 1650), being now in decline.



A

B

Fig. 3 Dockyards plans. **A** Dockyards in XV century (Barrionuevo). **B** Dockyards in XVII century.

1.3 XVIII century: the end of the port and new aesthetics for the ancient dockyard.

Once diverted American Traffic towards Cadiz the stores at the foot of the dock had less and less sense and the Crown thought to give them a use in accordance with the new situation. The first idea was to convert the building into a Tobacco Factory. From 1724/25 were realized studies on what would be the most appropriate location and, among other places, was proposed dockyard. The report drawn up on Alcazar reporter that the state of the arsenal lanes is bleak, with most of the empty and abandoned spaces. The reporter does not agree with the conversion of the 'Tobacco Factory building, he still harbored the hope that Seville would return to be the port of the Indies, and, in his opinion, the arsenals had retrieve to follow with its ancient task. The trade never returned and the arsenal even converted into a tobacco factory. The military engineer Jorge Prospero Verboom (who was working for the project) ordered his subordinate Don Ignacio Sala to realize the design of the new factory and the latter he said that the arsenal spaces were too narrow for the realization of the project.

Jorge Prosper Verboom arrived in Seville after being in the Straits to prepare weapons for conflicts that were to explode. In the eighteenth century Spain collided with England in Gibraltar. It was necessary to find a safe place in which to put the guns and artillery equipment. The dockyard

possessed adequate space in a city that, to be located in the hinterland, was not so vulnerable to British attack and sealed the ultimate fate of his last stores: the Strait of Gibraltar and its strategic position influence return strongly in the arsenal fate. He was born as a military shipyard under Alfonso X to the crusade against the Muslims, and in the eighteenth century the British presence in the Straits determined that the old arsenal should repent in the Real Maestranza de Artilleria. All the space was occupied becoming Artillery Park. In 1763 it proceeded to a general reorganization of the staff and the building. The experience of recent conflicts proved the need to have in Seville a storage carts and equipment to meet the needs of the war and, once finished war, he continued to work in the factory. In these years, the last seven lanes are permanently transformed architecturally and lose the medieval appearance of the building.
Firewood and other supplies and conservation of artifacts, demanded more space, so they tore down all the rooms built in the aisles and in their place was built a rectangular structure with a high floor, the so-called *Cuerpo de cabecera* of Carlos III, in which is installed the armory. They also raised three new bodies on the three ships were turned and were used as store of weapons.

1.4 The contemporary age: inauspicious years for the building.

In the nineteenth century and up to almost the entire twentieth century, what remained of the architectural structure of the medieval shipyard was preserved and incorporated in the camouflaged artillery factory. The artillery was modernized little by little and introduced steam and electrical machinery.
In 1945 are demolished the last five lanes of the ancient arsenal for the edification of *Delegacion de Hacienda* and two decades later, in 1969 it was appointed as an artistic historical monument by the State.
In 1993 it is expelled the military and the ownership of the building and its surrounding areas pass to the Gouvernment of Andalucia. From this moment it changes visually around the urban plan of this part of the city and the dockyards remain as an isolated medieval flavor locked in a contemporary building that have nothing to do with what for centuries had been the *Arenal*.
Many projects have been proposed for the recovery and rehabilitation of the building which, unfortunately, were lost behind controversy and public debate that has long been going on, leaving after so many centuries of use and transformations, for the first time, the building stay abandoned.
With the new urban planning of the district in the nineties closes the link between arsenal and the river and will erase the footsteps of what was once the port area, the only vestige remains is the Torre del Oro, but also isolated it from its original context.
The legacy of the link with the sea and the great port remains in Seville in the form of great culture and material reachness, historical and monumental, but the image of this symbol place and the middle of this link does not remain that some faint trace. (D.L.)

2. *Las Reales Atarazanas* of Seville: exemplary building born from the reuse of existing elements in time.

The complex of the arsenals of Seville as we can observe now, at first glance looks like a single building and compact. Quite the contrary, is a juxtaposition of many different parts, both for architectural styles, though simple, and for both materials. This architecture is a book where we can read almost eight hundred years of history; each brick is a word, and every element, pillar, arc or time, are phrases that help us track the pages of this intricate story.
The fundamental constructive principle, of easy deduction, is to have been able to exploit as the previous fabrications that, if on the one hand have affected the subsequent development of the yard, on the other hand they have made feasible the superposition of many layers.
First, the original seventeen aisles are built reclining Muslim city walls. From the beginning we see this going to use preexistence as a factor of whole building generator. In fact, the aisles are orthogonal to the direction of the section of the wall exploited, and the total width of the yard is imposed for the extension of this portion, that is, between two ports of the city. These define the limits of the yard, otherwise it might have to raise more or less aisles, because, as the site where the dockyard is the most appropriate, the essential conditioning was just such a stretch of the wall. Moreover, already from the first phase, different materials are used. The city walls are made up of a foundation in *sillares*, big square blocks of stone, and wall in *adobe*, a concrete material to dry in wooden molds, then covered by a protective layer of mortar. The structure of the dockyards, however, is completely made of solid brick. Although small in size, with a fair amount of these elements, it was possible to realize a majestic complex defined by pillars, tall approximately 5 m, joined by slightly pointed arches, with the light of about 8.5 m. The alignment in succession pillar-arch, generated the wall row that engages with the wall. Juxtaposing, approximately every 8 m, such rows have come to create the aisles, which were the true place is precisely where they produced the boats. The wall, is used for a three-fold purpose: first, to have already at the start of a well robust and stable rear closure, the second type of functional system, namely, to have the arsenals in direct contact with the city thanks to the side doors, and

finally, for constructive questions and static, in fact, the horizontal thrusts of the arches are absorbed by the portion of wall on which weigh. Obviously the front was provided a system to support these pressures, you might think of a wall, with entrance rooms for boats, which still held the buttress function.
Once abandoned the basic use, the dockyards have undergone a long process of re-use, recovery and renovation of the place. Some aisles have been entirely re-used in their entirety, sometimes just providing interventions subdivision of spaces, but without altering the architectural structure. This is the case of the southern aisles, unfortunately now disappeared, which were used as warehouses and Customs.

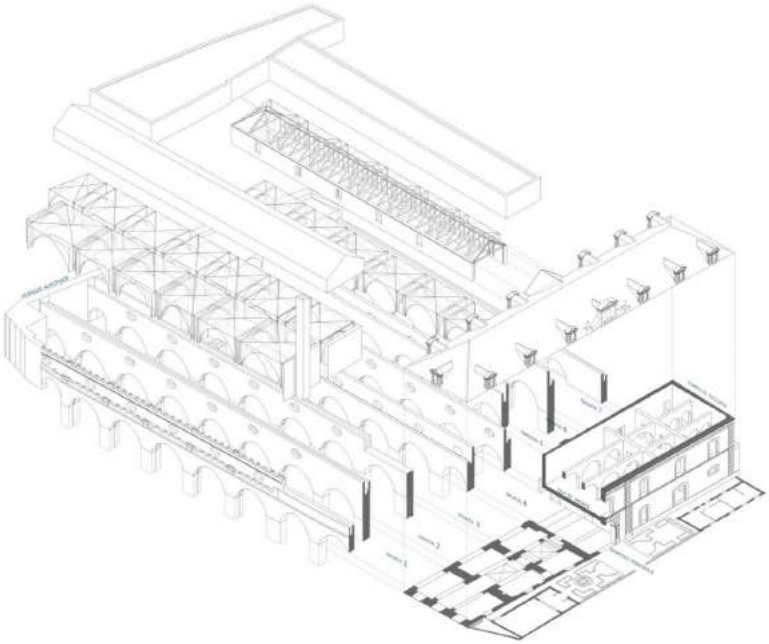


Fig.4 Isometric of the current complex de las Atarazanas in Seville (Debenedictis D.)

3. Constructive techniques and hinges elements.

The spatial definition is given by the combination of rows of arcades that create a simple architectural style but by their large dimensions, both in plants that elevation: the aisle. Each of them was originally covered with a gable roof, which rested on rows of arches, which, collecting water, served as aqueducts. The pillars having a section to "H" appear to be so, not so much for aesthetic reasons but for a structural: on each pillar, in fact fall four arches. The extended depth of 17 aisles, 100m long and about 12m high, formed by a set of brick piers of 2,40m to 1,80m on which it bases the arches, called it a colossal space.

Fig.5 Wooden formwork foundation (Delgado C.)

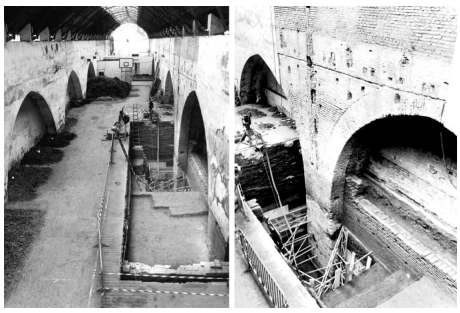


Fig.6 Original pillar longitude (Delgado C.)

3.1 Foundations.

The structure supports a continuous foundation and has a size of 1.30 m in height and 1.94 in width, running for the whole longitude of about 100m. This structural base rests on a layer of soil consists of gravelly clays defining the stable level, on which rests the whole structure, to 2.00m under the original soil. The foundations are anchored to the sandy ground by wooden poles to prevent movement. The formwork (Fig. 5) in wood that has been preserved in all its integrit, comprises: horizontal boards that form the part of the case and transverse boards that support the first. The vertical plates are fixed in their turn by two horizontal wooden hoops, above and below, with a system that allowed to adjust the various elements, both to reinforce the structure in general is to prevent the opening of the formwork.

3.2 Pillars.

The pillars (Fig. 6) emerge from foundations including plan rectangular section of 2.5 x 1.8 m approx. to a height of 2 m where it has a small narrowing in its longer sides. From this point the pillars have a section at "H";they are pillars constructed of brick measuring 0.29 x 0.15 m on average approximately, with a nucleus and wedges of lime mortar according to audition unchanged extracted from certain horizontal surveys.

3.3 Arches

The arches remain in their section the same as that of the pillars, namely "H". The vertical wall is supposed to originally ended in a longitudinal wooden axis on which rested of the authentic roof truss, not preserved, protecting every aisle with a gable roof. The walls present in the final part of a large channel for collecting water that flows towards the facade. The last arch has a variable light depending on the alignment respect to the Almohad Barbican that use as foundations**.**

4. Important structure for the versatility of use.

Today this place, restricted to just seven aisles corresponding to the Maestranza de Artilleria, has emphasized the entry of natural light that is introduced through windows or covers removed in modern times.

What remains to us of the dockyard is the testimony of an architectural monumentality that even medieval denotes a contemporary conception of space: large depth, perspective games specimens and arches that seem to chase.

Once inside, now you would think that this is merely an empty space, but we must not think of it with negative meaning, we might even call it a "positive empty" as the reservoir of a church or a theater and overall the latent space made "active" from the solid that surrounds and defines it. It seems, in fact, that the architecture here has carved an empty.

5. Changes in altitude and relationship with the Guadalquivir

The formal transformations do not take place, however, only due to intervention plan; what has changed, and then carved this emptiness, we have been in the vertical alterations: on the one hand, the raising of the ground level, the other with the replacement of coverages.

The terrain height of the aisles would be feasible to + 2.25m above sea level, just 0.50m compared to the free surface of the river water in the original era.

The interior was spacious with a width for each aisle around 9m around 11,40m and a height up to the beginning of the hedge. Archaeological excavations have attested that the lower sectors are of loamy deposits packages certainly due to frequent flooding.

The current fee is due to work around all the different functions, in fact, it was crucial to raise the level of the floor to put the building in relation not only to the city but to remove it from the influence of the Guadalquivir river flooding that rendered arsenal unfit and unmanageable for use.

This was possible thanks to the height of the building. He was thus able to begin a gradual process of elevation of the ground floor with several grants and contributions.

If the floor was raised, drastically reducing the spatial volume and obviously was thought of creating raised floors that replace this.

At first it was the wooden roof to be replaced by groin vault, which made system structurally more stable; later on some of aisles (aisles 2, 4 and 6) were erected having a variety of new configurations of coverage in relation at the time of construction: wooden ribs, metal structures and even a reinforced concrete structure.

6. Formal description of the building

The building we see today is only part of the primitive arsenal. Because of the nearly eight hundred years of history, including political, economic, socio-cultural and human whims, a portion was demolished and others have undergone changes over time of use; what remains of the naval factory, are the seven northern aisles to which was added a body, perpendicular to these, who fills the role of the facade and main entrance.

The last use that has hosted these spaces has been to artillery factory. It is at this time that was added to the front that still encompasses the entire complex, unifying it and working as dispatcher to the various levels and different small bodies.

Fig.7 North perspective, calle Dos de Mayo **Fig.8** *Cuerpo de Cabecera* **Fig.9** Entrance portal

6.1 *Cuerpo de Cabecera.*

The front of the body (Fig. 8) is a front built for the city looking towards the river. It was built relying on the first arc of each wall line of the original aisles, with a system of arches to all sixth perpendicular to those of the dockyard, also raising a higher level, for armory. It is distinguished, in fact, a transverse continuous structure along the entire width of the seven aisles, and which presents a giant unitary building with a gable roof.

Fig.10 *Sala de Armas* **Fig. 11** Vertical connection **Fig. 12** Wooden roof

First floor: the first layer occupies the same area as the ground floor, although it has a different spatial definition. A large diaphanous space marked by a square brick pillars, connected by arches. There are two rows of pillars that run longitudinally along the body of front, the arches of these layer are orthogonal with respect the direction of the ancient arches primitive arsenal. This plant housed the *Sala de Armas* (Fig. 10), which is why there are no interior partitions, except for the last two rooms in the south.

Vertical connection: the two levels communicate with each other through a staircase (Fig. 11), built specifically to access to the armory. It was created in a perpendicular direction to the aisles, pushing it up against the rear wall of the front body, pointing out that this does not have a proper place to add it.

Cover: the roof structure of the body (Fig. 12), under which it creates an attic space, consists of wooden elements, like a large truss, resting in the pillars of the main floor, divided into three compartments, longitudinally along the body up to meet with the minor load-bearing walls. The elements support each other and with the bottom chord of facade walls through bridges and tie rods, also of wood. On this structure resting the strips that hold the plank.

6.2 Lanes

The architectural system that organizes the inside of the Artillery is configured by alternating lanes covered by groin vaults and lanes with semi-transparent roof with skylights, which allow the entry of sunlight inside, specializing their function and configuration as patios.

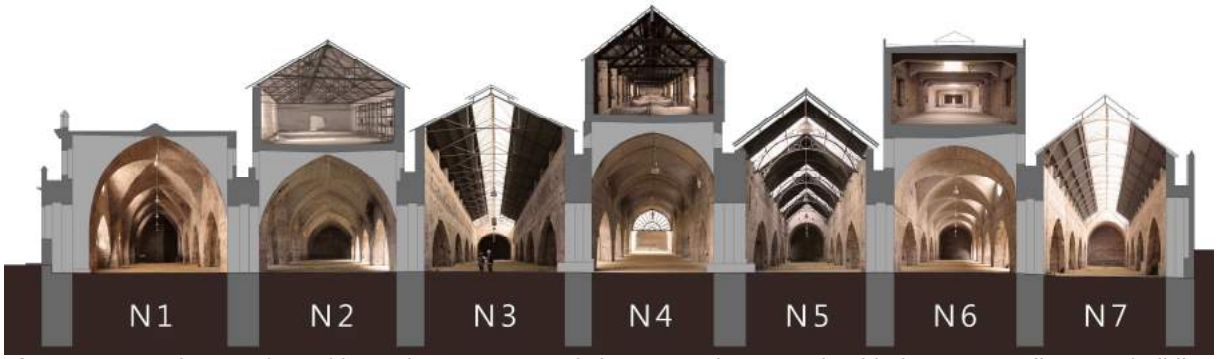


Fig.13 perspective section with a photomontage of the seven lanes and added corresponding top building (Debenedictis D.)

Ground floor: the aisle 4 is the central one, as this leads to the other six, three to the right and three to the left. It is the representation of all lanes as well as being the point from which you perceive the entire space of the place, is also the place in which is placed the staircase which leads to the upper level.
The first lane, the second and sixth are covered by cross vaults, from the archway 3 to instill, intersecting with the wall. The fourth lane, however, is always characterized by similar coverage at times, but it starts from the first arch, grafting to *cuerpo de cabecera*, and extending up to the sixth arch. The vaults are made entirely of brick tile full of different size to those of the ancient arsenals rows, integrating perfectly with the original plot, almost merging with it, creating a unified and compact effect.
First floor: other structures engaged mainly in warehouses make up the second level and are superimposed on the aisles turn 2, 4, 6; each of these is constructed with different techniques and materials. The block overlying the lane 2 is formed by two walls that run along the entire perimeter, on which there are rectangular openings. This simple rectangular masonry, closed with a key cover made of steel pylons, it seems to have no architectural significance, in contrast contrasts with the original structure. Applies the same to the nave of the body 6, which, indeed, is made with reinforced concrete beams for the flat roof, and presents compartments of lighting and ventilation around the perimeter, in correspondence of each arch, and skylights on the ceiling. The raising of the lane 4, is the only one that seems to dialogue with the pre-existence, since he sees integrated coverage wooden trusses that of *cuerpo de cabecera*. A further block of reinforced concrete and steel reinforcements covers the rear of the last five aisles, having the function of connecting the upper parts of the nave 2 and 6. Even this last block, illuminated by skylights, rests on barrel vaults that are found in the bottom of the corresponding lanes.
Lanes patio: Finally, the lanes patio, covered spaces but still connected to the outside are closed by steel structures gable that run along the entire length. That of the third nave has a steel roof truss, matte side and glazed in the central area, the latter raised for ventilation. Those, however, of the aisles 5 and 7, are real steel arches with, including tangent areas with cover, is decorated with circles of different diameters. Even in these, the coverage is sometimes opaque and sometimes transparent.

7. Situation of general degradation.

The state of actual fact, as a result of the pathological analysis carried out on the wall faces of the thirteenth century, is presented for the pillars, for the arches, with a high degree of anthropogenic transformations, various changes occurred during the use of the building , but with no pathology laying down structural damage.
In fact, most of the lesions on the brick rows are deficiencies, of various sizes. Some of these are quite significant, and it could cause a loss of security if they should not be restored. In addition, all the elements that circumscribe such losses of material, have suffered a process of erosion.
Anthropic interventions are also characterized by the introduction of metallic elements, now disappeared, which left traces in the walls. These, are constituted by parts of beams or rods which have not been extracted completely. They do not present a serious pathology, but since their oxidation process is in place, because of their swelling may lead to breakage of the near materials. Other traces, instead, consist of stone elements, of different shape and size from the original factory. These are designed to cover up and suppress some deficiencies; although the principle that were made are right, the methodology followed is incorrect as it is not used any criterion of restoration, and this is known enough.
Another common problem in all aisles is made by brick posting; this phenomenon is more present at the edges of the arches, where the actions of weathering have degraded the joint causing the detachment of some stone elements. This does not impair the arch stability, but in some places, which read the missing wall structure, it is spoiled the aesthetic appearance.
Finally, many areas are suffering from coat, that denature the quality of masonry and requiring a general cleanup. As well as infested areas biological glaze with an adjacent natural vegetation.
From the static point of view, the structure does not show signs of instability, this is mainly due to three factors:

- The backfill accumulated over the centuries: this layer entirely covers all the pillars, implementing a process of confining the latter, leading to increase the security of the entire structure;
- Bodies added to the aisles, 2, 4 and 6: the weight of these structures centered loads of underlying vaults, increasing the vertical component;

- The floors of reinforced concrete and metal of the added bodies: the first, stitched existing cracks, giving continuity to the vaults on which its rest, the second (lane 6) made with a cavity, causes the floor not major on vaults avoiding degradation.

It can be concluded, saying that despite the almost eight hundred years and the complex architectural stratigraphy the Medieval Dockyards of Seville have resisted wearing factor par excellence, the time, presenting itself today with a great emotional impact space and evocative spirit of port cities.
Although not organized to arrive until us, the *Reales Atarazanas*, is an exemplary architectural place of which we can use as a reference model since the architecture is the action of man through which it seeks to shape a space and turn it into a place that last as long as possible.

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San Leucio e San Leucio and Solomeo: Two successful towns.

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The entrepreneurial idea that brings together the historic towns of San Leucio and Solomeo turns out to be the completion of a social, political and artisanal experiment of great value, both industrial and productive, in the context of a system based on equality and meritocracy.
While San Leucio, in the wake of the european "enlightened despotism" of the second half of the eighteenth century, arose as a concrete example of the Bourbons' reform policies that built new towns in order to experiment new industrial plants; the project of urban recovery promoted in the historic town of Solomeo by the italian textile company "Brunello Cucinelli", brings forth a new entrepreneurial dimension. By breathing new life into the historic urban pattern, and patiently recovering the spirituality of these places with an almost Franciscan attitude, the Time of History can also be recovered.
To recover and restore an old town centre, having in mind the ideal of a community vision, is connected to the social ethics of common good and responsible behaviour, taking roots in the cultural necessity of preserving the evidence of the past in its global environmental value and in the urban configuration of the old town.
Can we measure the success of a strategic project that recovers an architectural heritage expression of concepts such as sustainable devolopment, and that incorporates the four economic systems known to us: private, public, social and natural

Keywords: historic towns, idea, experiment, strategic project, success, architectural heritage, systems, urban configuration, development, innovation, human recovery.

1. Introduction

The village of San Leucio belongs to the municipality of Caserta, in Campania, and it is well known for historical and artistic reasons. It is located 3.5 km northwest of the city of Caserta.
The Real Site, along with the Caserta Royal Palace, were recognized as World Heritage by UNESCO.
Solomeo is a fraction of Corciano's municipality, in the district of Perugia, in Umbria. Populated by 436 inhabitants (2001), it is situated at about 9 km south of Corciano, and it mainly develops on the top of a hill.
Either the success and history of San Leucio's village or Solomeo's most recent one rely on the development of a city project based on an innovative, political, social, and entrepreneurial organization. Therefore, despite their spacial and temporal distance, it is possible to identify a link between the experiences of these two hamlets.
The utopian idea of an "ideal city" the Bourbons craved about San Leucio in the eighteenth century - on the grounds of a trend that could be easily recognized as pre-socialist- and the one of Brunello Cucinelli, do not only concern the mere intervention on the physical space - which also plays an important role in building a "brand" – but also focus on the promotion of a large production program, based on the idea of recovering the feeling of common welfare in relation to the site and its traditions.
The takeover of an abandoned hamlet in a Fashion-Design entrepreneurial spirit has proven to be an experiment of great human significance. Not only as far as a restoration of the artistic and cultural heritage or a social rehabilitation of the place are concerned, but also about an innovation of the landscape through the application of new programs of investment, of eco-sustainability applied to new

consolidation methodologies and / or to the extension in volume. The evolution that equates the two villages is similar but simultaneously reverse.

2. A compare between two Towns

The purchase of the San Leucio hill carried out in 1750 by Charles III of Bourbon from the principles of Caserta, the Acquaviva of Aragon, was part of a regional policy conducted on a large scale and already launched time before by the sovereign himself who tended to establish a large set of possessions and feuds -proprerty of the ruling house- around the city of Naples.
The initial assumption was just to create a number of hunting reserves and secondary residences for the recreation of the royal family. Ferdinand IV was definitely the promoter of the project, continuing the territorial strategy undertaken by his father Charles III. However, since 1778 he tried, through a series of experiments and attempts, to implant in the royal reserve a proper industrial silk factory, taking personal care of introducing the most recent developments in technology, the most modern equipment, as well as adopting new concepts in the manufacture of precious materials.
The project for the development of a building dedicated to the Silk manufacture is directly linked to the complex and ambitious urban program promoted by Ferdinand IV the moment he created Ferdinandopoli.
Such a program, which responded to a precise urban plan, foresaw an enlargement of a social and productive experiment about the San Leucio's Colony, and its expansion at a regional level, foreshadowing in the dreamt Ferdinandopoli a real great working place gravitating around the silk industry.
The village of San Leucio was born with a precise social and entrepreneurial idea.
Therefore, in 1780, schools and factories were initiated and nine years later, the royal manifactury was established as an indipendent entity, a sort of state within a state, and its inhabitants were gathered in a regulated and protected by a special statute community.
In 1834, the Bourbons decided to lay the foundation of a company with some private citizens, and such was the organizational structure of San Leucio's silk production until the Unification of Italy. In 1862, despite the development in the amount of production and the refinement of the new "Jacquard" fabric, the Savoy decided to close the factory down, only to reopening it after just four years and conceding it leased to private companies. In 1866 the Colony of San Leucio was elevated to administrative unit under the name of San Leucio, until its final aggregation in 1928 to the town of Caserta. [1]

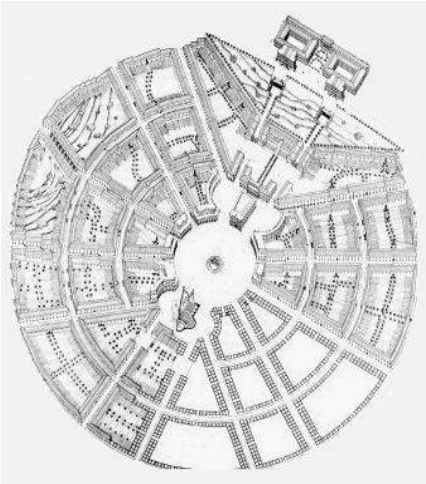

Fig. 1: Ferdinanfopoli (http://www.sanleucionline.it/home.htm)
Fig. 2: Belvedere Palace – San Leucio (http://www.sanleucionline.it/home.htm)

On the other hand, Solomeo, situated on an Umbrian hill and built between the late twelfth century and the first half of the thirteenth, developed on the settlement of a previous rural complex -called Villa Solomei- which was fortified with the construction of the Solomeo castle in the spring of 1391.
To the third century B.C. belong some Etruscan finds unearthed in the area; perhaps, the syncretic term San Lumeo, by which people began to name the place, comes from the name of the Etruscan god lumn. The Solomei Castrum, a fortification to defend the countryside, was then built in 1391 by Giovanni di Meo Nicola and Peter Galassi Tanoli, on request of the magistrates of Perugia. In 1402, Solomeo was conquered and plundered by the papal troops, and the following year it was regained by

Perugia. During the sixteenth century, probably driven by a recovery of its demographic development, the housing units expanded beyond the castrensian walls and in 1729 the town developed along the entire path at south-east of the walls themselves. The castle, the ancient parish church, the seventeenth-century Villa Antinori and the Teatro Cucinelli make the backdrop to a charming environment rich in historical, artistic and natural beauty. Since 1985, Brunello Cucinelli has made of the town the seat of his humanistic enterprise.

Fig. 3: Solomeo Town (http://www.brunellocucinelli.com)

Athough San Leucio and Solomea equals in their sharing a strategic project, the comparison of the two villages shows a significant difference: Solomeo underwent a reverse evolution, because, in the sixteenth century, probably driven by a recovery in its demographic development, the housing units expanded beyond the walls but the condition degenerated few centuries later, when it took a considerable demographic drop, which unrelentingly continued until 1982 when Solomeo only hosted 235 inhabitants and was called the "ghost village".
The genesis of San Leucio, however, is very different because it comes in a different time, from a very strong idea of business and a precise spatial and functional position. The recent history is yet different. San Leucio, as a result of social, political and administrative affairs, loses its international first place in the silk spinning mill, in the last decade of 1900, until the beginning of an inevitable and gradual agony in the early 2000.
One reason is certainly linked to a lack of strategic choices implemented by the "San Leucio" companies working for third parties.
Despite the prestige of the "brand" San Leucio, the local companies slowly lost their power not being able to produce fabrics using their own brand. They pleased themselves in the role of contractors and carried out most of the manufacturing the finished product for third part.
Let us examine, for instance, the example of the Ancient Silky Mill De Negri, which in the past used to receive prestigious orders regarding tapestry work by some of the most important venues in the world, like the White House and the Chamber of Deputies or the Senate of Rome. To the same company also belonged the vestments used by Pope John Paul II during the Jubilee. At closing time, in March 2015, the factory had 20 employees, the production was exported to 90□ and the turnover was 2 million, a figure far from the about 24 billion of the golden age of manufacturing, in the years 80' and 90'.
From a small district – where the De Negri Company was located – the 70□ of world production of "top quality" fabrics for furnishing would come. A past of all respect that, however, has not preserved the historic firm from the severe crisis that hit the textile sector after, in part, the invasion of fabrics from Asian markets and the difficult economic circumstances . The 2008 crisis has seen the production activity of numerous companies definitely cease. □et, another cause of failure is undoubtedly linked to the lack of any operation to foster local business development, as well as to an ineffective innovation on behalf of the companies themselves.

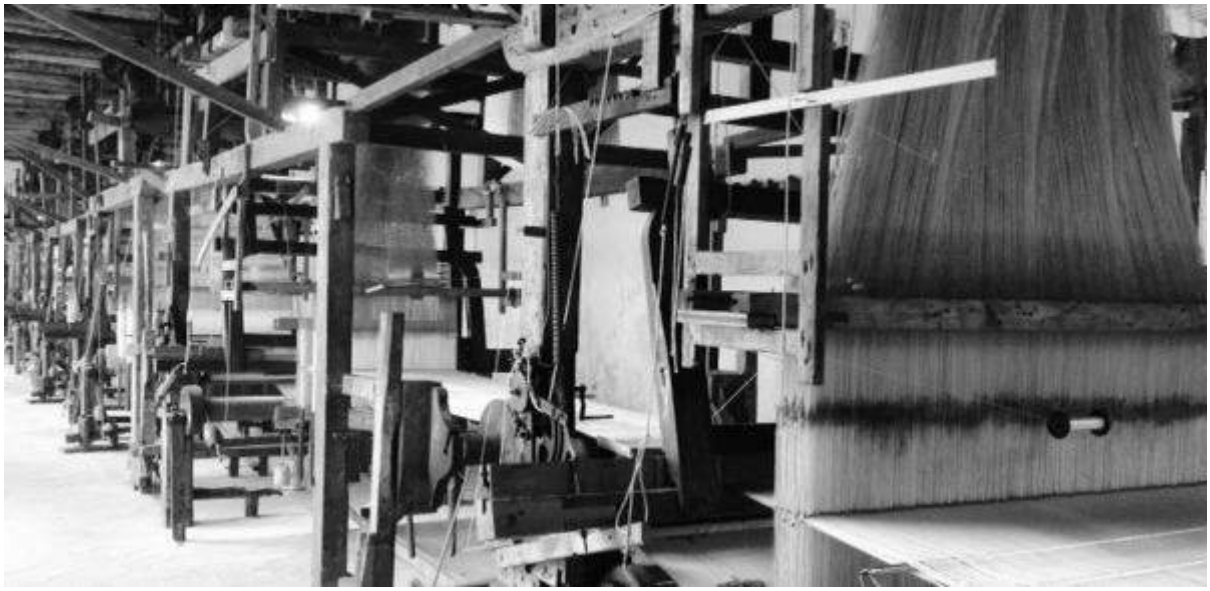

Fig. 4: Frame – Antico Opificio Serico De Negri – San Leucio (http://www.connectingcultures.info)

The village of Solomeo, however, with his buildings: the Arts Forum, the Library, the Academy, the Amphitheatre, the Theatre and School, which later became the School of Trades, was purchased in 1985 by the Foundation Brunello and Federica Cucinelli. The Foundation was created in order to extend and deepen in a concrete way the goals and ideals that had fueled and formed the humanistic aspiration born in Solomeo over the years. Recovering the value of the relationship among the place of birth, the life and the men's action, the Foundation assumes itself the task of directly operating in the direction of human values, conceived as a relationship between people and the different activities that animate the human society.

Any tool that can give substance to this desire is a wanted, welcomed and promoted with enthusiasm instrument, in the believing - shaped by experience - which each human manifestation constitutes a form of culture worth being realized. Therefore, if on one hand the art - in all its figurative, conceptual, musical, theatrical and so on aspects - fully enters the goals of the Foundation Brunello and Federica Cucinelli, no less compelling is the culture of studying and researching a modern "artisan humanism", which retrieves to the values of the spirit the authenticity of everyday practices among work, family and recreation. Neither "physical activities", on which the foundation even see one of the basis of social culture - is considered secondary and the Foundation intends not only to discover but also to disclose and make present the meaning of being amateur as opposed to be agonistic. Every contribution of women and men who recognize themselves in these ideals is a source of wealth that embodies the cultural identity of Brunello and Federica Cucinelli Foundation in the best way. [2]

Fig. 5: School crafts – Brunello Cucinelli Academy - Solomeo (http://www.brunellocucinelli.com)
Fig. 6: Craftsman at work – Brunello Cucinelli Academy - Solomeo (http://www.brunellocucinelli.com)

The Umbrian entrepreneur makes of the village the headquarters of his "humanistic" before Business Company. His intervention should not be seen as the usual marketing operation based on strategies plan of financial level, aimed at the most profit, but it should be seen as an experiment based on a new entrepreneurial dimension, that makes work more human and puts the man at its center. The Cucinelli Company's philosophy refers to an "ethical capitalism", researches a higher purpose, against

the mere gain, such as the sense of a collective feeling. The Foundation's thought refers to a view of the world already embraced in the past by great soul masters like Seneca, Socrates and Francis of Assisi. *To give the compan a significance that goes be ond profit, and reinvest in improving the lives of those who wor to enhance and restore the beaut of the world*. [3]
This way immediately earned the trust of the locals, who overstated the buildings that the firm buyed; the firm involved locals inserting them into the firm's production cycle.
The company, thus, meets an ethical mission: always to put human values come first. It enhances the probabilities to create a cohesive group of workers, where everyone has a role to play for the good of all. Solomeo today is home to one of the largest textile companies in the world for the production of cashmere.

Fig. 7: Cachemire – Brunello Cucinelli (http://www.brunellocucinelli.com)

3. Strategic Design Project

The process of turning places into other - like King's Charles III of Bourbon hunting grounds into the famous industrial city for the production of silk, San Leucio, or an abandoned ancient Umbrian village into a site of a well- known Textile Company, the Brunello Cucinelli, Solomeo- involves a mechanism of innovation and productive research in the domain of strategic design.
Strategic design is not closely related to the life wear sector- namely the one that concerns the house and the person- but is intended as a much broader concept, which involves the material and the immaterial space, just as claimed by Francesco Zurlo, architect and lecturer at the Faculty of Design at the Politecnico of Milan: *... strategic design wor s in a collective area of interest, capable of bearing its action than s to its own s ills while finalizing its practicalit to the production of a meaning effect. The conse uence of this operation results in an offer-s stems more than in a punctual solutions of a service-product or in a simple product- visible representation of the strateg* [4], Zurlo clearly founds his thought on explaining the concept of strategy conceived as dialogue and conversation, confrontation and negotiation among multiple actors, aimed to the achievement of some form of success. He states that *... to change the realit is a concrete action: it is what ou do and not what ou sa In addition, in the ma ing process ever action generates some form of reaction that depends on the agents involved as well as on the characteristics of the environment* [5].
The making process itsels, along with the humanistic-entrepreneurial approach of the Foundation Brunello and Federica Cucinelli, could give birth to a new revitalization project of the village of San Leucio.
There are many accomplished scientific efforts that have resulted in conventions, conferences, theses, but not yet to produce any noticeable effect. An article in Il Sole 24 Ore, edited on April 1st 2016, reports the news that just the Old Mill Silky De Negri is ready to resume production under the name of "Old Silky Mill San Leucio". And since only 5 of world production is destined to furnishing fabrics, the factory is changing direction, moving closer to the fashion industry. To pursue this goal, to be fully achieved by 2017, the factory is organizing an internal design department, to work not only on order, but also to propose their own creations.

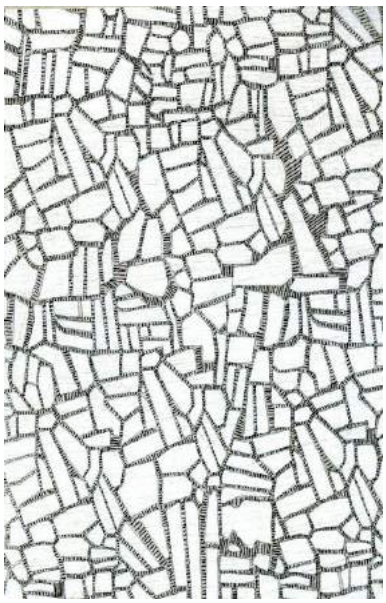

Fig. 8: Detail red jacquard fabric - De Negri production – San Leucio - "Souvenir" of Luca Scacchetti for showing love Pompei, Naples, 2002 - curator and creator Claudio Gambardella.
Fig. 9: Detail blue jacquard fabric - De Negri production – San Leucio - "Souvenir" of Luca Scacchetti for showing love Pompei, Naples, 2002 - curator and creator Claudio Gambardella.
Fig. 10: Azure mosaic design – Paola Navone Design – San Leucio - "Souvenir" of Luca Scacchetti for showing love Pompei, Naples, 2002 - curator and creator Claudio Gambardella.

In order to protect the historical companies of the district it is in the pipeline the quality mark "Silk of San Leucio", owned by the Caserta Chamber of Commerce, which will be granted only to manufacturers who will qualify.
The relaunch proposals, not only in regard to the Ancients Silk Manifacturies, but as for the entire village of San Leucio, should find ground in a strategic transaction that sees the design process and the scientific convey as an innovative mechanism. The design should be conceived not only as a set of methodologies, but also as a process or as the implementation of a specific project.
It could be used, thus, to create the "personality" of a company, and doing so, to influence the way in which the company and its brand are expressed and perceived. The projects and the design process that consolidate the brand, not only add value and are combined to innovation but also create competitive advantage. The completion of a design project consist of a result, a process that, therefore, finds a solution to the problems. In other words, it helps the company shape and define the strategy. To reach the goal, it is necessary to have a close relationship among the local cultural and scientific centres of the territory, such as the Department of Architecture and Industrial Design and the Department of Economics of the Second University of Naples, the Industrial Union, the Campania Region; the initial idea would be to establish, in the ancient colony of San Leucio, a foundation involving all these actors, fostering a new project to promote the design of San Leucio companies through the establishment of a business.

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Cultural Heritage Conservation: referential relationships between sign and signifier of minor architecture

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Abstract
The regeneration of an area hinges itself between the invention of the tradition and the recognition of local identity, which are phenomena bounded in narration and communication of iconic, symbolic and representative signs – properly categorised and connected. The proposed intervention places itself inside the cultural discussion over evaluation, study and protection of the art works preserved within ecclesiastical buildings, which were landmarks of religious orders' both spiritual effort and touchable evidence of artists and architects creative talent.
This work is focused on *minor architecture* examples. They are so-defined not due to their importance, but due to their compositional scale; in particular, this work studies those structures built between XVI and XVIII centuries, in Val di Noto territory.
To this extent, the work aims to propose a categorisation to be meant as a conservation tool, today more important than ever. The objective is to create a database including historical information, photo-documentation and surveys. This work aspires to become a tool of knowledge and critical analysis, able to involve protection specialists in a productive dialogue with religious institutions, keepers of art heritage of universal value, which does not only belong to the ecclesiastical world, but to the whole national and international community.

Keywords: Cultural Heritage, Conservation, Cataloging, Survey, Facades.

1. Val di Noto theme-based paths: minor architectures for identity study *(R. Valenti)*
In this research, the ideas of conservation, promotion and awareness of the architectural heritage are based on the traditional connection between architecture and the context of belonging. This connection also identifies the elements of the recognition marker of the aesthetic-cultural value of the context itself. In particular, if an area shows highly connotative and extended signs, it is sometimes possible to find and motivate some correspondences. When it happens, it is licit to undertake an analytic research on reference relationships which makes an extensive area something both unique and on a semantic and linguistic continuum of iconic or symbolic signs.
The peculiar case of "Val di Noto" structure can be considered as an extraordinary example of a cultural environment, where it is possible to establish a relationship of proximity and reciprocity between elements placed in urban areas which are less popular than the 8 late-baroque cities of Val di Noto (Caltagirone, Militello in val di Catania, Catania, Modica, Noto, Palazzolo Acreide, Ragusa and Scicli), which have been considered UNESCO World Heritage since 2002. It is important to take into account the homogeneity of their art and architecture, due to the amazing reconstruction of 1700, after the disastrous earthquake of 1693.
A system of smaller centres gravitates around these 8 cities: architectural characteristics of the smaller centres, both on small and large scale, can be only attributed to one expressive system, typical of the South-Eastern Sicily Baroque. Ferla, Sortino, Buccheri, Cassaro, Buscemi are some centres in the area of Syracuse where is possible to find abundance of tactile shapes and scenic layouts in the elements of religious buildings, of facades with rich gates and decorations and holy altars and furnishes inside, meant as a *continuum*.

Fig. 1: Oriented cataloguing of cultural heritage: facades.

This study has examined in depth the themes of various survey scales, moving from a cultural heritage cataloguing as basic informative tool for knowledge; a scheme linking Palazzolo Acreide (UNESCO site) with Buscemi, Buccheri, Ferla and Sortino has been adopted in order to highlight the observed similarities. The sheets follow ICCD (Cataloguing and Documenting Central Institute) indications. Their reading is organised on theme-based paths establishing coherent relationships between architectures of the same set, even if they belong to different topological environment. Sheets for different variations of facades, of their elements (recesses, columns, gates) and small-scale architectures of the inside have been formulated.
For examples, the facades' theme is analysed by type – triangle, tower and sinusoidal shape – and an overall view of repetitions or exception is obtained. The result is a theme-atlas aimed to highlight the complete heritage of which the fragment analysed is provided.
The districts "weave" aims to a coherent data collection and the main action is to define an open and enlargeable structure, meant as a net. In this net, connection bends are established by the links found out after an in-depth analysis of religious architecture elements.
Research, comprehension and divulgation are inevitable steps to repossess the architectural heritage, configured as an organic, dynamic and spread unit from the viewpoint of compositional, technological and cultural activities.
The establishment of this complex analysis system activates the protection and the conservation of the heritage, also due to the development of accessible and easy-readable means of information.
The architectural ecclesiastical system, with its elements (facades, gates, recesses, altars, sculptures, etc.) shows itself as a complex net of semantic knots originating an expression characterised by the juxtaposition of codified signs and visual relations which dialogue with the location. The synchronic and compared representation of the perceptive relation of approaching to the magnificence of facades allows to evaluate coherence with scenic-urban aspects of the Baroque era and to visualise harmony and balance with the different variations of the current context.
We focused on two emblematic and opposite examples: the "Chiesa di S. Sebastiano" in Palazzolo Acreide[1] and the "Chiesa della Maddalena" in Buccheri[2]: the former has a strong impact, reinforced in the course of time by the XIX century transformation, due to its position, higher than the urban context; the second one has a magnificent façade and it is in a higher position than the lateral access route, and it is gradually evident in getting closer to the staircase and the vast interclosed churchyard.
The morpho-perceptive analysis highlights the genetic correspondence with Baroque culture rules, not only related to the context but also to the decorative elements.

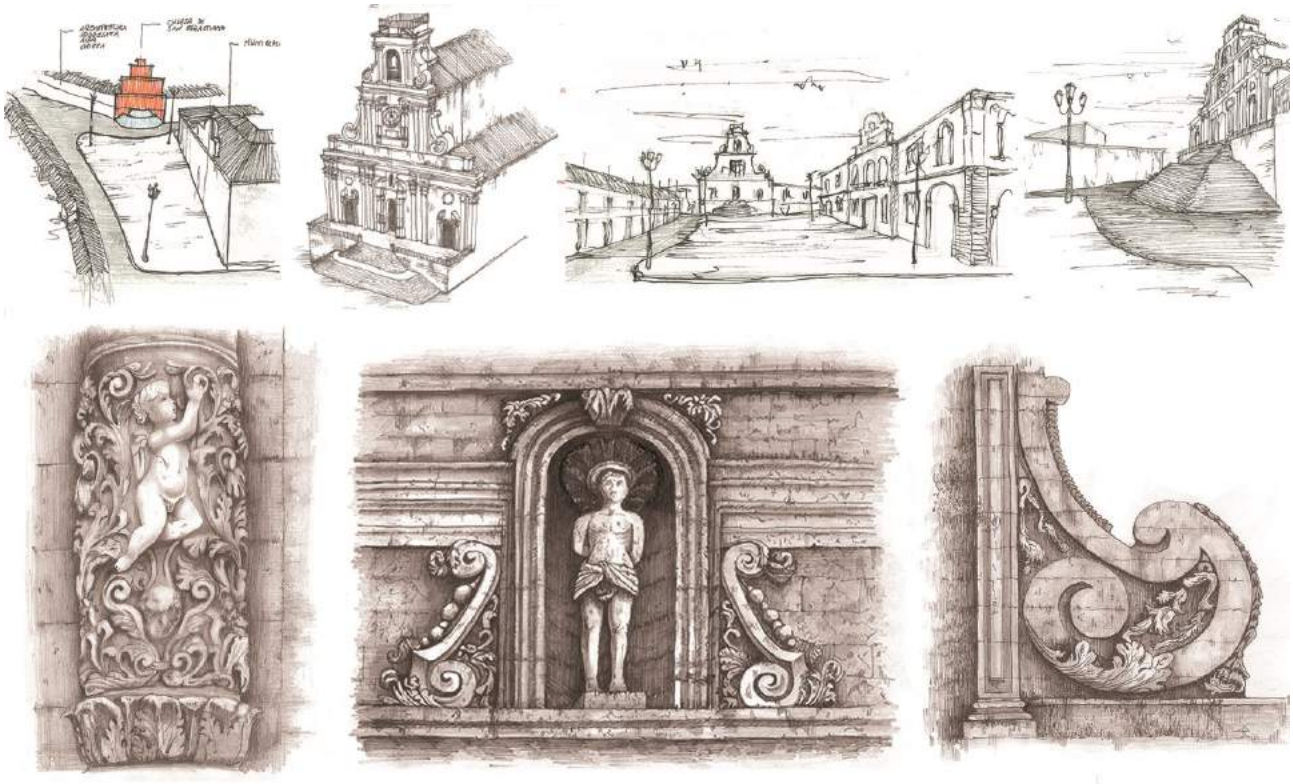

Fig. 2: S. Sebastiano church, Palazzolo Acreide. The representation of the perceptive relation of approaching. The morpho-perceptive analysis of the decorative elements.

In Sicily, in the compositional language of XVII and XVIII centuries, it is possible to find a *renovatio urbis* attitude which saw architects, workforces and purchasers involved in adaption to Baroque conventions. This period is one of the most meaningful for the development of the Sicilian architecture.
Through cataloguing and comparing, the sculpture analysis, even leaving aside a Mensurius research, provides food for thought both about local workforces as *magistri fabrorum*, and about decoration symbology of religious architecture. It becomes clear that the ideas of *firmitas* (stability) and *venustas* (beauty) are deeply rooted in the space and temporal culture of the Sicilian architecture thought, expressed by sculptural group of columns, pilasters, architraves, capitals and statues.
The graphic tool is the most important one both in shape-acquiring phase and in survey and metrical data transposition. The shape-acquiring phase takes advantage of the freeform drawings and the chiaroscuro technique elaborates the depth of the contents. In the following phases, the geometrical analysis explains the relations and the proportion underlying the architectural projects; the aim is to understand the project origin in order to identify the base scheme to refer similarities and differences too.

Fig. 3: Maddalena church, Buccheri. The representation of the perceptive relation of approaching. The morpho-perceptive analysis of the decorative elements.

2. Facades in Religious Architecture *(S. Giuliano)*

This study aims to document the development of the eighteenth-century facades of Val di Noto churches, through a survey campaign, with particular attention to small urban centres of Hyblean Mountains.

The survey, mean tool of knowledge, examined not only the facade morphometric aspect, but also the intangible aspects which make these architectures art works to protect and cherish.

The architectural survey was carried out using laser scan; the intangible aspects using archive research about case study architectures and reference models of the Baroque architecture. The combination of these elements originated a huge amount of information about the church architecture studied. The aim is to clearly classify, register and describe every single element of cultural heritage, often considered as minor work, following ICCD (Cataloguing and Documenting Central Institute) standards. (Agency of the Ministry of Cultural Heritage and Activities and Tourism).

The XVIII century facade of Val di Noto is an architectural object provided with its own space. Its spatial configuration is horizontally and vertically defined by jutting parts and modular bays, evident both from the small urban centre than from the landscape.

In order to make the research easy and fruitful, facades of the area have been classified by type and then referred to "canonical" models of Sicilian baroque big cities.

The first type of facade is "tower shape": characterised by the triple order and the incorporated bell tower. Generally speaking, this type is characterised by vertical repetition of three orders: the first one is the building entry; the second one, often composite, holds the icon of the religious temple; the last one is characterised by the bell tower.

The reference model of this type of facade is the "S. Giorgio" church of Ragusa Ibla, designed by Rosario Gagliardi, recognised as a master of the Sicilian "Tower-shape" facade.

The innovative project efforts and the echoes of his work would influence most of post-1693 religious architectures. They are considered as cornerstones of renovatio urbis idea strongly purchased by Catholic Church and well interpreted by Gagliardi [13].

There are several Sicilian facades presenting this compositional style, but for the purpose of this research we analysed the "S. Antonio Abate" Church in Buccheri and the "S. Paolo" Church in Palazzolo Acreide, both in Syracuse district.

The second type of facade is "sinusoidal": characterised by concave and convex smoothness, it is nearly always put on free locations, able to nurture the stylistic smoothness of the facade. "Chiesa dell'Immacolata" in Palazzolo Acreide, "S. Maria Santissima" and "S. Antonio di Padova" churches in Buscemi, as well as the "S. Antonio Abate" church in Ferla.

The third and last type of facade is "rising triangle-shape": characterised by a triangular scheme with decreasing prominences and culminating with a tower bell supported by volutes, like the "tower shape" type. Examples of this type are: "S. Sebastiano" churches in Palazzolo Acreide and Ferla, the "Maddalena" Church in Buccheri and the "S.Sofia" Church in Sortino.

The geometric reading of these buildings, filtered by graphic analysis of small and large architectures, has often shown compositions based on simple structures, in modules and often ascribable to golden or diagonal relations.

Moreover, the graphic reading revealed the missing of a unique project for church facades. It is the case of the "S. Sebastiano" church in Palazzolo Acreide[3].

The building develops on three decreasing orders. Even if the construction did not follow a unitary project – as confirmed by historical sources and by the fact that the three orders develop on independent geometries – the second and the third orders follow a proportional logic with the first one, somehow confirming its right proportions.

The geometrical reading of the facade of the "S. Maria Maddalena" church in Buccheri is noticeable. It is defined by two orders connected by volutes. This is a unitary-project building, as confirmed by geometrical relations between the first and the second order.

Comparing the facade architecture with the Sicilian metrical system called "Canna abolita di Palermo"[4] (lit. "Abolished reed of Palermo"), we observed that the first order of the "Chiesa di Maddalena" in Buccheri[5] corresponds to 5 measure units (reeds). This metrical relation, defined by natural numbers metrical units, is in contrast with the old Sicilian metrical system of the Palazzolo Acreide's church.

Taking this reading into account, the correspondence with the old metrical units of the Bucchieri's church can be attributed to educated workforce, whereas its absence in the church of "S.Sebastiano" could be attributed to less educated workforce.

To this extent, treatises were the information and education means which were used to guarantee the passing on of the building rules in spatial and temporal terms. Those rules guaranteed the correct formal relations of the five architectural orders.

This modularity, ratified by clear education means, is opposite to a compositional rule related to remarkable relations geometry. Despite the absence of a fixed rule, as this research demonstrates, this geometry repeats itself in different scales and in geographical areas apparently far from each other. It is to suppose a spread of knowledge which, thanks to building customs repetitions, allowed master masons to overstep the

space and time limits, passing down the intangible treatise about harmonic architecture from a generation to another.

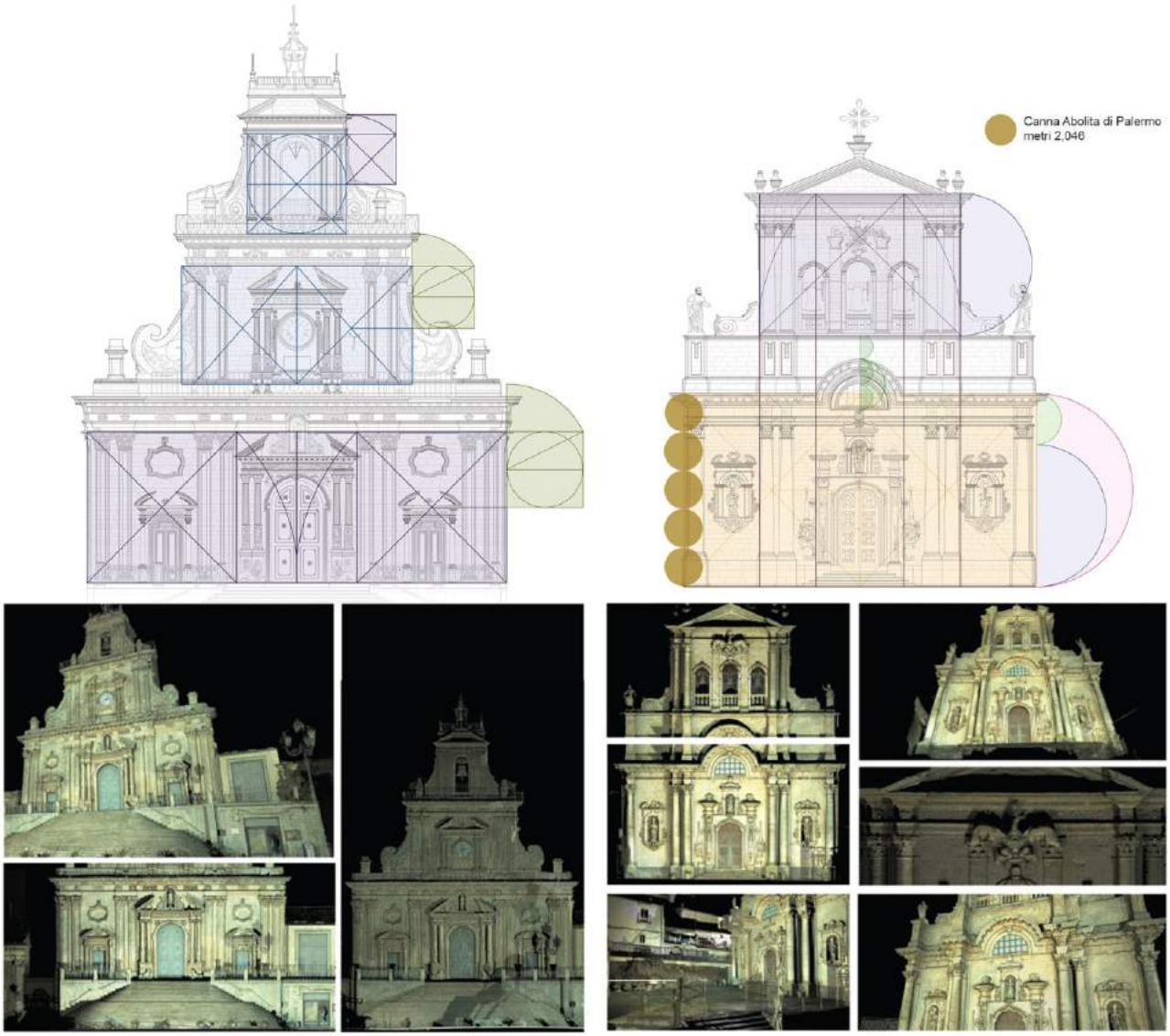

Fig. 4: San Sebastiano church and Maddalena church: Survey and graphic analysis.

3. Formal elements and decorations of Baroque "miniature architectures" of Val di Noto *(S.Gatto)*

This study is an open work in progress. It suggests a reading of Val di Noto Baroque Architecture intended to interpretation and communication of spatial and figurative configurations. It is also aimed to capture the deepest and the most intimate aspects of "micro architectures" or "miniature architectures", so original they are a high artistic and cultural phenomenon.

The fervid building process post-1693 earthquake originated extraordinary various and beautiful buildings. Their beauty is evident both outside and inside, and it follows the new aesthetic categories of the Baroque period, which modifies semantic values it had inherited from the Renaissance, highlighting the difference between parts and the use of decoration. From the outside, this beauty is represented by the facade, with aediculae and gates; from the inside by miniature architectures such as altars, antependia, cases, processional carriages, meant to show the extraordinarily of divine. It is possible to find common elements between large and small architectures, and between small and ephemeral architecture too.

There are strong connections between enduring, temporary and decorations. «The altar shapes are often influenced by those kind of ephemeral architecture that Baroque devotion deploys inside ecclesial buildings» [1] «They represent the ideal place for formal experiments and new models applications» [2]. In Sicily,

«propensity to sculptural decoration generates emphasis and enriches the Sicilian Baroque architecture. It is to be interpreted also as the ability of local workforces to create an enduring celebrative appearance» [3].
The façade of the building is to be studied in relation with all the elements of the layout. First of all, the gate. The gate's theme expresses the architectural culture of *lapidum incisores* and blend functional aspects of the Vitruvian triad with plastic arts, "signs" which qualifiy architectures. The gate, both of religious or noble buildings, juts out from the wall mass of the façade, even if it is intimately connected with it «putting architecture in direct contact with the city space and create a continuity with it also through staircases or atria» [4].
The Sicilian territory offers several different examples of gates: arched, entablatured, mixed, in simple renaissance style or exuberant Baroque one. Among the latter, the gates of "S. Lucia alla Badia" Church and of the Cathedral shows the Solomonic column incorporated. The central gate of the Cathedral was made by Andrea Palma and it shows two six-spirals Solomonic columns, their bodies decorated with grapevine theme.
Other examples are the gate of the "Chiesa dell'Annunziata" in Palazzolo or the "Santuario della Madonna dei Miracoli" in Mussomeli (CL) with broken pediment decorated with flowers and volutes. Moreover, it shows two Solomonic columns rising from pedestal and giving leap to the façade.
The transfert between facade and gate can be repeated between aedicule and gate. The aedicule is a holy symbol both in working-class and noble districts, often built in facade or corners, representing "road signs" [5] and cultural heritage for the community. Micro architectures are characterised by precise base models [6] and the gate is often the archetype.
The other transfert is between the façade and the altar, or vice versa; in the latter «the bind between shape, function and meaning can lead to composition very similar to façades under the figurative aspect» [7].
The altar-icon of the inner part of religious buildings can be considered as a «*scaenae frontes*, with curtains open on a stage crowded with [...] saints and relics, angels and putti, flowers and fruit but also various columns [...] where decoration can discretely superimpose or excavate the bearing element» [8]. It is an artwork meant to surprise and move, witness of creative ability of skilled workforces or important designer-architects, who express, both in drawings and in buildings: «emphasis, monumentality, theatricality, plastic dynamism, polycentric vision, abundance of materials and spatial experimentation» [9], recurring elements corresponding to the new aesthetic taste.
There are copious examples of altars around the Val di Noto, in particular in small centres, often made by anonymous workforces. The church of the Holy Trinity in Bronte, commonly called "Matrice", despite its modest exterior, offers inside a great decorative richness with its altars, real treasures of great historical-artistic value. At the extremities of the transept there are two Baroque altars, with two couples of Solomonic columns on where the public focalizes. On the left, there is the Cross altar; on the right, the purgatory one, with four Solomonic twisted columns, decorated with floral elements and golden plaster. The purgatory altar is quite interesting, due to its allegoric representation: between the columns we find skeleton wearing hats; the different shapes of those hats allow to identify imperial and ecclesiastic offices.

Fig. 5: Left: altar of Purgatory, church of SS. Trinità, Bronte (Ct). At the center: drawing of the catafalque erected for king Charles's III funerals, detail. Right: altar custody, church of Santa Maria degli Angeli, Adrano (CT).

Moving to the hinterland, we can find the noteworthy altar of the “SS. Sacramento” inside the Cathedral of Nicosia, made by Tommaso Amato, or the extraordinary major altar of the Sanctuary of “S. Maria Maggiore del Piano” in Grammichele. The latter shows a decorative exuberance which can be assimilated to the “scuola serpottiana”. Together with the altar, the cases too deserve attention: they are small architectures, made of wood and finely engraved, destined to preserve the Eucharist; these cases provide evidence of high operative talent, which shows itself in the elaborate models, in rich and defined decoration and in the large inventory of illustrations and reliefs. The precious one placed upon the major altar of the “Santa Maria degli Angeli” church of Adrano is a wooden case. It is made of three decreasing levels, richly decorated by half rounded niches. The niches are decorated with a shell theme and with exquisite carving; Father Alfonso Maria from Adrano [10] affirms that « [...] there is an identical case, of same finery and dimensions, in the convent church in Lipari. This makes possible to suppose that they were made by the same artist, maybe a friar».
Then we find the processional carryings going on procession. Some examples are: the processional carrying of “Santa Maria della Stella” going on procession in Militello Val di Catania; or the silver carrying of S. Sebastiano in Acireale designed by Alessandro Vasta; or the ancient and superb carrying of S.Rosalia in Centuripe, which shape is close to the carrying of S. Lorenzo in Frazzanò, made by Filadelfio Allò from Messina[11].
Another parallelism can be found between the tower-shape facade –,typical of the Sicilian Baroque – and the catafalque. The catafalques are wooden architectures, usually rising from the apse zone under the dome, built in order to celebrate the death of princes and cardinals. They are decorated with drapes, candles and inscriptions and contain the coffin or expose the corpse. The scientist S. Tobriner affirms that there is a close relation between the catafalque and the tower-shape facade. Some examples are: the facade of the“Duomo di San Giorgio” in Ragusa Ibla, the facade of “San Sebastiano” in Acireale, the ”San Paolo” church in Palazzolo Acreide or “San Giorgio” in Modica, or the facade of “S. Maria della Stella” church in Comiso or “Spirito Santo” church in Syracuse.
In the light of these first considerations about minor architecture, the extreme vividness of a corpus of shapes and ideas characterised by varied decorative magnificence emerges.
The importance of the historical knowledge and the detailed study of these independent objects – readable in several and conjunct ways – is an essential and preliminary moment for the protection of our cultural heritage.

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[1] The original "San Sebastiano" church was built in the area where it is still nowadays, maybe in the second half of 1400. It was close to a small church dedicated to S. Rocco, a little bit higher than it. It was enlarged during the 1500 and in the first half of 1600. The earthquake of 1693 completely destroyed it and it was rebuilt in the first twenty years of 1700. The scenic staircase was added at the end of 1800.

[2] The old "Chiesa della Maddalena" was originally peripheral, back in '400. It was destroyed by the earthquake and than rebuilt in the current place.

[3] The former order, referring to the entablature base, can be perfectly drawn as two rectangles in diagonal relation, on the bigger side. About the entablature height, we refer to the golden ratio of the square having the side equal to half of the square of the diagonal relation. Despite its posterior building, this rule can be perfectly observed in the second order of the façade. However, the main relation is in two squares, always referring entablature base. The entablature height too refers, as the first order does, to the golden ratio of the square having the side equal to half of the square which defines the second order. Same rule for the third and last order, which can be drawn in a square at the entablature base, now referring to the diagonal relation of the square drawn on the half of the side.

[4] The dimensional analysis adopted the metrical system based on the "Canna abolita di Palermo", substituted for "Canna legale di Sicilia" in 1812.

[5] The first order can be drawn in a rectangle with relation 1:2, overcame by a mediation pedestal between the two orders combined by the half rounded entablature upon the main gate, proportioned in a 1:2 relation with the pedestal. The second order follows a diagonal relation, in which the side of the original square is the result of the subtraction of the two modules corresponding with the ray of the half rounded entablature on the smaller side of the rectangle of the first order. Another geometric relation between first and second order is given by alignment of median point of the lateral arches of the tower bell mullioned window with the main gate of the first order. This alignment is governed by the original square of the diagonal relation of the second order, distracted from a place to the other.

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Archaeological material seized in the territory of Santa Croce di Magliano (Campobasso, Molise)

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Abstract

In the first half of the 90's, in the context of the Cultural Heritage safeguard activity, the archaeological Superintendence of Molise identified, together with the Financial Police of Larino (CB), several illegal possessors of archaeological finds, some of them resident in the territory of Santa Croce di Magliano, a small town in the province of Campobasso.
Investigations and rescue interventions led to the requisition of several hundreds of archaeological finds, many of which considered of high value and in good condition.
These actions are followed now by enhancement interventions and the publication of the materials.
In this paper will be exposed the various stages that led to the recovery of such materials as well as the first scientific data and studies on them. It will be finally possible to show to the scientific community materials that are often excavated illegally creating a serious damage to the Cultural Heritage to the citizens and to the research.

Keywords: Legality, Cultural Heritage, Property, Protection.

1. Cultural property legislation

Since the beginning of last century there has been a strog need to protect the so-called "art thing" the country was so rich of. The protection measures, in those years adepte, ended a way of considering the matter in the former, when they discovered and studied objects found in archaeologic excavations, made in those years all over the country. The issued acts in 1902 [1], in 1909 [2] all basically mean "artistic or historic artistic objects protection" [3]. This statement includes all kind of objects or buildings considered as antiquity value and artistic qualities; objects which can be touched and nominated by law rules but the final set of rules arrives whit the 1939 act about "artistic or historic objects protection" [4]. In this set of rules it isn't considered the artistic value any more, but the interest, they don't want to calculate the value considering instead the need to protect any object which could be related to the material history of the country and its inhabitants [5].
The so-called "Bottai act" (1089/39) has been regulating the whole matter until the issue of the consolidation act (1999), in this context the expression "Bene Culturale" (cultural property), although nowadays used in Italy more than in any other country, becomes part of the juridical language only later. In fact it has been used after the issue of either the "Bottai act" (1939) and the constitution (1948), and now is a typical Unesco expression. In fact has been used por the first time in 1954 in an International convention concerning war cases [6].
The expression "Beni culturali" becomes part of the italian juridical language only in 1967 through "Franceschini commission" and a bit later it is used again in the commission Papaldi's bill describing it as:

“Any object which is material witnessing having civilization value”. That commission establishes the institution of the “documentation central office”.
This departement keep the first list of experiences started by the 1909 legislation till the mid-seventies when has been made the central institute for catalogue and documentation (ICCD) [7].
The expression “Beni Culturali” reminds the inseparabile link between the ordinary law and the values constitutionally recognized and garanteed, particulary the article 9 of the constitution, which assignes to the tutorship of the historical, artistic and landscape patrimony of the Nation, expressing in the same time the cultural function of the patrimony under tutorship [9]. The expression “Beni culturali” really became part of italian law language only at the end of 1974, when has been founded by a legislative decree, a ministry of cultural and environmental property [10], through which has been set in order the all territorial management of the cultural property, living the same importance to the tutorship, preservation, but also the exploitation and promotion [11]. Since 1974 the expression “Beni Culturali” has been in various ways mentioned, without a precise definition, if we leave out the “Bassanini act” 31st march 1998 n. 112, which enlarges and extends the previous “Franceschini act” to intangibile property [12], from taht moment it contrasts or, to be precise, replaces the traditional determination which, as previously said, was the base of the legislation at the beginning of the century. If the oldest definition was centred on objects and its materialità, as they are put in categories order according to law, the “Bene culturale” one is referred to an occasional representation o fan intangibile value relating to the civilization [12].
After the issue of “Bassanini act” has been founded a ministry of property and cultural activities in order to give more importance to the promotional aspect, exploitation and fruition of the cultural property compared with the tutorship actions which were the base of the act n. 1089/39. In the new ministry configuration is underlined the need of cooperation whit public and private institutions for cultural property management by ministry itself or directly with the superintendences.
In october 29, 1999 has been issued the consolidation act of the provisions concerning the cultural and environmental property (d. l. 490) made by a special ministerial commitee. The main aim of the document has been to set in order of rules, to avoid the confusion made by the too many acts. There is also expressed the will of making for the first time a unitary corpus on the matter. Actually it’s not a new act, but a reorder of all the legislative artiche in force issued between 1939 and 1999 [13]. Result of a precise will of a radical reform of institutions concerning the cultural property is the code of the cultural property and landscape (d. l. n. 42, 22/01/2004). The choice of the term “code” indicates the will of a systematical organization of the previous set of rules, the intention of making up a legislative corpus related to cultural property. In this case “Bene culturale” is meant to be a precise juridical value concept, included in the legislation, providing tutorship actions and exploitation of property and cultural activities ministry (MiBAC), regions and local public bodies, according to the functions assigned by the V title of the second part of the Constitution wich specifies that: “the italian Constitution recognizes the local autonomies as exponential public bodies pre-existent the republic. Communes, cities, provinces and regions are exponential public bodies of the populations resident in a certain territory which have to provide for their needs. The government’s action develops in a lower level and as closer as possible to citizens, but with the possibility of changing it in a superior level in case the other level doesn’t work (principle of vertical subsidiarity). It has been necessary to bring about the reform for realizing and covering institutionally the previous reform named “federalism at unchanged c.” (A. 59/1997).
In the code the definition “cultural patrimony” is used with a larger meaning: it includes cultural property as well as the landscape one.
Compared to the previous consoldation act (490/1999) where “patrimony” meant to express the summation of the several categories of cultural property, the code proposes a further enlargement of the term, including the landscape as territory expression of identity; the character of it comes out from man-nature interaction [14].
Cultural property and patrimony seem toh ave two different meanings conceptually nested one inside the other, with different juridical effects [15].

2. Patrimony tutorship: a study case

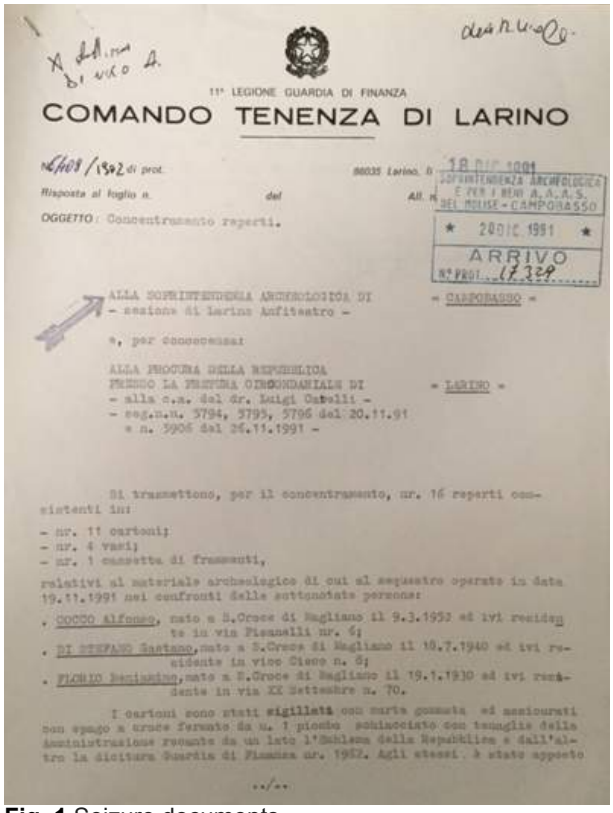
The study case we are going to examine i san exemple of cooperation between different public bodies (archaeologic superintendence of Molise, Police lieutenancy of Larino) having the aim of protecting the cultural patrimony of the country and, in this case, a remarkable number archaeologic finds.

After the novembre 19 th, 1991, searches by the police of Larino, a big number of objects (total 417) has been found in several homes of S. C. fo Magliano (Molise, Cb) esteemed of artistic and archaeologic value without a justified ownership; all those objects have been sequestrated (fig. 1).

All the owners have been charged of crime against the act n. 1089, june 1939, art. 67 (1st paragraph) and 68. They have been discharged by the court (february 1994 sentence) because the charge has been considered inexistent, so the objects were given back. The stated reasons for the judgement were: 1) artistic and cultural value not stated; 2) as the accused persons had the objects since a very long time, it was not proved that they were the ones who found and kept them.

Therefor the judge ordered the dissequestration of the finds and the return of them to the owners.

The general proxy contested the sentence, complaining about the incorrect valuation of the deeds (recalling the art. 67 and 68, act n. 1089, june 1939), which should have given the proof of the artistic and archaeologic value of the sequestrated objects. So, as these objects should have penal tutorship, according to the quoted regulation, the accused persons should be condemned; so the general proxy requested to reopen the trial with the aim to acquire further and more correct valuation data about the ancient and artistic nature of the objects through a new examination of the objects by the superintendence of cultural property of Molise officers. Their new examination has produced a long list of objects precisely described (fig. 2). This has given the possibility of decreeing, without doubt, that those objects, although they couldn't be classified as unique pieces, had clear characteristics of appreciable historical and archaeologic value oblects. On the other end, if the arguments of the sentence can be right about the non-unicity of the objects and the similarità of those found in other archaeologic sites, they don't demonstrate at all that they don't have any archaeologic value.



11ª LEGIONE GUARDIA DI FINANZA

COMANDO TENENZA DI LARINO

N. 6408/1992 di prot. 86035 Larino, li 18 DIC 1991

Risposta al foglio n. del All. n.

OGGETTO: Concentramento reperti.

SOPRINTENDENZA ARCHEOLOGICA E PER I BENI A.A.A.S. DEL MOLISE - CAMPOBASSO

20 DIC 1991

ARRIVO

N° PROT. 17329

ALLA SOPRINTENDENZA ARCHEOLOGICA DI - sezione di Larino Anfiteatro - = CAMPOBASSO =

e, per conoscenza:

ALLA PROCURA DELLA REPUBBLICA PRESSO LA PRETURA CIRCONDARIALE DI - alla c.a. del dr. Luigi Catelli - - seg.n.n. 5794, 5795, 5796 del 20.11.91 e n. 5906 del 26.11.1991 - = LARINO =

Si trasmettono, per il concentramento, nr. 16 reperti consistenti in:

- nr. 11 cartoni;
- nr. 4 vasi;
- nr. 1 cassetta di frammenti,

relativi al materiale archeologico di cui al sequestro operato in data 19.11.1991 nei confronti delle sottonotate persone:

. COCCO Alfonso, nato a S.Croce di Magliano il 9.3.1952 ed ivi residente in via Pisanelli nr. 6;
. DI STEFANO Gaetano, nato a S.Croce di Magliano il 18.7.1940 ed ivi residente in vico Cieco n. 6;
. FLORIO Beniamino, nato a S.Croce di Magliano il 19.1.1930 ed ivi residente in via XX Settembre n. 70.

I cartoni sono stati sigillati con carta gommata ed assicurati con spago a croce ferrato da n. 1 piombo schiacciato con tenaglie della Amministrazione recante da un lato l'Emblema della Repubblica e dall'altro la dicitura Guardia di Finanza nr. 1982. Agli stessi è stato apposto

../..

Fig. 1 Seizure documents

The general proxy, analysing the fact, has suggested that the accused person should be considered absolutely conscious of the archaeologic objects value they were keeping and the unlawfulness of the appropriation. Some witnesses statements, including some superintendence officers ones. In the same time, espresse the doubt that the accused persons wanted to keep forgood the objects: it seemed more that they only wanted to be careful and watchful caretakers. In the end the general proxy absolved the accused persons because there wasn't committed any crime, but, in the same time, entrusted the finds to the cultural property superintendence of Molise.

2.1 Materials samples

The quantity of the seized archaeologic material shows how widespread is this bad habit of the illicit collection and how devastating for the archaeologic research. In this study hasn't been possible, for several reasons, to show the whole catalogue of materials, but the chosen samples give an idea of the quality of the finds and how harmful has been for the scientific research. They belong to different categories of archaeologic material. All the categories are referable to funerary context, but their place of origin remaines uncertain and indeterminate. The presence of formal characteristics and decorative styles referable to a long period of time, probably from the final part of the iron age till the complete archaic period, means a variety of areas searched by the smugglers, even if the possibility of one site in a dvelopping life doesn't have to be excluded.

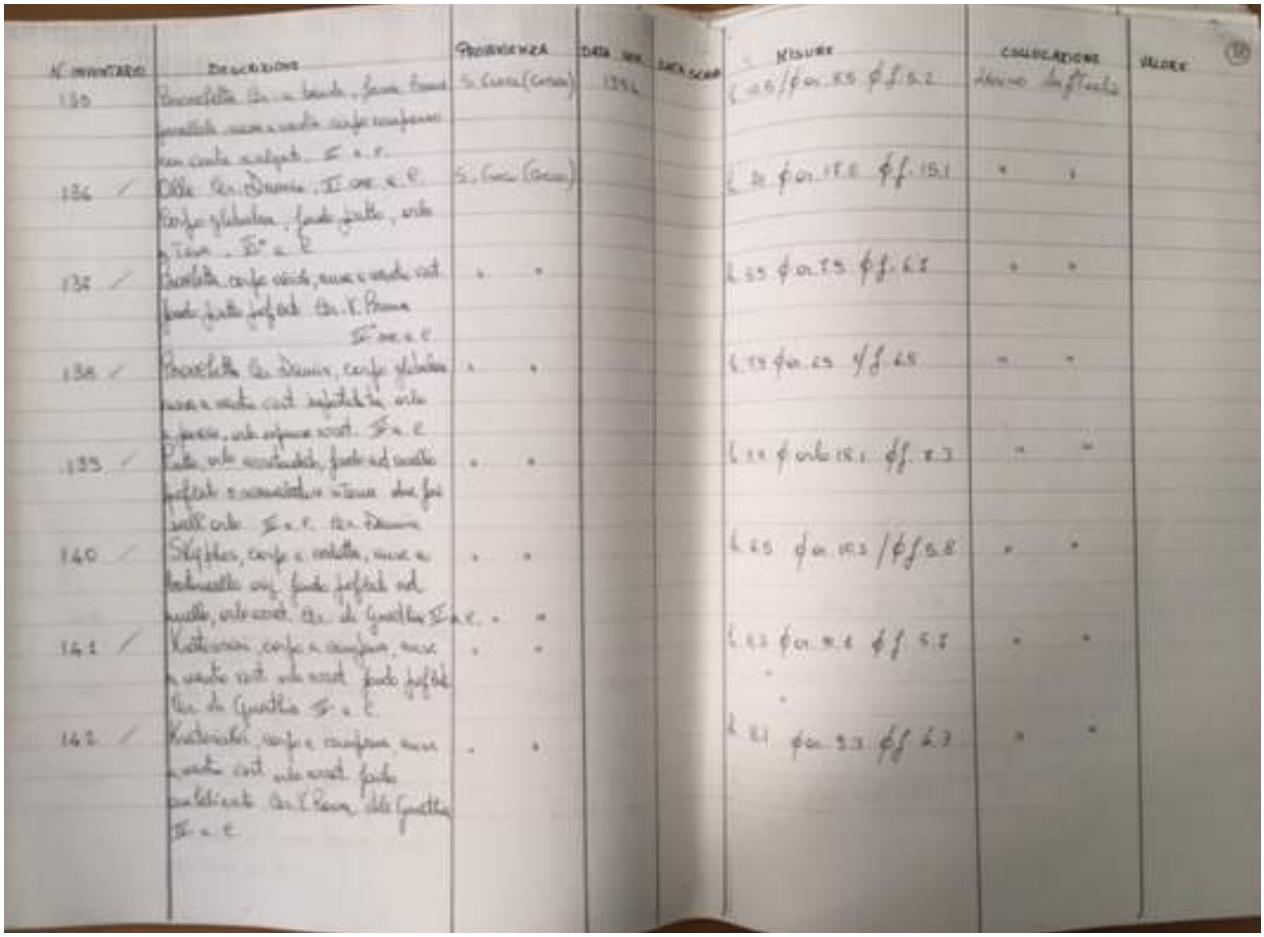


Fig. 2 Lists of materials

The analysed samples are made up of clay or metal. Among the clay objects we can distinguish various categories of production. A miniature kantharos decorated with a single open palmette pattern (fig. 4 n. 6), a miniature amphora decorated with a turning pattern (fig. 5 n. 11) , a miniature skyphos decorated in two levels, the higher part with a small horizontal branch painted in spirals and the central part with a continuous winding pattern (fig. 5 n. 9), a miniatur oinochoe with a trilobal mouth, decorated with an open palmette pattern in the front part, and a dark band is painted round the middle part, while in the right side there is a palm outline [17] (fig. 3 n. 1).
As figuline ceramics overpainted can be classified instead two jugs. The first one has got a short funnel-shaped neck on the biconicol body and a vertical ribbon-shape handle set on the edge and on the shoulder; it has a linear decoration made of a red-orange band which paints completely the internal edge, and another one again red-orange, which paints the shoulder framed by four same coulor lines [18] (fig. 3 nn. 2-3). To the same category belongs a small amphora almost completely covered by monochromatic decoration. The handles are red-orange painted, while, just under the short flared neck, there is a same-coulored band which works like an upper frame of the central pattern of ivy leaves which is covering the whole shoulder. The lower part has a parallel bands decoration red-orange colore as well (fig. 4 n. 7). Another object which can be considered as painted figuline ceramics is a two-handles cup. It has an internal central pattern as decoration made up of two concentrical circular bands; besides having the edge complitely red painted, it has three red painted lobes on both handles (fig. 4 n. 5). Among the samples there is a fragment of a bell-shape crater with red pictures, decorated with a linear laurel twig just under the brim, while in the central body there is a scene probably referable to a wedding (19) (fig. 5 n. 8) and a small three-lobed jug, probably made in daunia, decorated with a linear pattern as red and brown painted bands set in couples and divided by a double brown line. In the back part there are, near the handle join to the body, some vertical pod-style brown ornaments. The peculiarity of this object is the decoration in the external part of the brim, in the frontal lobe sides: two stylized eyes, made with a circular brown band and a red spot in the middle (fig. 3 n. 4).
There are some black-painted objects too: a two-handles kylix without decoration (fig. 7 n. 15), two attic salt-cellars (fig. 7 nn. 16-17) and a oinochoe with flat brim on a short neck, and a globular body, fully decorated with pod-style relief [20] (fig. 5 n. 10).
There are some remarkable bronze objects too: the buckle of a belt with the four hooks and a palmette decoration [21] (fig. 6 n. 13), a hook of belt-shaped lion poised to attack (fig. 6 n. 12) and a sword, probably a

parade one, in good condition. The remarkable part of this object is the hilt: it probably represent Hercules holding the cudgel over the head, while under the pelvis there is an open palmette (fig. 6 n. 14).

Fig. 3 Archaeological materials

0 5 cm

Fig. 4 Archaeological materials

Fig. 5 Archaeological materials

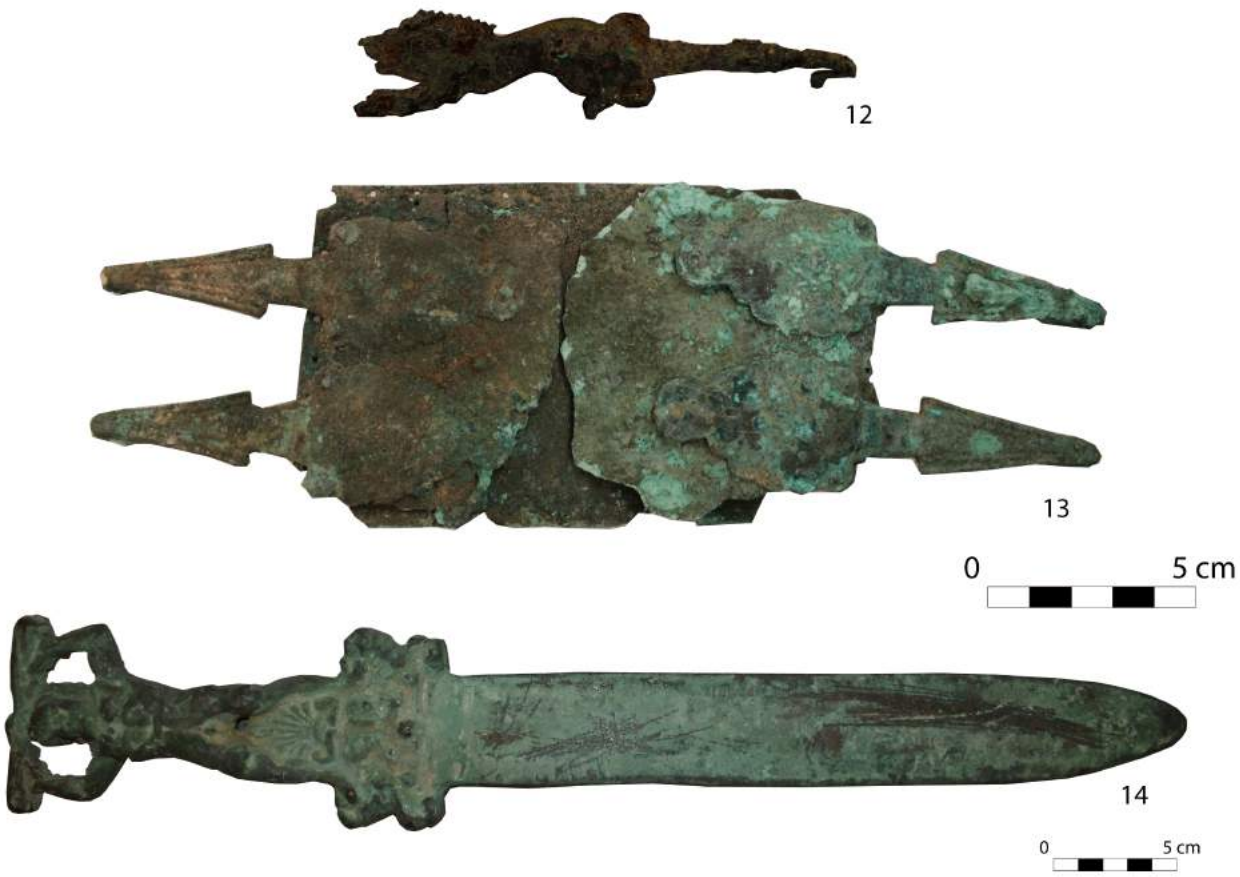


Fig. 6 Archaeological materials

Fig. 7 Archaeological materials

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The Cultural-historical value of Traditional Agricultural Landscape in Slovakia

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Abstract
The historical development of settlements in Slovakia and long term agricultural cultivation created diverse traditional agricultural landscapes that have been preserved despite the pressures of modern land development and intensive agriculture. A national inventory of traditional agricultural landscapes identified the remnants of traditional agricultural landscape in Slovakia by using visual interpretations of aerial photos and field surveys. The historical value of traditional agricultural landscape is evaluated on the basis of the characteristic features: (a) preserved small scale structure of plot division; (b) presence of typical agrarian landforms (e.g. terraces, walls); (c) unchanged land use during the collectivization of agriculture; (d) the use of some traditional agricultural technologies. Traditional use was verified using historical maps from pre-collectivization era, archive documents and published data.
The cultural-historical value was signified by: the degree of preservation of structural features like original plot division and land terracing, shape and size of land, type of bounds, land use, and original farming techniques. The cultural-historical value was evaluated on three case study areas. The cultural and historical heritage of the traditional agriculture also includes verbal, musical and visual forms of folk art.

Keywords: land use, historical maps, traditional agriculture, management intensity

1. Introduction
The present cultural landscape has resulted from the interaction between man and nature over several thousand years. A rich variety of traditional landscapes have emerged in Europe forming an integral part of our cultural heritage. Historical and present land use tells us many things about the socio-economic state of the local community, and society as a whole. Our assessment of the values of the land and its prospects for sustainable development take into account trends in the development of society and the socio-political factors which drive them. The spatial-temporal potential and its constituent parts, continuity, inertia and time accumulation potential, are considered to be very important phenomenon in the development of the cultural landscape (Olah and Zigrai, 2004).
The traditional landscape expresses a unique sense or spirit of place (*genius loci*) that helps to define its identity (Antrop, 2000). The position and uniqueness of typical features contributing to the landscape heterogeneity enable us to the identify landscape values and landscape character (Jančura and Daniš, 2008). The landscape value was studied from the economic, ecology and aesthetic (architectonic) point of view (Supuka and Stepankova, 2004).
In accordance with the European Landscape Convention (Council of Europe, 2000), the Slovak Republic aims to identify and define the landscape types with respect to their particular values. The protection of the national cultural heritage applies to static and non-static monuments, registered in the Central List of Cultural Monuments of the Slovak Republic. Part of the cultural heritage also consists of other objects which contribute to intangible aspects of the place that complete the original landscape character and its genius loci, such as old waterways, the original mosaic of the agricultural landscape of terraced fields, balks, alleys, dispersed settlements etc. From a landscape point of view, those

structures are a well defined group of landscape elements, and such landscapes are uncommon and interesting, although the locals may consider them normal and unremarkable. The scientific study of such elements can provide new knowledge about the history and values of the landscape, and provide new incentive to protect them.

There are 5 classes of historical landscape types of Slovakia – viticulture, agrarian landscape with a mosaic of narrow-strip fields, historical mining areas, fish farming areas and spa areas (Hrnčiarová, 2004). We wish to pay attention to traditional agricultural landscapes (TAL), because agriculture represents the main economic activity during the historical development and settlement of Slovakia. Of the 5 classes mentioned above, traditional agricultural landscapes include viticulture and agrarian landscapes with mosaics of narrow-strip fields. According to Dobrovodska (2006), TAL represent ecosystems that consist of a mosaic of small-scale arable fields and permanent agricultural cultivations such as grasslands, vineyards and high-trunk orchards. They have not been significantly affected by modern advanced technologies, intensification of agriculture, industry, transport development or the mining industry, which have been affecting agricultural land since the second half of the 20th century.

The high cultural-historical value of traditional agricultural landscape motivated us to propose an approach for their evaluation. Our study aims to point out the historical and cultural value of TAL on a national level on the basis of the results of a national inventory of TAL, as well as by three examples of detailed evaluation of local study areas.

2. Methods

The cultural-historical value was evaluated at three different levels: (1) Cultural-historical value of TAL on the national level, (2) Assessment of cultural-historical value of TAL in case studies, and (3) The role and effects of traditional agriculture in culture.

A national inventory of TAL was performed for the whole territory of Slovakia using the method of visual interpretations of aerial photos and field surveys (Dobrovodská et al., 2010). In order to obtain a detailed overview of different TAL, we adopted a classification based on land use categories (Špulerová et al., 2011): (I) TAL with Dispersed Settlements, (II) TAL of Vineyards, (III) TAL of Arable-Land, Grasslands and Orchards, and (IV) TAL of Arable-Land and Grasslands. The cultural-historical value of TAL on the national level is derived from the characteristic features defined for identification of this landscape type: (a) preservation of the small-scale structure of plot division; (b) the presence of typical agrarian landforms (e.g. terraces, walls); (c) unchanged land use during the collectivization of agriculture (1949-1989); (d) the use of some traditional agricultural technologies or presence of traditional agricultural crops. To consider a mosaic of agricultural landscape as traditional, at least one of the characteristic features had to be present. The small-scale structure of plot division and unchanged land use were verified using historical maps from the pre-collectivization period and aerial photos. About 20 of TAL plots were verified in the field. The presence of typical agrarian landforms and the use of some traditional agricultural technologies were reported during field surveys. The overall cultural-historical value of TAL was reflected by other characteristics related to traditional land use and cultural significance of the landscape recorded in the field, and by management intensity, threats and small architectural elements.

Traditional land use and rural layout formed the basis for an assessment of the cultural-historical value of three case study areas of TAL in Slovakia. The cultural-historical value was determined by the degree of preservation of agricultural landscape heritage features like (1) original plot division, shape and size of land, and field path network, (2) land terracing with typical agrarian landforms and micro-drainage systems for water and soil retention, (3) land use including management intensity and original farming techniques used for crop cultivation and land parcel maintenance, (4) small architecture and technical features – e.g. wine sheds, wine cellars, wells etc., (5) duration of continual agricultural use of the studied area. Each parameter was evaluated on the basis of field surveys by an expert on a scale of 0 to 3: 0 - without value, 1 - low, 2 - medium and 3 - high value. The final cultural-historical value for each plot was expressed as the average value of the characteristics listed.

The reflection of traditional agriculture in culture is expressed by the presence of or reference to the cultural and historical legacy of traditional agriculture in verbal, musical and visual works of folk art.

3. Study area

The geological, geomorphological and climate diversity, and variations in culture and political-economical systems have given rise to a diverse array of cultural landscapes in the Carpathians. The historical development and settlement of Slovakia and long-term agricultural tradition have resulted in diverse traditional agricultural landscapes (TAL) being preserved despite the pressures of land development and intensive agriculture. The results of the national inventory of TAL in Slovakia found that plots of TAL cover about 42,085 ha, which comprises only 0.9 of the entire area of Slovakia (Špulerová et al., 2011). The distribution of the four classes of TAL over Slovakia is not balanced; they

are mostly preserved in hilly and mountainous regions unsuitable for intensive agriculture. The TAL of arable-land and grasslands occurred most frequently, followed by TAL with dispersed settlements.
A detailed evaluation of cultural-historical value is presented for three case study areas in which is preserved the original plot division of the traditional agricultural landscape. These study areas, situated in different regions of the Western Carpathians mountains, represent three different types of traditional agricultural landscape (Fig. 1, Table 1): (I) Hriňová - TAL with dispersed settlement, (II) Svätý Jur - TAL of vineyard landscape, and (III) Liptovská Teplička - TAL of arable-land and grassland (Mojses and Petrovič, 2013; Špulerová et al., 2013; Štefunková and Dobrovodská, 2009).

Fig. 1: Location of the case study areas in Slovakia

Table 1. Landscape characteristics of the three case study areas

	Hriňová	**Svätý Jur**	**Liptovská Teplička**
Site and natural conditions	▪ TAL with dispersed settlement in the Slovenské Rudohorie Mts. and surrounding mountains (Detva region) ▪ acid rock - granodiorite, volcanic rock ▪ prevailing cambisols ▪ cool climatic region	▪ TAL of vineyards landscape ▪ situated on alluvial cone in the Malé Karpaty Mts. ▪ prevailingly on crystalline subsoil with cambisols and rankers ▪ moderately warm climatic region	▪ TAL of arable-land and grassland ▪ small basin surrounded by mostly steep (12° - 17°) or moderate slopes in the Low Tatra Mts. ▪ carbonate pad ▪ rendzinas, cambisols ▪ cool climatic region
Colonisation and settlement	▪ colonised in the 17th century on Wallachian law ▪ establishment of dispersed "Kopanitse" settlement	▪ settled by the Slovenians in 9th -11th centuries ▪ influence of German colonisation in 13th and 16th centuries	▪ colonised in the 17th century by Goral settlers - colonization on Wallachian law
State - specific features of mosaics and landscape	▪ original strip-like structure of small-scale arable fields and semi-natural mesophilous meadows, terraced landscape ▪ traditional practices still used in agriculture ▪ pasture tradition, no collectivisation ▪ typical wooden architecture	▪ developed viticulture already present in the 13th century ▪ original strip-like, terraced vineyards, oriented along the fall line, with several centuries old stone hedges and stonewalls ▪ preserved chestnut and oak groves ▪ preserved urban structure of medieval fortified town with traditional bourgeois houses and the houses of the winemakers	▪ original strip-like structure of small-scale arable fields and semi-natural mesophilous meadows and poor pastures with typical agrarian landforms ▪ traditional practices still used in agriculture ▪ typical wooden architecture – dwelling houses, complex of barns; complex of 350 log cabin cellars

4. Results

4.1 Cultural-historical values of TAL on the national level

Traditional agricultural landscapes (TAL) represent a type of cultural landscape that contains both natural and manmade features that reflect the typical land use, and often preserve a cultural heritage reflecting past events or patterns of physical development (Dobrovodska, 2006; Dobrovodská and

Štefunková, 1996). The cultural-historical values of TAL on the national level derive from the following characteristic features of TAL identified during the national inventory.

Preservation of small-scale structure of plot division and unchanged land use during the collectivization of agriculture

The TAL are characterized by a preserved small-scale structure of plot division, which was key to verifying TAL using historical maps from the pre-collectivization era and aerial photos. The small-scale structure is characterized by the parcel shape, and an arrangement of parcels dictated by the relief. Plots placed on a semi-direct contour line dominated in TAL with dispersed settlement as well as in TAL of arable-land and grasslands. This parcel arrangement, created over the centuries, served to combat erosion. The traditional land management for such plots was aimed at reducing soil erosion and mitigation of the slope by ploughing fields and creating bounds such as terrace slopes or step balks. Plots placed on a semi-direct fall line were characteristic for TAL of vineyards, often in combination with a mixed arrangement of plots. Narrow fields were the most common shape, but often an area of TAL would contain a variety of parcel shapes, with narrow fields coexisting with differently shaped plots, or with shorter rectangular fields (Fig. 2).

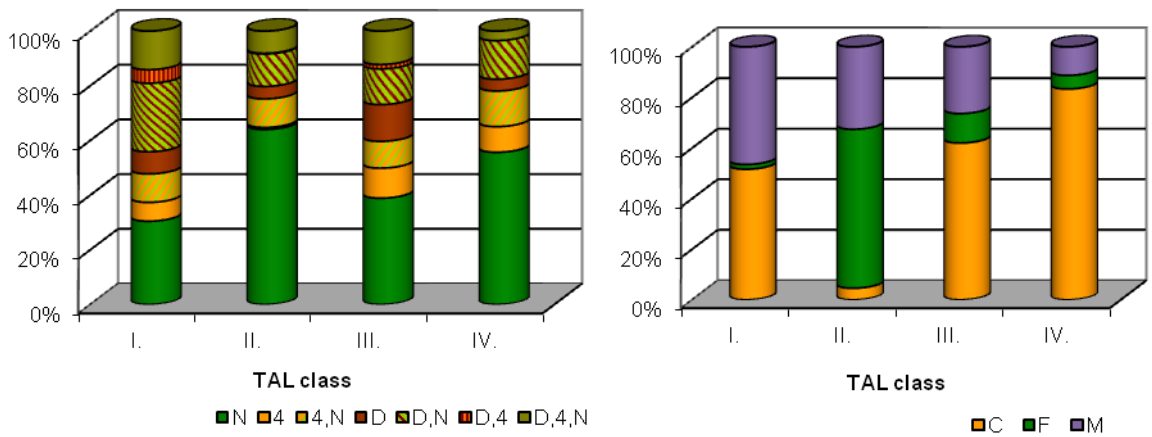

Fig. 2: Shape and positioning of plots of land (Legend: I. TAL with dispersed settlement, II. TAL of vineyards, III. TAL of arable-land, grasslands and orchards, IV. TAL of arable-land and grasslands; Shape of plots: N – Narrow fields; 4 – Shorter rectangular, D – Differently shaped plots; Relief plot curve: C – Semi-direct contour line; F – Semi-direct fall line; M – Mixed).

Land use unchanged by the collectivization of agriculture (1949-1989), and continuing management, helped to preserve TAL even when the management intensity changed. The transition of agriculture to cooperative and mechanized socialistic farming in the last century caused most of these old TAL to dwindle. Only small fragments of TAL have been maintained and their management intensity is still declining. From analyzing land use elements of individual TAL areas, we can conclude that grasslands are the most widespread dominant form of land use present for all classes of TAL, except TAL of Vineyards. Most of the former arable fields were transformed to grassland, indicating a decreasing trend in traditional farming, since its production is low and small farmers are not able to compete with intensified large-block fields. Examination of management intensity in the TAL showed that almost half of the TAL sites (51) are still regularly managed (Lieskovsky et al., 2014). The most significant threats to the TAL and its biodiversity, as recorded in the field, were succession, linked with abandonment, increasing tourism, urban development and reforestation.

Presence of typical agrarian landforms

One result of the efforts at improving the soil and relief quality of cultivated land over the centuries is the multitude of typical agrarian landforms observed in the field (Fig. 3): (1) terrace slopes, (2) step balks, (3) lengthwise mounds, (4) solitary heaps, (5) unconsolidated walls, (6) mounds/heaps on terrace slopes. The step balks (2) and terrace slopes (1) represent the largest group of mapped typical agrarian landforms and they occur mostly in the TAL of Arable-Land and Grasslands and TAL of Arable-Land, Grasslands and Orchards. They both result from measures to improve the relief-soil quality. The terrace slopes resulted in parallel plateaus and grassy slopes (balks). The step balks were created on the bounds of fields through ploughing, without making the relief of the arable plots horizontal, and they are situated on moderate slopes. The proportion of skeleton on terrace slopes was increased by farmers collecting stones from neighbouring managed plots.

Lengthwise mounds (3) and solitary heaps (4) are the result of soil-skeleton removal. Solitary heaps were formed from the stones removed during annual ploughing and deposited at one place within a field or along its edge. Lengthwise mounds have been created gradually by heaps merging.

Unconsolidated (dry stone) walls (5) were built from stones as supporting walls for a vineyard terrace or orchard terrace. In the present many of these walls are partly ruined due to lack of maintenance. Mounds/heaps on terrace slopes (6) were shaped by removing stones from the soil and by heaping them on the terrace slopes or step balks during annual ploughing. Their surface is irregular and they occur less frequently in the landscape.

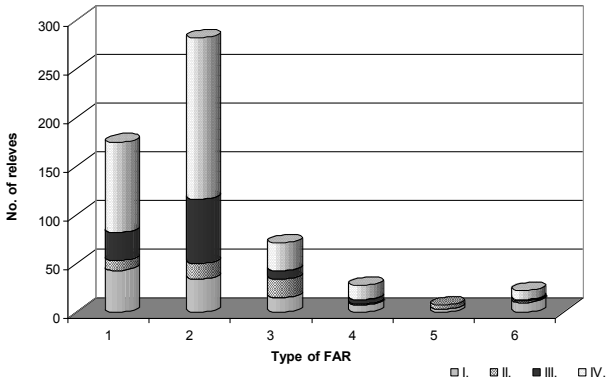

Fig. 3: Typical agrarian landforms in traditional agricultural landscape (Legend: (I) Traditional Agricultural Landscape with Dispersed Settlements, (II) Traditional Agricultural Landscape of Vineyards, (III) Traditional Agricultural Landscape of Arable-Land, Grasslands and Orchards (IV) Traditional Agricultural Landscape of Arable-Land and Grasslands; *T□pical agrarian landforms*: (1) terrace slopes, (2) step balks, (3) lengthwise mounds, (4) solitary heaps, (5) unconsolidated walls, (6) mounds/heaps on terrace slopes).

The use of some traditional agricultural technologies

The traditional agricultural technologies include original farming techniques of fields and bounds. These techniques include ploughing, arable crop rotation, traditional hay-making, mowing, grazing and stone removal. The old agricultural traditional plough equipment (scratch plough, wooden plough, harrows etc.) with cattle or a team of horses can be found in TAL of Arable-Land, Grasslands and Orchards (III) or without Orchards (IV). Farmers still use agricultural hand tools - hoes, scythes, hay rakes, sickles. In the last decades, small machines such as small tractors and lawnmowers have supplemented the traditional tools. Some archaic methods of land cultivation have been preserved or revived since the post-1990 agricultural decline, e.g. the three-field and the two-field system using fallows because of low intensity of utilization. Other archaic land management methods are fertilization with ashes, and folding the sheep in distant parts of village and building filial stables for them. TAL with Orchards (III) are known for old disease-resistant fruit varieties.

One of the oldest systems of vine pruning, used by the Romans in ancient times, was common in Slovak vineyards until almost the end of the Second World War, and has been partially preserved in TAL of Vineyards to the present day. The vines were usually pruned into low bushes and trained to wooden stakes. So called head-trained vines were planted with a close spacing of 0.80 – 1.20 m, unlike the vines in the modern trellised vineyards whose rows are separated by 2 – 3 m. Traditional staked vineyards were maintained without weeds and grass from spring till midsummer. Narrow spaces between plants allowed only hand-hoeing. Later, after the phylloxera epidemic in the first half of 20th century, the new plants were planted in wider rows, which allowed the ploughing of vineyards by horses. Small terraces were built inside the individual vineyards, supported by low dry stone walls to prevent soil erosion. The winegrowers also dug shallow ditches and small retaining ponds in order to hold rainwater and soil within their land. Soils on the steep and narrow plots were mostly skeletal, so vineyard workers removed stones from the soil annually and stored them on the edge of land. Over centuries of vineyard cultivation, lengthwise stony mounds arose along the land margins. Nowadays, some of biggest ones are about three meters high, 4-5 m wide and about 180 m long.

4.2 Assessment of the cultural-historical value of TAL in case studies

The traditional character of local agriculture was ascertained from historical documents, interviews with local people and field research. The distribution of preserved plots of traditional agricultural landscapes is not the same in the three case study areas (Tab. 2, Fig. 4). The largest area of TAL has been preserved in the Hriňová case study area, the smallest one in Svätý Jur. The final evaluation of the cultural-historical value, as expressed in the scale we described earlier (with rankings of 0 to 3) shows that the highest proportion of preserved TAL, with respect to the total land area, was also present in the Hriňová case study area.

Table 2. Total area and relative proportion of preserved traditional agricultural landscape in three study areas, and our rating of its cultural historical value

Case study area	TAL area (ha)	TAL as proportion of total size of agricultural land (%)	Proportion of preserved traditional landscape of:		
			Low cultural historical value	Medium cultural historical value	High cultural historical value
Svätý Jur	113.0	11.12	48	49	3
Hriňová	1517.0	50.99	12	39	49
Liptovská Teplička	275.6	20.97	12	73	14

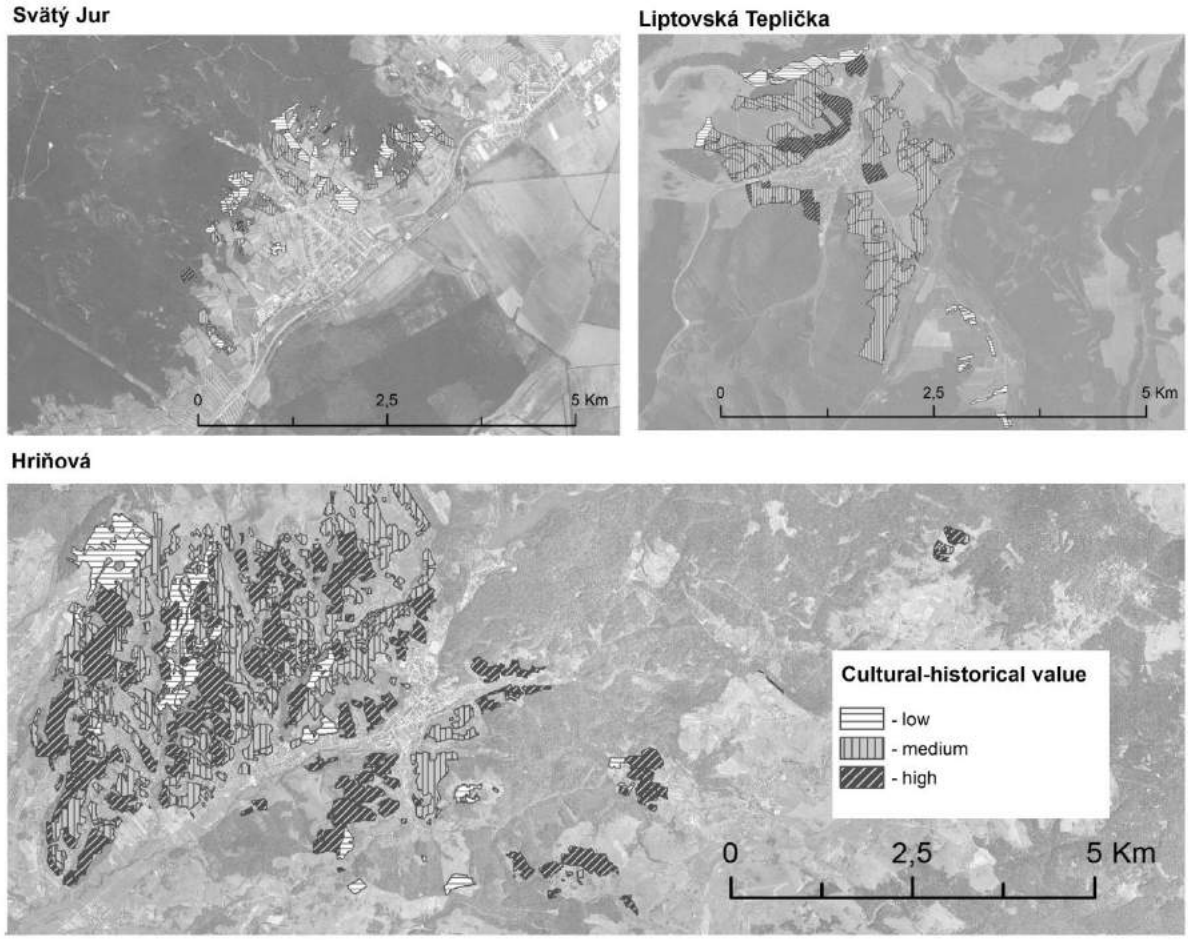

Fig. 4: Cultural-historical value in the three study areas.

1. Low cultural-historical value is represented by TAL without regular management with signs of gradual abandonment and overgrowth by shrubs and trees. These areas were frequently observed in the contact zone with the forest, or in highly terraced areas. Intense urbanization, such as the construction of holiday cottages and houses with residential gardens, has degraded the traditional vineyard landscape character in Svätý Jur. The original plot division and bounds are only partially preserved.
2. Medium cultural-historical value in Liptovská Teplička and Hriňová is represented by former grassy fields or former mosaics of arable fields and grasslands which are regularly mowed or extensively grazed. These types of TAL dominate in both case study areas, since the majority of former arable fields have grassed over during the last 50 years and are now extensive meadows or pastures. Most of the grasslands in Liptovská Teplička are managed by the Agricultural Cooperative with the subsidy support of agri-environment schemes.
TAL with trellised vineyards in Svätý Jur represents an area of medium cultural-historical value. These vineyards are used mostly for hobby winemaking and recreation purposes. The same value was also shown by the grassland on the former staked vineyards with preserved plot division and typical agrarian landforms; abandoned chestnut orchards; and fenced property with gardens displaying preserved plot division and typical agrarian landforms.
3. High cultural-historical value in Liptovská Teplička and Hriňová is found in mosaics of arable fields and permanent grassland with traditional use and practices almost intact (rotation of arable crops, use of draft animals, traditional methods of hay making, etc.). These TAL mainly occur in the most

accessible areas near dwellings. The areas of high cultural-historical value in Svätý Jur are TAL mosaics with bounds such as stone walls and stone mounds, regularly cultivated in the traditional way without changing crops, with no visible signs of abandonment or significant degradation by the construction of holiday cottages, parcel fencing, tractor use and other modern constructions or technologies. This also includes a managed chestnut plantation and terraced staked vineyards with preserved balks.

No cultural-historical value was reported for reclaimed intensively used grassland and arable land in the Liptovská Teplička and Hriňová case study areas and the new vineyards in Svätý Jur that often face to abandonment.

The cultural value of the case study area is increased by the presence of typical wooden architecture such as wooden houses in the village, the wooden barn in Hriňová and Liptovská Teplička and typical vine cellars in Svätý Jur. A unique feature of Liptovská Teplička is the approximately 500 earth cellars located on the slope, behind the urban areas of the municipality, which are still used to store the harvest of potatoes, vegetables and flowers. An inseparable part of traditional agricultural landscape are the elements of small architecture – such as crucifixes, crosses, statues, haylofts or spring shelters situated on the field edges or crossroads – which sometimes become dominant elements in the landscape (Štefunková and Cebecauer, 2006). These elements reflect traces of the cultural and architectural heritage of the regions that relate to the hardships of farmers' lives in the past, and to their devotion and religion.

4.3 The reflection of traditional agriculture in culture

Many folk artworks, special cultural events and entertainments are linked with the cycle of agricultural management, related to the seasons from spring to winter, and with the running of the household and the overall village life. These culture, traditions and folklore are kept alive even today in some places in Slovakia. The beginning of spring is connected with a "welcoming the spring" ceremony and a symbolic "burning of Morena" (a straw dummy dressed in women's clothes carried by singing young maidens to the stream, where it was set on fire and thrown into the water) (Botík and Slavkovský, 1995a). Easter is the most important holiday of spring, associated with the purification and initiation of the agricultural cycle. The sheep grazing season used to begin on the name-day of Juraj (George, April 24) and ended on Mitra (Demeter, October 26), which for the shepherds meant six months of continuous work around the sheep (Podolák, 1982). When letting the cattle graze for the first time in the season, magic rituals were carried out against the influence of damaging forces and to support milk production and milk quality (Horvátová, 1986). "Ján bonfires" and a celebration of the summer solstice are the major summer events. Tradition says that Saint John (Ján) helps to protect the farm from the natural elements, and to heal the sick with the help of herbs collected in the midsummer night. A bonfire burning is today a cultural event in many villages. Mowing and haymaking for winter supplies was the main agricultural activity during the summer, usually beginning on St. John's day (June 24). The heritage of this activity is reflected in mowing songs, called "trávnice", sung by the women. Today, mowing is not common in the villages, but interestingly scythe-mowing competitions have developed in recent years. The harvest took place at the end of the summer, and culminated in the harvest festival. Even today, these festivities take place in some municipalities and symbolize gratitude for the harvest. The grape harvesting is other important activity of autumn, ending with a celebration of the vintage, similar to the harvest festival. The autumn period of harvest and feast completes the agricultural year. Gradually, the work moved into the house, and during the winter evenings it was mostly female jobs being done, like the so-called "páračky" (ripping feathers from poultry) and "priadky" (spinning the fiber of flax, hemp and wool using a spindle or spinning wheel) (Botík and Slavkovský, 1995b). The chief celebration of winter is Christmas. Agrarian-prosperity events have gradually disappeared; however, family cohesion at the Christmas dinner table is maintained.

The cultural and historical legacy of traditional agriculture includes the creation of verbal, musical and visual folk art. Today these arts – folk singing, dancing, habits, clothing, food, crafts – are presented at many folklore festivals. Such festivals are held in two of the case study areas - Liptovská Teplička and Hriňová. Viticultural celebrations and days of open cellars regularly take place in the Svätý Jur case study area.

5. Discussion

A spatial analysis of historical maps and aerial photos has documented the high historical value of the traditional agricultural landscapes in Slovakia, which are also enriched by presence of other historical elements such as typical agrarian landforms, elements of small architecture, specific fruit trees of the archeophyty group, unchanged land management and preserved traditional agricultural technologies.

Similarly to our evaluation, the assessment of historical value for several UNESCO World Heritage Sites has taken traditional land use and traditional crops and products linked to specific historical rural architectures or land arrangements as the most important parameters (Gullino and Larcher, 2013).

The choice of the primary landscape components as the terms in which to describe the cultural value of the landscape (Cullotta and Barbera, 2011) provides a tool to define the primary components of traditional cultural landscape and to designate specific characteristics of importance (e.g. landscape composition and configuration, original farming techniques, and heritage features). Together with other experts we can summarize by saying that traditional agricultural landscape with preserved terraces, dry stonewall features, and traditional buildings and elements of small architecture related to agricultural activity, are considered to be an important part of the cultural landscape, serving as witnesses to the historical-cultural nature of the site (Lozic et al., 2013; Supuka et al., 2011).

Although the study confirms and demonstrates the high historical and cultural value of traditional agricultural landscape, the intensity and proportion of managed traditional fields is declining (Lieskovsky et al., 2015). This reflects a general trend of agricultural land abandonment as a major environmental threat in Europe (Baumann et al., 2011; Keenleyside and Tucker, 2010; Masny and Zauskova, 2014). The cultural and historical value of traditional agricultural landscape is threatened by disturbance of bounds, urbanization, and such threats to the quality of agricultural production as landfills, polluted rivers, and other forms of pollution (Van Eetvelde and Antrop, 2004). To limit this negative trend it is necessary to seek new ways of management in order to preserve traditional agricultural landscape and its values for future generations.

The traditional land-use system is notable for its ability to combine agricultural production with other benefits (e.g. regulating and cultural services) like amenity functions, preservation of local crop and animal varieties, or creation of native forms of socio-cultural organization (Altieri, 2004; Surova et al., 2011). The traditional agricultural landscape with historical terraced fields represents valuable features that improve the quality of the landscape (Slamova et al., 2015). Even though these outstanding agricultural landscapes are not profitable, they have an irreplaceable cultural and historical value and traditions formed under the influence of economic and political processes in a particular region, and should be maintained through regular support schemes (Bucher and Istokova, 2013; Dika et al., 2011). Traditional practices deliver a wealth of unique opportunities for cultural heritage, life quality, and tourism development, not only to rural inhabitants, but to mankind generally (Harrop, 2007).

Preservation of the historical landscape structures requires not only legislatures and land managers, but also the wider society, to regard TAL maintenance as a priority (Belcakova and Psenakova, 2014). The recognition of cultural traditions, especially the specific traditions of individual regions of the world, may create conditions for rural tourism and agro tourism and stabilize the economic and social development of this marginal areas (Svoradova et al., 2013).

6. Conclusion

Traditional agricultural landscapes constitute a particular class of landscape in Slovakia. They are valuable because of both their rarity and their historical and cultural value, as acknowledged by our study.

Traditional land use and rural layout were the main parameters which formed the basis for identification of TAL features in Slovakia. Cultural-historical value was assessed by the degree of preservation of structural features and characteristics such as: original plot division and presence of typical agrarian landforms, the shape and size of the parcels, unchanged land use during the collectivization period, and preserved traditional agricultural technologies.

The highest cultural-historical value in our three case study sites was found for mosaics of arable fields and permanent grassland with almost completely preserved forms of traditional use, or vineyard landscape with unconsolidated dry stone walls or lengthwise mounds, chestnut plantations and terraced staked vineyards regularly cultivated in the traditional manner. Traditional land use like arable crop rotation, traditional hay-making and use of draft animals, and presence of traditional crops and products, is what shaped and has helped preserve TAL in its present form, although these are being replaced by more modern techniques.

The cultural and historical legacy of the traditional agriculture should be preserved for future generations, and we must look for new ways to promote the value of TAL for local inhabitants and visitors, as well as other stakeholders who are involved in management and development plans for target areas.

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Enhancing beauty.
A project to rediscover the landscapes of an ancient route.

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Abstract
Paesaggi in Movimento is a research project promoting beauty, along an Ariadne's thread, suggesting how to cross the territory. This route is not accidental, it is a fragment of the ancient roads network for sheep transhumance, the ancient Appian way. The pinpointed points of interest are often secondary and considered devoid of charm, but they strongly represent the context identity and express its nature, traditions and customs. We have pinpointed:
1. Murgian Landscapes, quarries and Pulicchio, Gravina;
2. Rural Landscapes, farms between Gravina and Castellaneta;
3. Rational Landscapes, Spine Bianche, Matera;
4. Stone Landscapes, Madonna delle Grazie, Palagianello;
5. Negative Landscapes, Madonna della Scala, Massafra;
6. Olfactory Landscapes, Ionian Arch;
7. Functional Landscapes, Paolo VI, Taranto;
8. Marine Landscapes, Circummarpiccolo, Taranto.
The project aims to rediscover the identity of places and to give, to this small stretch of the ancient sheep track, the lost importance through: the recognition of the peculiarities of its natural and cultural heritage; the design and layout of the route; the design of a series of grafts that highlight the unique nature of each landscape, by architectural interventions that allow humans to be oriented and live in these places, and by lightweight stagings that delimit and address the look.

Keywords: Landscapes – Apulia – Route – Beauty - Grafs

Enhancing beauty. A project to rediscover the landscapes of an ancient route

You can find a logic for anything once it's done, once it e□ist. Thin□ of those houses with windows in aluminium and no plaster. People go live in them, The□put curtains, geraniums, a television and, after a while, it's as if everything had always been there. Nobody remembers what it looked like before.
It ta□es so ver□ little to destro□ beaut□. Someone should remind people what beaut□ is, teach them how to recognize and preserve it.
Beaut□ is ver□ important. Ever□thing else comes from it.

In fondo tutte le cose, anche le peggiori, una volta fatte poi si trovano una logica, una giustificazione per il solo fatto di esistere. Fanno 'ste case schifose, con le finestre in alluminio, i muri di mattoni vivi, i balconcini. La gente ci va ad abitare e ci mette le tendine, i gerani, la televisione e dopo un po' tutto fa parte del paesaggio, esiste. Nessuno si ricorda pi□ di come era prima. Non ci vuole niente a distruggere la bellezza. Bisognerebbe ricordare alla gente che cos'è la bellezza e aiutare a riconoscerla, a difenderla.
E' importante la bellezza, da quella scende gi□ tutto il resto. [1]

Considering this as assumption, *Paesaggi in Movimento*[2] project, described below, is primarily a research project to enhance the beauty of our territory. Its starting point is the interest in the traditional Mediterranean architecture, expressing the nature of the place, that weaves a complex and organic relationship with the context that surrounds it and which is constantly linked to the landscape. What has led us to think about a project of valorization of this land is our architectural critical consciousness and a desire to make the shape/background report, typical of the Mediterranean tradition, even more readable, by highlighting the symbiotic relationship between architecture and territory, which reveals itself through the matter, the rules, the surfaces, the colours, the light, the images and the suggestions of the construction.
We have chosen a route, an Ariadne's thread, suggesting how to cross a territory within the regional natural park "Terra delle Gravine", at the edge of the "Park of the Murgia Materana" and "Murge Tarantine". It is not a random route, but it is a fragment of the ancient functional roads network for of transhumance of the sheep, which gave rise to a model of pastoral life, a transition from nomadism to sedentary farming. In particular we've considered , as directrix, a section of the sheep track Melfi-Castellaneta, which corresponds to the final stretch of the ancient Appian way. The route starts from the countryside of Spinazzola, Bari, and ends on the eastern outskirts of Taranto, crossing the territories of Gravina in Puglia, Altamura, Matera, Castellaneta, Palagianello, Palagiano, Massafra and Taranto. Sometimes it passes through the cities to stop in a specified place, sometimes it passes nearby without entering, choosing to focus on the natural part less touched by the man.
In a few kilometers and with small detours as compared to the main course, the route goes through different landscapes and visions: the historic architecture that the man has constantly inserted over the time, such as farms, jazzi, sheep tracks and religious retreats; natural places depicted by rivers, plateaus or citrus groves, but also the evidence of the latest man-made actions such as factories or urban functional settlements. Single and heterogeneous parts, each of them interpretating the nature of the place, but that nevertheless are intertwined and connected by roads, tracks, railway lines and bridges.

The project, in this way, aims to bridge the gap between different morphological contexts, linked by an imagined line, i.e. this thread, that crosses the territory but that is also a concrete route that come to life from different landscapes, that connects and that creates tension.
The intention of the project is to try to enhance and promote a territory trying to hold together many contexts, for a large scale transformation, which does not reduce the project to a single place, devoid of connections with the rest. The project aims to recognize the importance and the identity of the small stretch of the regional selected tracks network, through the recognition of the quality and the peculiarity of its landscapes and through suggesting a detailed knowledge of the area "walking in it" by crossing it in different ways. The fastest, by cars, with flowing landscapes where colours, shapes and sounds blend together along the way. Then there is the slow mode of the walk, unhurriedly, leading to observe the landscape and to interpret the rules, the reasons, the relationships. Finally, the stop over mode: stopping to enjoy the flow of time, to leave on a sheet of paper our thoughts, to hear the voice of the places and stories rooted in tradition, narrated by unknown faces burned by the sun.

We travelled along this route and we investigated the history of the components, and our aim is to illustrate it through pictures and descriptions, hoping that other people may fall in love with this route and decide to follow it. Even if only a few will welcome our "challenge", we will have achieved the goal of bringing the man, to the practice of the travel as a way of direct, slow and pondered experimentation of landscape places, free from the immediacy and contemporary speed. In this regard we would like to quote the French paleontologist André Leroi-Gourhan, who claimed that the history of humanity had properly begun on its own feet, but by the time the man has, in a way, removed his centuries-old experience of the world through the walk, in favour of immediate knowledge systems.
We believe that the complexity of contemporary landscapes can be understood from the simple practices of walking, crossing, running into, treading on, stopping. Simple gestures of reading the place, and in a way even primordial, which through a sensorial experience, lead to encode fixed reference points, natural or anthropic. In particular the action of crossing, combined with that of living,has led the man, unconsciously and instinctively, to seize the land and the landscape, that have changed and have become increasingly comfortable and familiar, so as to become part of our collective memory. This approach establishes a direct relationship with the territory: being inside the places, with no mediation, to discover the relationships between the parts and imagine new ones.

We've chosen a notion of beauty linked to the multiplicity of the views and to the experience of the landscape which is lived through the movement. In this peripatetic space, the body of the moving man becomes the third element besides the form and its background: the man, moving along his path, correlates the landscapes with each shape that meets his gaze and his body. The physical presence of man in the space and the perceptions he gets when he goes through it, are already a form of

transformation of the landscape itself. Even when the man doesn't leave tangible traces and visible objects, he changes the meaning of the space itself, he performs an action which in itself is already an architecture, a legacy that tells, to those who will come after, the spaces he went through and the views he preferred.
In *Paesaggi in Movimento*, the physical presence of man and the action of perception take place along a route, as a paradigm of three different meanings: metaphor of the passing through and the action of walking; real and physical line that runs through the territory and draws it, as it does for the buildings; but even a report of the crossed space through the description of landscapes and of the points of view that follow each other, i.e. as a common thread in the reading of the territory.
The concept of road as a place of crossing the landscapes explains the name of the project, *Paesaggi in Movimento*, where the chosen landscapes are not only the scenarios offered to the eye along the route, but they are often hard-to-reach, in some marginal cases, and seemingly devoid of charm for those who look at them hurriedly, but actually they express, sometimes in a contradictory manner, the nature of places.
The route is not only the first architecture of the nomadic and primitive man who moved on the land to find shelter and to leave his sign, but it is, for our project, the figurative concept in addition to the physical and real means to deepen the study of the chosen stretch, to make it know and to try to improve its fruition[3].

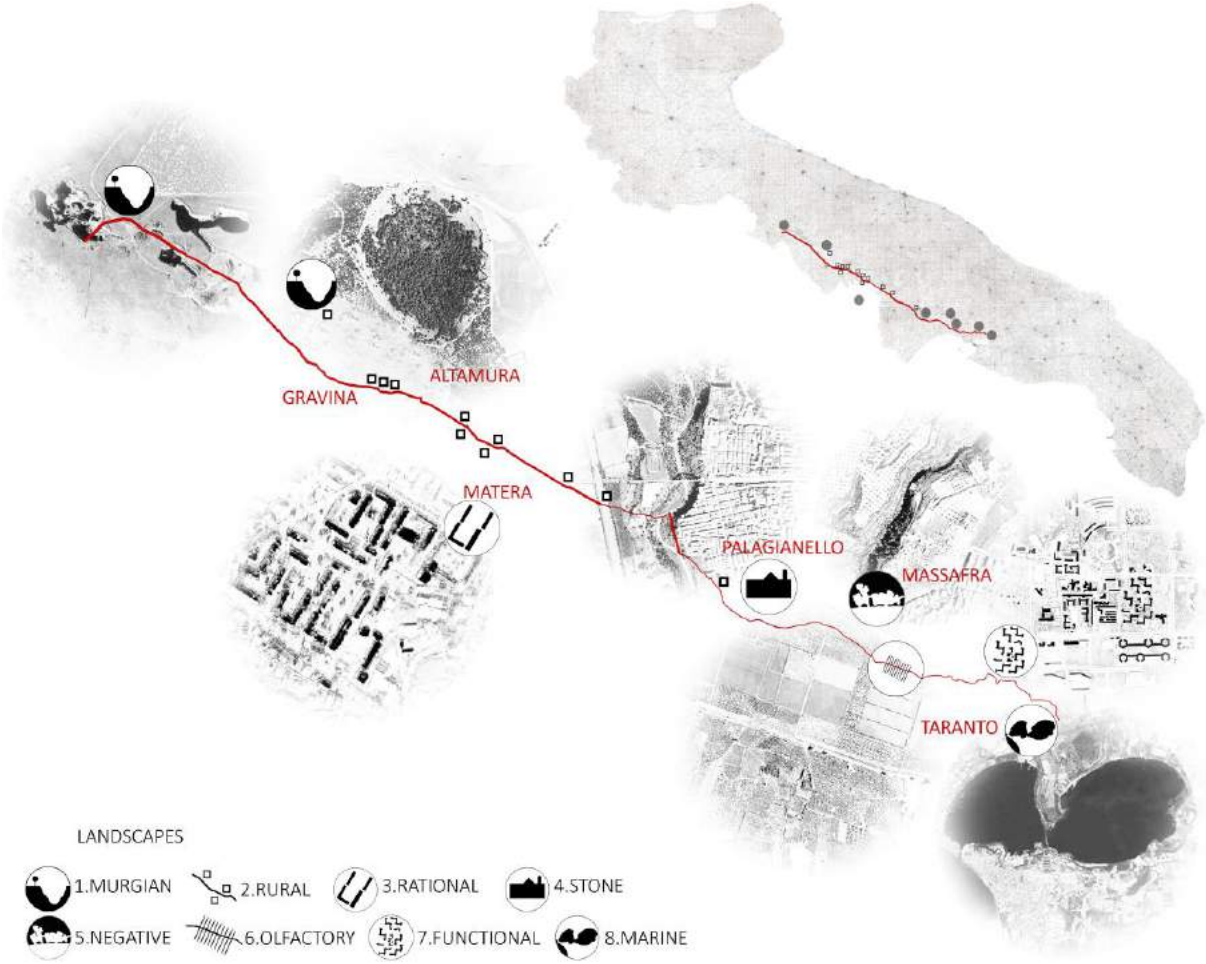

Fig. 1: The red path and the crossed landscapes.

Picture 1 shows the main route of the project, through two images at different scales. By the territorial-scale image based on IGM, you can get an immediate idea of the extension of this route and of its spatial placement in Apulia.
In the second image, in a smaller scale, the route is represented as a red line flanked by symbolic icons that conceptually show the peculiar nature of the chosen landscapes. Each landscape is also associated with a larger image, i.e. an excerpt of orthophotos of the landscape itself. Already starting from the observation of this succession of orthophotos you can deduce the nature of the places, through the nuances, colours, shades and density: the presence of the built or the predominant vegetation; the relationship between land and sea in the peculiar shape of the two coves of the Mar

Piccolo (Taranto); the divisions of agricultural land into squared plots, karstic cuts and the hollows system that cut through the territory of the ravines.
This red thread is just the route on a map of a travel to be physically made, witnessing the succession of our landscapes, while "the meteorological time is joined to the chronological time," quoting Italo Calvino[4]. The thread runs into eight very different landscapes, which are highlighted for: singularity, visual impact and ability to provide immediate knowledge of the site. The choice of these places along the way, matches to our aesthetic and sensorial experience of the route. Anyone, along the red thread, might choose other places or might take new detours along which get lost to find out other beauties.

1. Murgian Landscapes
2. Rural Landscapes
3. Rational Landscapes
4. Stone Landscapes
5. Negative Landscapes
6. Olfactory Landscapes
7. Functional Landscapes
8. Marine Landscapes

We divided the eight Landscapes into three types, always applicable to any reality: unspoiled landscapes, anthropized landscapes and heavily anthropized landscape. The unspoiled Mediterranean landscapes are those dominated by smells and tastes, by the colours of the fruit trees in spring, by the ears of wheat swaying in the wind. In this case, the topographical conditions, the serial repetition of the vegetation, the alternation of hills and plains and the weaving of the stone, make them peculiar. The anthropized landscapes, however, have seen men settle in an organic way with the environment, creating architectures that have respected the *genius loci*. In this case the man has created elements at different scales, roads and paths, bridges, rocky hermitages and isolated farms, drawing from the nature itself the compositional laws to fulfil these architectures. Finally, there are the landscapes heavily anthropized, where the transformations of the man prevail over the natural setting and the lacking relationship between the built and the nature, with its forms, is soon perceived. This is the case of the urban outskirts where large residential blocks alternate with wastelands.

These eight points of interest along the way are not identified by the specific names of places, but by the combination of an adjective with the word “landscape”, the first being chosen to communicate the immediate impression that place generates and that we’d like to convey, highlighting it through recovery design hypotheses and protection of both its route and its valuable elements. The goal of *Paesaggi in Movimento* is to enhance the enjoyment of such landscape system, by establishing connection paths and by designing a series of grafts that, from time to time, focus or clarify the feeling that each landscape has within itself.
The proposed design measures are of a different nature, the study of areas and surveys have helped to highlight the most critical situations in some landscapes (Murgian Landscapes, Negative Landscapes, Functional Landscapes, Marine Landscapes), which require significant interventions to the architectural scale, aimed to solve matters left unsolved, at developing potentially existing velleities and at making available some places left to carelessness : a tower to dominate, a ladder to reach, a park to stroll, a pier to look further.
For the remaining landscapes (Rural Landscapes, Rational Landscapes, Stone Landscapes, Olfactory Landscapes), not having found any big problems and being the nature of the place already greatly clear, we preferred to think about lightweight settings as wooden or stony portals that delimit the view, offering a point of view “addressed” to the landscape.
In contemporary territories, dominated by discontinuities and fragmentation, this operation of "re-meaning" takes on a new value to understand the *genius loci*, since it invites us to explore a place, to culturally seize it, to assimilate its features and finally to rebuild it.

1.1 Murgian Landscapes, quarries and Pulicchio, Gravina: a tower to dominate

Moving Landscapes begins along the Alta Murgia National Park, which area is mostly taken up by pseudo mediterranean steppe, characterised by vast and barren expanses of herbaceous vegetation. The cultivable land is scarce, because the underlying limestone, the tuff, appears everywhere, and the growing vegetation is of herbaceous species that have adapted to extreme environmental conditions. In this framework, we focused on two places of colour and formal discontinuity than the context described: Bauxite quarries by Spinazzola and Pulicchio of Gravina.
Along the track, on the western border of the Alta Murgia Park, near a stone quarry still exploited, the gaze is caught by the reddish colours of bauxite that blush the top of a small hill, creating an absolutely surreal atmosphere. Today, the old bauxite quarries, exploited from the '50ies until 1978, are the evidence of the mining activity which has become obsolete.

A space in a state of abandon, despite the utter singularity. Through a short detour, the route leads from the bauxite quarries to the Pulicchio of Gravina, a sinkhole, produced by the collapse of an underground cavity. The Pulicchio is situated on a higher ground in comparison with the road, it reaches a maximum depth of approximately 85 m and it is characterized by a pine forest, which covers the walls and bottom, creating a green spot little suited to the typical Murgian landscape.
As can be seen from the descriptions, both places are considered as unusually coloured soil cavities, hard to reach and not very visible to those who do not know of their existence and who are not looking for them. In this case, the design hypothesis is to build wooden towers, strategically placed, that allow both to observe these cavities from a higher and overall point of view - which is currently impossible because you have only fragmented visions of these spaces - and to set vertical nodes visible from various parts of the Alta Murgia Park that work as elements of attractiveness.

1.2 Rural Landscapes, farms between Gravina and Castellaneta: a frame to focus

Along the Ariadne's thread, the project studies a stretch of road, from Gravina to Castellaneta, whose peculiar nature is the settlement system of the tracks, characterized by dualism between the sheep-tracks, and the stopping and manufacturing places, i.e. the farms. The choice of studying, in this segment, the early identity of the sheep-track is not accidental, but it derives from several factors. This segment of the important sheep-track "Melfi-Castellaneta" has not undergone great urban or building transformations, as along other segments of the track. As a result, you can travel along the original route, albeit extremely changed in form and materials, and it's possible to observe the succession of farms in their early location compared to the road. Probably due to sun exposure and to the orography, livestock farming and grain cultivation have merged along this stretch. These have led to the coexistence of both types of farms: sheep farms and the field farms.
The succession of rural architectures along the route is as follows: Masseria and Jazzo Pantano, Masseria S. Chiara, Masseria Cialledde, Masseria Bovio Sereno, Masseria Lo Surdo, Masseria Lorusso, Masseria Iesce, Masseria Viglione, Masseria Miseria and Masseria S. Stefano. The new project highlights them through the laying of large stone frames placing the artefact at the intersection between the track and the small path leading to each rural architecture. We consider this "framing" the architecture, not as an added value to the architecture itself, but rather as "furnishing the road" by placing innovative elements that capture the attention of those who travel along the route without giving value and meaning to the landscape they are going through.

1.3 Rational Landscapes, Spine Bianche, Matera: grafts to join

The route diverts toward Matera and the beauty we want to focus is not, as one might expect, the ancient core of Sassi di Matera, but the modern part of the city. We study a neighbourhood, Spighe Bianche[5], built after World War II, a particular national historical moment in which the architecture had the role of restoring an image to a country destroyed by the war. In the case of the city of Matera there was, in addition to the national problem of reconstruction, the question of inhuman conditions of life of the old district of Sassi, for which it was decided to displace and to build new districts and hamlets in the so-called *Cit□ of the plan* to re-locate the displaced inhabitants[6]. For the realization of these neighbourhoods, in 1954 a national competition was proclaimed. The winning project, the neighbourhood Spine Bianche, was the one signed by C. Aymonino, C. Chiarini, M. Girelli, S. Lenci and M. Ottolenghi but, at the end, it was opted for a collaboration with architects outside the winner group. Spine Bianche has distinctive features: the façade coating by exposed bricks ; the visible floors on the façade in the form of a string course that show the reinforced concrete structure; the openings that measure the distance between these string courses; the travertine base which creates a chromatic detachement with the rose-coloured bricks; the tile roof protruding compared to the façade.
Rational Landscapes because some features belong to the modern rationalism as the unification of the constructive elements and layouts and the greatest economy of materials compatibly with good durability. The residences are spread inside of splints that, grouped in groups of three leave, in the central space, courtyards considered as connection between collective green and private gardens, between driveways, entering into the neighborhood, and footpaths. It was abandoned the first idea of shaping the new neighbourhood by creating the same environmental conditions of ancient districts, where the sociological concept of neighbourhood corresponded to the physical form of the open space, common to several domestic units, the "urban room" (*camera urbana*).
It was opted, instead, a whole new residential structure, full of confidence in the future development of the people lifestyle of Matera, who abandoning the intimacy of the neighbourhood, would acquire a freedom in human relations, choosing who to relate to no longer on the accidental base of the neighbourhood, but rather on the affinities arising in collective places[7]. But at a closer look, the impression Spine Bianche gives of itself, is that of a place to which its people have "rebelled" trying to recreate the conditions of neighbourhood by seizing the courtyard spaces and also by changes from the original project, like adding balconies and small loggias on the ground floors.Our project consists

of small grafts within the gaps between buildings, which make these areas more livable and appealing, towards the neighbourhood, for people external to the "neighbourhood" of such courtyards.

1.4 Stone Landscapes, Madonna delle Grazie, Palagianello: a frame to focus

Palagianello rises in the quarries. There are quarries to the South, East and North of the city center, flanked on the East by the *Gravina* (ravine). The shape of the ravine represents the distinctive picture of its landscape. The tuff rock has been excavated to shape vaults and recesses of caves, crypts and hermitages, it has trapped the shells of a distant past, it has been excavated to extract tuff ashlars to build farmhouses, castles, stone walls and houses in the city centre. Palagianello is in the rock and, the place from which we choose to observe the city so that our perception is immediately visible, is inside Parco della Gravina, opposite the historic centre. This location is yet another opportunity to place into the landscape, already well established, a stone frame that will focus the long-ravine of the Ancient Sanctuary road, dotted by rock settlements, and placed on the tuff wall of the ravine. At the end of this road there is the sanctuary of Madonna delle Grazie, which dominates and enlightens the valley below through its tripartite façade made of tuff ashlars, whose central part ends as a hut and a small bell tower on the right side that stands out against the background of the quarry behind it, todays amphitheatre. Looking at Palagianello through this frame highlights the unique and contradictory matching between the stony surface belonging to the entire city and the variety of vegetation growing in Parco della Gravina.

1.5 Negative Landscapes, Madonna della Scala, Massafra: a ladder to reach

The route encounters another ravine, that of Calitro in Massafra, near the Sanctuary of Madonna della Scala, located downstream of the ravine, but fastened at its eastern side by an imposing and impressive staircase of 125 steps. Along the corridor to the right of the churchyard you reach a rocky village that, in prehistoric times, and then from III to XV century a.d., has established for about 500 meters by digging the steep tuff walls. This village is made up of a series of dwellings, which open outwards only through irregular openings cut out on the rock wall, correcting the surface design and the unceasing continuity. The underground spaces, often inaccessible, in some cases are made accessible through temporary solutions, such as stairs leaning against rocky walls. This was for us an interesting cause for reflection, and we tried to design compatible solutions with the landscape-historical value of the place and, at the same time, that would integrate, in materials and shapes, with a wooden path that draws a walk in the ravine, respectful of approximately 600 different plant species hosted in this area.

1.6 Olfactory Landscapes, Ionian Arch: a space to stop over

The Ionian arch from Taranto is a vast arch-shaped plain facing the Ionian Sea. Its peculiar morphological feature is the series of terraces and flat terraces with parallel pace to the coastline, through which the Murgia plateau slopes towards the sea, creating a sort of *natural Amphitheater*. Here you can read traces of soil remediation, which have transformed a marshy and uninhabited area into a highly fertile farmland, as it is now. Crossing these routes means to enjoy the colours and scents of the crops which grow prosperous thanks to the Mediterranean climate. On the higher terraces, the landscape displays a prevalence of orchards and citrus groves. Approaching the coast, to these, the intensive cultivation of cereals, olives and grapes in the West side is added while, in the East side, the intensive cultivation of wine grapes prevails. The intervention we propose in this case consists in selecting an area which is the place of an interactive stop over, where you can watch the products of the soil, feel their smell, touch their skin and taste their flavour.

1.7 Functional Landscapes, Paolo VI, Taranto: a park to stroll

Paolo VI is an outer neighbourhood of Taranto, which lies northeast of the Mar Piccolo. In the years of economic development of the city, while the imposing steel industry, Italsider, grew larger, the borough starts to be built and, over time, this area, previously occupied only by thick stretches of Mediterraean Scrub, became the broader neighbourhood of Taranto. The concept behind the design of the area is the diversity of forms and spaces, in contrast to the uniformity of the rationalist settlements. The original core was made up of large irregular Greek frets made of four-floors volumes, with eight-storeys towers. This part of the neighborhood is the one that preserves more homogeneity and compactness; the rest is characterized by differentiated buildings, tall and massive blocks or curvilinear volumes that delimit huge and deserted open spaces. The disjointed urban structure, lacking of gathering places and with large empty spaces that isolate the built, contributed to create some difficulties from a social point of view, in an area inhabited mainly by families in precarious economic conditions. The buildings look like uncontrolled spots in the middle of a countryside where nature has escaped the anthropization of man, to reach a new balance, an hybrid and ambiguous state in which it has assumed new forms. The goal of *Paesaggi in Movimento* is also to track down places of little interest in the collective imaginary and to highlight their resources and great potential,

as in the case of the conquering nature of Paolo VI, which we do not want to "subdue" by filling it with objects, buildings, things, but that we want to traverse, listening to the void. The aim is to restore these public spaces, reorganizing the general urban plan and aiming to improve the social quality of neighborhood life.

1.8 Marine Landscapes, Circummarpiccolo, Taranto: a pier to look further

The Circummarpiccolo, reopened only in 2014 after years of closure due to repairs, it's a long road about 9 km along the eastern cove of the Small Sea and it provides a global view of the entire Gulf of Taranto, where the Great Sea is separated, by the old town island, from the Small Sea: a real lagoon divided in two coves, the eastern and western one. The distinctiveness of this small sea, besides the sinuosity which makes it more female than male, is that its waters are less salted due by the presence of *citri*, underwater springs of fresh water, that depart from the Murgian Plateau and flow in underground networks up to gush into the Gulf of Taranto, making its waters suitable for mussel farms.
This route is quiet and goes through a territory where the man, since the 4th millennium BC, has lived and built productive and religious facilities, such as farms, Roman villas, tombs and churches. One of these is still preserved today, the convent of Battendrieri, a small cloistered building with the refectory, sacristy and kitchen on the ground floor, while on the first floor there're the friars simple cells. The hallways and the cells have windows that look out to enjoy the seascape. Along the way, we arrive at the Oasis "Palude la Vela", a small marshy area with groves of reeds and Mediterranean scrub, surrounded by Aleppo pine forest. The area is safeguarded by the Wwf as, soil moisture and climate, have made it suitable for hygrophilous vegetation and for beautiful species of aquatic birds.
A route with targeted staging points, the Convent and the Swamp, but without stopping points on the sea, even flanking it continuosly and breathing salt air to each and every soft curve.
We want to stop and watch the sea and we do this by creating small piers, minimally invasive, which do justice to the Sea of Taranto, a sea of everyone: from the small fisherman who leaves, every night, with his fishing boat for expeditions, to the big merchant ship; from kids who during summer dive from marinas, to the great industrial structure that draws the skyline from any observation point we look to the city.

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[1] English and italian version from the dialogue on the importance of preserving the landscape beauties between Peppino Impastato (Luigi Lo Cascio) and Salvo Vitale (Claudio Gio□), adapted from the Italian movie *I cento Passi* by Marco Tullio Giordana, year 2000.

[2] The concept of this project was designed by architects: M.B. Pisciotta, R. Soleti and V. Spataro, and it is the winner of the Prize *Raffaele Sirica □01□ - Start up giovani professionisiti*, sponsored by CNAPPC in 2014. The idea was rewarded by the jury because directed to the promotion and development of design culture in our country. The project is currently developed only by the authors of the paper.

[3] The project was developed in stages. A first stage of critical-cognitive survey that has allowed to identify the route and collect documentation consisting of: bibliographic and archival material, historical maps, tests and photo shooting during on-site inspections. This phase has allowed us to understand the nature of the area and assess the cues for the projectual hypotheses of enhancement of the sites. The current phase is the development of architectural projects aimed at offering a better fruition of the examined landscapes. The next stage will be the dissemination of knowledge through the publication of a small volume that might accompany the "walkers" in recognizing the quality and peculiarity of this small stretch of paths network.

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Fig. 2: From the top: Murgian, Rural, Rational and Stone Landscapes.

Fig. 3: From the top: Negative, Olfactory, Functional and Marine Landscapes.

Fig. 4: Eight projects fot eight landscapes.

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Artistic remains in an ancient Christian place of worship in Termoli

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History and legend merge when it comes to reporting on the origins of the mother church dedicated to St. Mary of the Purification. Unfortunately, due to the destruction of old archives perpetrated over the centuries by invading armies and earthquakes no documents currently exist in the Termoli region to help us establish the history of the cathedral from its inception. Nevertheless, we know a church was built before the year 1000 followed by a second place of worship, built on the same spot. Several remains can rightfully be traced back to this second church: the apses and fragments of the mosaic floor found during restoration of the current cathedral in the mid-twentieth century. Accordingly, these remains represent some of the oldest and most important artistic and architectural artefacts in the Molise region.
Eighty years after their discovery we still know very little about when they were built, the technique used to build them or the workmen who created them; nor do we have information about their symbolic meaning or the event that damaged the mosaic floor. The fact similar works do not exist in the vicinity has discouraged comparative studies but emphasises the unique and extraordinary nature of these artefacts and ultimately prompted this geometric and photographic survey to document the state-of-the-art of the mosaics.

Keywords: Middle Ages, Cathedral, Survey, mosaic floor, bestiary

1. Introduction

A preacher visiting Termoli in the second half of the sixteenth century gave this description of the hamlet: “It’s a beautiful, anonymous little town, with an old and much revered church and sensible decorated houses. Surrounded by the sea on three sides and land on the fourth, it is protected by very high and very strong fortifications and walls, with just one access through a gate on the fourth side”.
History and legend merge when it comes to reporting on the origins of the “much revered church”, the ecclesia major dedicated to St. Mary of the Purification.
In fact, there are currently no documents in the Termoli region to help us establish the history of the cathedral from the moment it was built because over the centuries the old archives have been destroyed by invading armies and earthquakes.
Since onsite research provided no documentation we had to turn to neighbouring settlements to gather useful information. We found the first interesting data in old parchments in the Benedictine monastery in the Tremiti islands: a deed of donation dated 1037. The latter shows that a group of inhabitants in Termoli donated the church of St. Quiriacus martyr and several lands between “Fracta de Guisole” and the church of “Sancte Marie, qui est Termolense” to the monastery of St. Mary and St. Jacob in the Tremiti islands. This is the oldest piece of information we found about an urban church dedicated to St. Mary.
We believe that the cartha donationis indicates one of the religious buildings that existed in the area before the construction of the cathedral. It too was probably a cathedral, because the document informs us about intense pastoral activities in Termoli, i.e., the letter of the Bishop of Rome, Pope Agapitus II (946), to the simonaic bishops of Trivento and Termoli, Leone and Benedetto, asking them about their work.
We believe that the Papal letter testifies to the construction of a church before the year 1000. In his article on the Castle in Termoli Luigi Marino reports that in the eleventh/twelfth century another church

replaced the former one. Since it was probably bigger than the previous church, it is almost certainly the ecclesia Sancte Marie mentioned in the document dated 1037, in other words the church where the apses and fragments of mosaic floor were found during restoration in the first half of the twentieth century. However, the church was destroyed one hundred years after it was built, whether this was due to an earthquake or warfare is still unclear. What we do know is that another bigger church was constructed ex fundamentis: the current cathedral, datable to the twelfth/thirteenth century.
Like many similar buildings, the centuries-old history of the church has repeatedly attracted scholars who, with different instruments and different objectives, have tried to understand it. In the late nineteenth century, however, interest in the building exited the doors of academies and travelled beyond national borders, while the goal of the bishops responsible for the church was to restore the original construction. An initial attempt was made by Mons. Giovanni Capitoli (1909-1911), but it was thanks to Mons. Oddo Bernacchia (1924-1962) that excavations uncovered the remains of the old church.

2. The mosaics

The first written data we have about the mosaics is the report by the Superintendent of Monuments in L'Aquila dated 5 December 1934, a year after commencement of the restoration: "remains [□] clearly visible, in other words the apses, pilasters dividing the naves, and large parts of a mosaic floor found in several areas of the church. [The mosaic floor is] damaged due to the many graves dug after it was laid [but not enough to hinder interpretation of the decorative layout]: it is possible to reconstruct part of the geometric design around the spaces occupied by figures and animals".
Even if it sounds unbelievable, the mosaic we can see now is only a small part of what was brought to light. We are aware of this very disconcerting fact thanks to the descriptions in the letter between L'Aquila and Termoli, but also in the reports written after the discovery, mainly in the letter sent to Bishop Bernacchia by the Superintendent on 16 December 1937. The letter mentions a "mosaic just after the entrance to the cathedral to the right". Instead the report written by the Bishop talks about another mosaic near the secondary entrance (currently plugged) on the north wall of the right nave: "The main entrance to the church, the sides, still intact, have traces of large areas of mosaic with fascia or weave patterns going in different directions, but nothing to indicate figures".
Furthermore, only two smaller areas of these mosaics are still visible compared to what was initially found: one is located in the left apse, the other in the centre nave (fig. 1).

1.2 The first mosaic

The mosaic in this area is divided into three parts. The first and third parts have a geometric chequered motif that does not follow the profile of the apse, while the area in the middle contains a scene with animals fighting (fig. 2).
Bishop Bernacchia provides a very interesting description of this mosaic. He writes: "Another piece of the mosaic depicting an animal in the front part of the apse tells us that the figures were not restricted by the curve of the apse, but haphazardly arranged across the whole surface". This excerpt shows that the zoomorphic image originally spread beyond the diameter of the apse and was therefore much bigger than the one currently visible. This is unfortunate because it means that the reports written immediately after the mosaics were discovered are the only historical sources that can provide us with information. Likewise, the photographs by the Superintendency are the only images supporting the descriptions. Now let's move on and describe the mosaic itself. The aniconic part is divided horizontally into two parts and is clearly present in the left field, while it appears only indistinctly in the right field. The lower area has a very basic geometric design created by intersecting two constant orthogonal grids, one with horizontal and vertical lines, the other rotated by 45°. The combination of these two graphic matrices creates a grid with a triangular base filled by the mosaicists with pieces of two different colours; this colour scheme enhances the optical effect of the intersecting lines and highlights the quadripartite squares along the diagonal and the rows of adjacent squares along the horizontal line (fig. 3a).
Instead, a constant orthogonal grid arranged with linear horizontal and vertical elements creates the geometric design in the upper area. As a result, the basic graphic unit is a square; each of these geometric figures is placed above a similar unit in the area below and contains other squares arranged one inside the other, but highlighted using different colours (fig. 3b). Only two units are characterised by a motif with a woven mat and an hourglass (figs. 3c-3d).
A four-footed animal is the main figure in the iconic part; its body, and the fact there are no antlers, would seem to suggest a female deer. The creature is represented in movement; its head is turned towards its hind quarters and its long tail spreads out and branches repeatedly, always ending in a five-pointed tuft. Only one branch is different: after circling the head of the four-footed animal it ends in the beak of an eel-shaped bird curved like a bow, perhaps a basilisk, located to the left of the figured composition. A circle next to the creature's head closes the intersection of two of the branches of the tail (fig. 2).

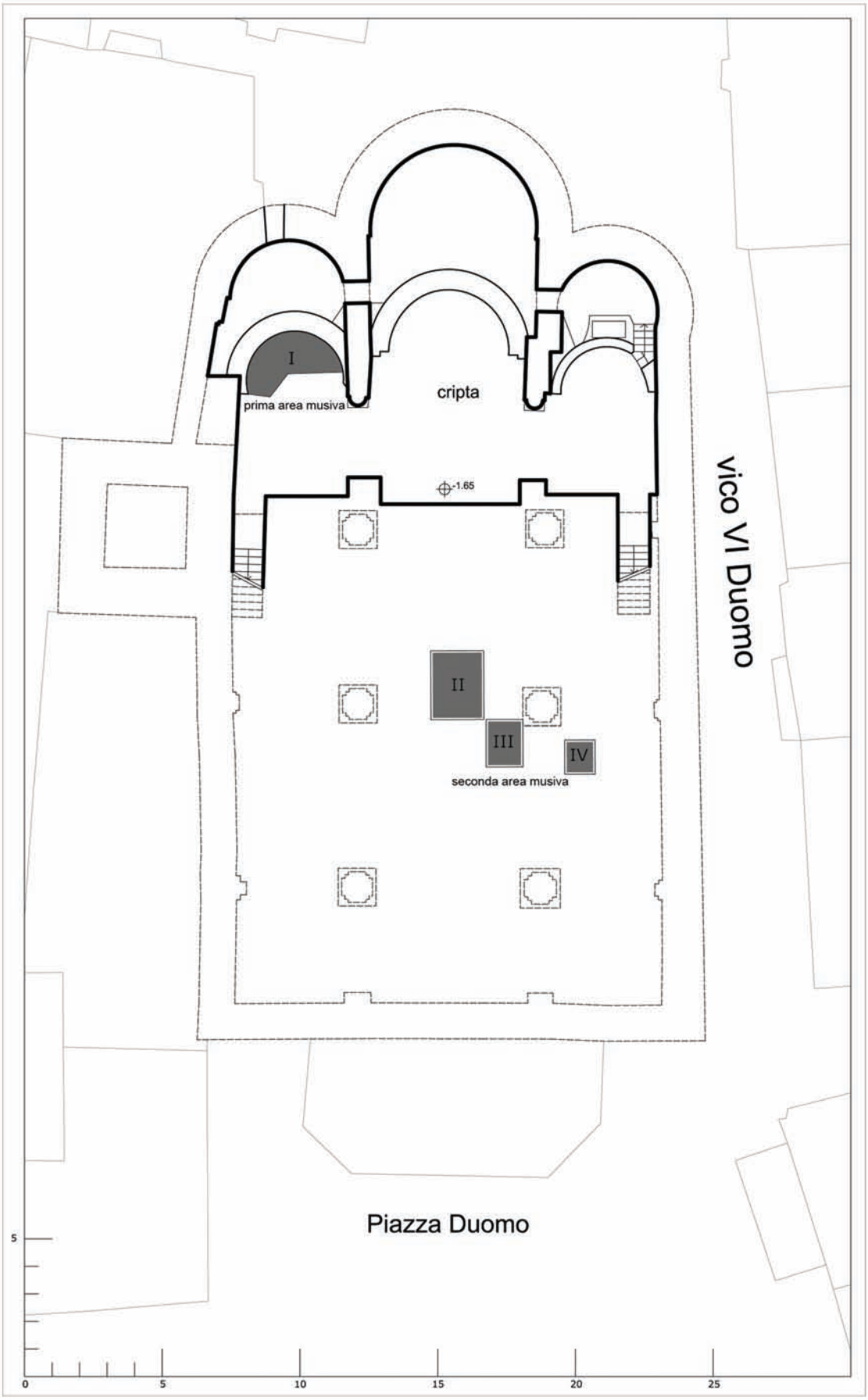

Fig. 1: Termoli Cathedral, plan of the old church, level of the mosaics

Fig. 2: Mosaic in the left apse.

Fig. 3: Mosaic in the left apse: 3a) detail with the swastika motif; 3b) detail with the coffee motif; 3c) detail with the weave motif; 3d) detail with the hourglass motif

1.2 The second mosaic

The mosaic in this area is also divided into three parts. The first has two superimposed narrative sequences with freely arranged animal figures (fig. 4). Even if this is only a partial representation, a bicaudal siren is clearly represented in the lower scene to the left of the onlooker. The siren is shown full-face with large, black-rimmed eyes, red cheeks, bare breasts and hair combed into two plaits. She is holding the two ends of her double tail and is surrounded by fishes of varying sizes. The proud, fierce lion positioned next to this mythological being is depicted eating a small animal. A small winged four-footed creature is visible above and to the right of the lion.

The upper part of the fragment is undoubtedly the most controversial. Large parts are missing but nevertheless it is clearly a symmetrical composition. There are two four-footed creatures, perhaps two deer, on either side of a tree. This very stylised tree probably represents the tree of life; two shoots are placed symmetrically on either side of the base of the tree while two big leaves are positioned almost at the top of the shaft, just under the lanceolate foliage. While the animal to the right is almost complete, only a bit of the hoof and a small piece of the nose of the animal to the left are visible. Not much to go on, but the four-footed animal on the left is evidently a match to the one on the right.

The second mosaic contains the remains of a panel used to decorate the intercolumniation (fig. 5). The fragment has a geometric tessellate design on a white background; the design is created using three big isosceles triangles bordered by black tiles; the triangles are decorated with several small square terracotta pieces rotated compared to the bases of the triangles. The three isosceles triangles are separated by a decorative fascia with small terracotta squares surrounded by a black frame and

Fig. 4: Mosaic in the nave; first mosaic fragment

Fig. 5: Mosaic in the nave: second mosaic fragment.

Fig. 6: Mosaic in the nave: third mosaic fragment.

placed in a diamond pattern. A terracotta band is present on either side of the mosaic; the mosaic on the other side has a chequerboard motif, rotated 45°, with small white tiles in opus tesselatum alternating with small terracotta squares.
The third mosaic contains the remains the face and front legs of a lion inside a circle (fig. 6).
Although any attempt to provide a meticulous and accurate analysis is thwarted by the state of the fragments, we can however make out certain similarities and differences.
All the decorative motifs are on a white background without chiaroscuro. The geometric figures are made using white or black tiles and are either filled with ochre or brick red limestone elements or larger terracotta pieces. Instead in the iconic area the edges of the zoomorphic figures are made using black tiles and the bodies are filled with either ochre or red brick elements. Only the eel-shaped bird in the first fragment is different; although bordered in black, its elongated body is filled with grey tiles, emphasising its shape, and several haphazardly placed darker stone elements. As regards the differences between these three fragments, we can safely say that bigger tiles were used in the mosaics in the nave and that their execution was less accurate than the one in the left apse.

3. The survey

Surveying the mosaics is an integral part of a more extensive study to document the state-of-the-art of the entire religious building.
The onsite operations basically included a photographic and metric survey while a tracing paper survey was performed on the fragment in the first area since it was easy to access and was not covered by a protective layer of glass.
The photographs were classified, organised and filed. Metric data was elaborated using a computer; this allowed us to assess how the size of the mosaic and its position inside the main hall. Instead the tracing paper used on the fragment in the apse was dusted, treated to stabilise the marks and then ironed; it was scanned and assembled in a large drawing used as a matrix for the vectorial representation and then filed. This CAD operation allowed us to acquire a very accurate graphic restitution because we were able to work tile by tile and use the direct survey to obtain a reliable document, especially on a 1:10 representation scale, which is exactly what we wanted to do (fig. 7).

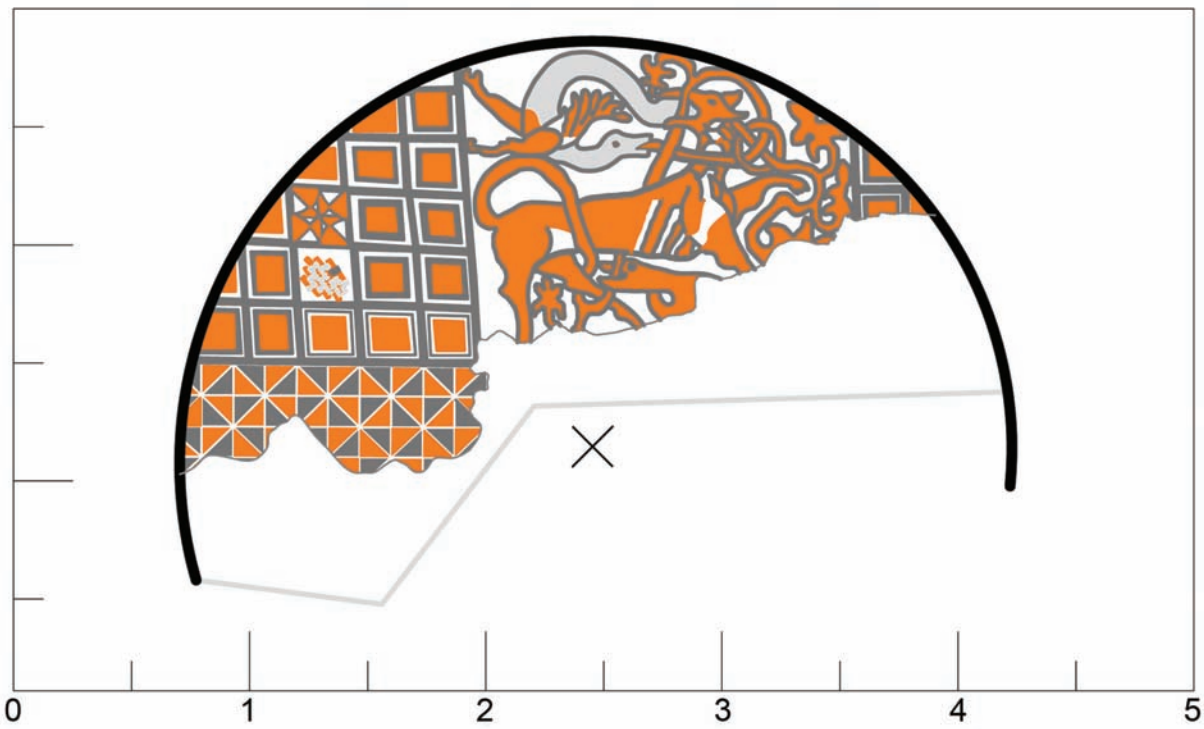

Fig. 7: Graphic restitution of the fragment in the left apse created after direct survey of the mosaic tiles.

4. Conclusion

Using the mosaic floor of the Benedictine abbey in the Tremiti islands as a yardstick, G. Matthiae dates the mosaic to the very end of the eleventh century or early twelfth century.

The close relations between the city of Termoli and the nearby abbey provide a historical basis for this proposal, but given the current comparative analysis, his suggested affinities appear to be rather vague. Nevertheless, the two floors were both made using the opus tessellatum technique and some features of the ornamental repertoire and bestiary are indeed similar.

On the contrary, we believe that the differences are much more evident and meaningful. The tiles of the mosaics in Termoli are irregular in shape and use only five colours; the iconographic themes are freely arranged and the mainly linear forms are two-dimensional; even the anatomy of the animals is entrusted to images in which flat, contrasting colour fillings are bordered by a lively inlay effect (reminiscent of opus sectile).

Despite these peculiarities we still feel we can support the proposal that they are artistic works, albeit not as elegant as the mosaics used as a model. There is one simple reason for this decision: despite their current state, and whatever school the mosaicists came from, the fact remains that these representations provide us with a snapshot of the culture of that age, no less than the sculptures on embellished portals or cathedral capitals. As a cultural artefact, it's helpful to study, safeguard and disseminate information about these mosaics, but first and foremost it's important to survey them.

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Sustainable Design of Natural Cooling Systems based on Traditional Architecture of Iran

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Abstract
Today, the knowledge of building ecology focuses on the capacity of integrating environmental and climatic parameters into design and thus enhances space qualities. Architects in Iran, as an immense country with different climatic zones and regions, had to use sustainable design approaches in traditional Iranian architecture from a long time ago in order to respond extreme environmental to conditions. This study focuses one of the results of this approach, which are natural cooling systems of Iranian traditional architecture in hot-arid regions. Despite there are different natural cooling systems in traditional Iranian architecture, the wind catchers (badgir) are well known architectural symbols in hot dry and hot humid climatic regions of the country. A wind catcher provides natural ventilation in the house which regarded as an important element for creating healthy environment and reducing the energy consumption. In the first part of this study, the traditional wind catchers of Iran houses will be analysed according to their functional and structural features. In the second part, the modernized wind catchers will be examined with the case studies from the Islamic Arab World and Western World. The case studies represent the combination of know-how of traditional architecture and This paper demonstrates the value of wind-catchers and provides insight into the application of natural technology of our millennium ventilation systems as an alternative to the inappropriate modern cooling system in hot climate regions. It also aims to examine the theoretical status of wind catchers and to identify its specific nature, use and function in the context of architectural practice and discourse, in the past and our present world.

1. Introduction
Sustainable architecture, framed by the larger discussion of sustainability having to do with the pressing economic and political issues of our world, seeks to minimize the negative environmental impact of buildings by enhancing efficiency and moderation in the use of materials, energy, and development space [1]. Due to lack of access to modem heating and cooling equipment in ancient times the architects were obliged to rely on natural energies to render the inside condition of the buildings pleasant [2]. “Evaluation of traditional solution in local architecture precedes the development of those that are mechanical in order to accept these methodologies . This process should be based on new progresses acquired in humanities, physics as well as in sciences such as material technology, physics, aerodynamics, meteorology and physiology” (Hassan Fathi, an Egyptian architect)[3]. He assigned the origin of wind catcher to Egypt according to the painting of Nebamun tomb in 1300 BC; it is shown in Fig.1. sustainable features are depend on climatic factors as well as local construction materials of hot regions. Wind catcher as one of the determining and organizing factor of traditional architecture in Hot□ Dry regions. This paper concentrates on the results of sustainability caused by natural cooling systems such as wind catcher (Bad-gir) as a climatic elements in Iranian traditional of hot regions.

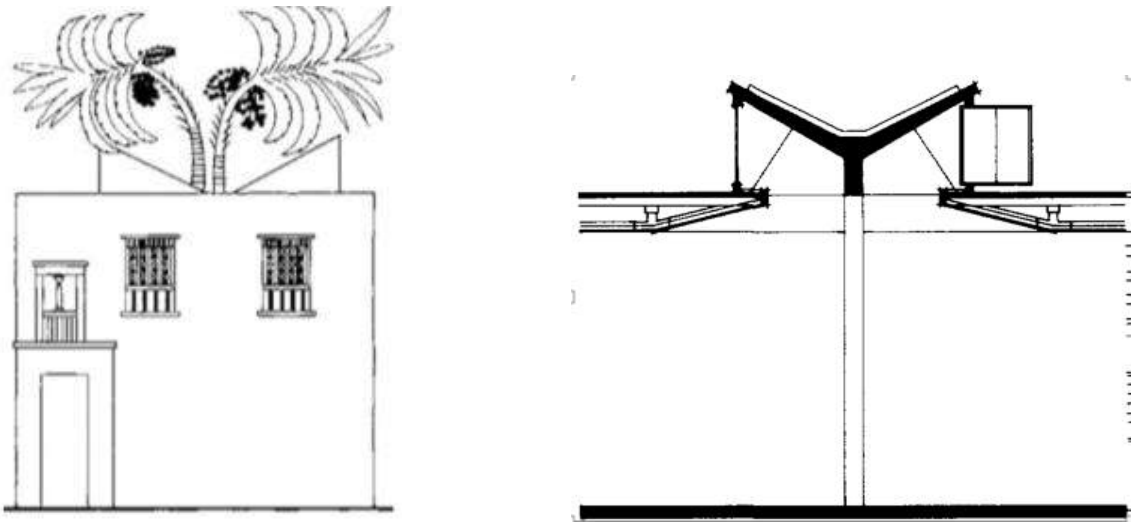

Fig. 1: Elevation section of wind catcher of the Pharaonic house of Neb-Amun, from a painting on his tomb' Nineteenth Dynasty (c. 1300 B.C.) [3].

2. Problem Statement

Iran it is one of the most important centrality of energy sources in the world,
but because of its widely use contemporary it will be hard to export any oil in the future and not only in Iran, but also in all over the world lack of energy will be the most important problem. So we have to think about the alternative sources of energy and in order to keep the world clean and also to reduce oil derivation, it is better to think about the natural environment and energies and to determine the disturbed relation between man and nature, the thing that Iranian traditional architects did many times ago.

3. Climate zone of Iran

Iran is located in a warm climatic district that lies between 25◦and 40◦latitude. The dry deserts of northern Africa and Saudi Arabia extend from the Atlantic Ocean in western Africa across Iran and finally end in Afghanistan and Turkmenistan (Keshtkaran, 2011).[4] There are distinct geographical locations in Iran and this provides different climates and every climate has its distinctive characteristics. Dr. H. Ganjee divided Iran based on Koppen‘s method [5]. Koppen divided the world based on growing of plants. Microclimates have effected on urban planning and architecture. In a huge country such as Iran with different climatic zones, traditional builders in the past have presented a series of logical solutions for human comfort. Iran is basically divided into four climatic regions: Mild – Humid Climate, Cold Climate. Hot – Mild Climate, Hot – Arid Climate. So, the way of their design was based on the region they were going to do and according to this we are going to talk more about the regions and their sustainable systems used in each region. Here, we just describe natural cooling systems which are used in traditional Iranian architecture like (wind catchers).

4. Sastainable natural cooling systems of Iran. Traditional architecture

People in traditional time living in hot regions only relied on the natural source of energy to ventilate and cool their houses. System and equipment by which wind is used for ventilation were, therefore, considered as ways and means of providing comfort and easy life in buildings. One traditional technique to create natural ventilation inside buildings without convectional energy requirements is the wind tower (Mahmoudi, 2006; Khan et al., 2008) [6]. Its operation is based on air movements due to the pressure differences created by wind forces. An example of one such low carbon ventilation system is the wind tower. Elmualim [7] stated that naturally ventilating buildings by means of wind towers provided increased control and reliability compared to cross-flow ventilation [8]. Natural ventilation is dependent on three climatic factors: wind velocity, wind direction and temperature difference. The speed and direction of the wind over a structure generates a pressure field around the building as shown in Fig. 2.[8] Elements such as badgir or wind catcher in vernacular architectural planning as well as water reservoir where very popular in Iran old cities planning. These space and elements produced cooling and ventilation in urban and architectural spaces and also provided comfort. Natural ventilation has become an attractive solution for not only reducing the energy usage and cost but also for providing good indoor air environment while sustaining a comfortable, healthy, and productive internal climate.[8] If it is suggested here to return dealing with tradition and solutions to use natural energy and avoid using the mechanical ventilations that were commonly applied in late years of 20th century so that we may save huge amount of fuel supplies and protect our environment,

it would be necessary to conduct proper studies on traditional systems. For this reason, we will study and analyse vernacular cooling systems.

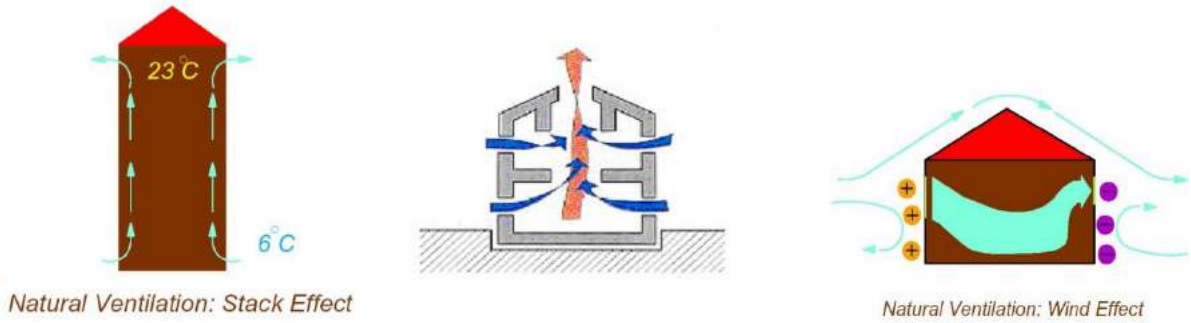

Fig. 2: Wind creates a positive pressure on the windward side of a structure and a negative pressure on the leeward side.

5. Wind Catcher Badgir

Wind towers are one of the traditional passive cooling techniques for providing natural ventilation. The wind towers were utilized in building geometry in the Middle East for more than three thousand years [9]. In other words Wind towers or wind catchers are small towers installed on top of buildings. Wind towers have different shapes and structures. For centuries wind towers have been used for ventilation and cooling of buildings in the hot and arid or humid areas [10].Wind towers are still used in some areas of Middle East and Dubai Figs. 3. By leading the outside air in to the building, wind towers serve as a natural ventilation system for work places and houses.

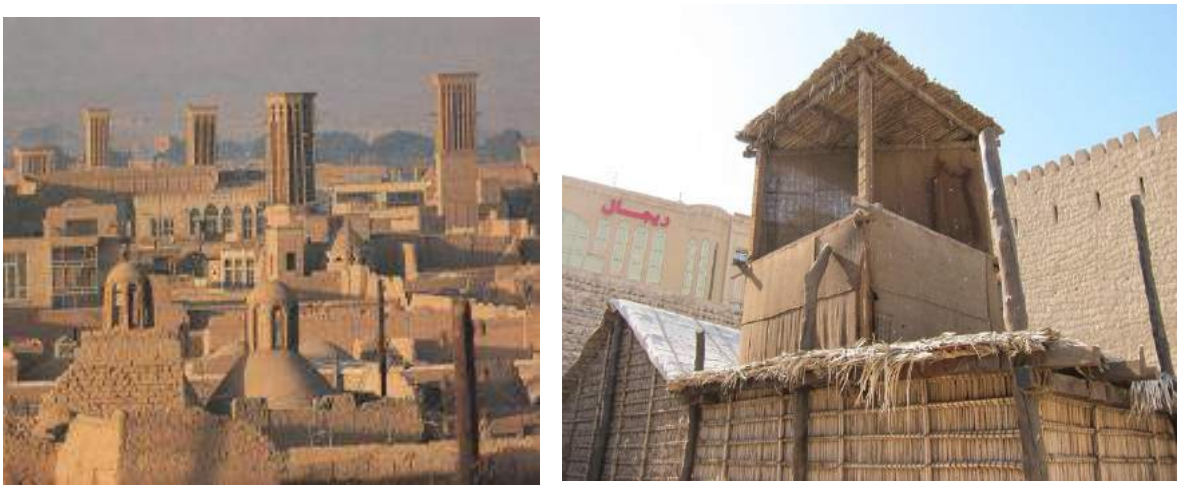

Fig. 3: (b) Reconstruction of a Wind-Tower (awani type). Dubai Museum. Image by deconcrete2013. (a) The view of one-sided wind towers in Meybod city ,azd, Iran[11]

Saadatian et al. [12] reviewed wind tower technologies. They showed that wind towers can be used as a sustainable cooling and ventilation method to compensate for lack of energy supply. They suggested use of wind towers as a green architectural feature in the future generation of buildings. They also suggested use of hybrid wind towers, a combination of mechanical cooling and natural ventilation systems. The first wind towers were built approximately 1200 years ago in the central and hot and arid regions of Iran Fig.4 [10,13,14]. Subsequently the technology spread to other regions of Iran, other Middle East countries, and Egypt. Fig.5 illustrates some regions of Iran and other Middle East countries and also Egypt where conventional and traditional wind towers have been used [10]. Table1 summarizes the important features of different types of traditional wind towers and their functionalities.

Fig. 4: azd, The Desert City That Caught The Wind - The First Air-Conditioners[15]

Fig. 5: The regions in Iran and other Middle East countries as well as Egypt hat use wind towers [10].

Asfour and Gadi [17] described the operation and function of a ventilation device which varies continuously throughout the day. During daytime, the operation of a wind tower is dependent upon the wind movement due to the pressure difference across the inlet and outlet as shown in Fig. 6. The wind tower catches the prevailing wind and directs the air downwards at higher velocity. During night time, the lower external air temperature cools the building mass, which provides additional cooling the next day.

Gage and Graham [18] described wind towers as tall structures which generally rise up to5–33 meters. Wind towers in the hot and dry areas were essentially tall because in these areas, the air at higher altitudes contains less dust and pollution. In dense urban areas wind towers have to be very high to be able to catch enough air. However, taller towers are expensive to build and maintain. Fig. 7a shows the pressure difference across a building. In this case, the ideal position for inlet openings is along the wind ward side where positive pressure is greatest. Fig. 7b demonstrates the positive pressure against the vertical facade increases with height.

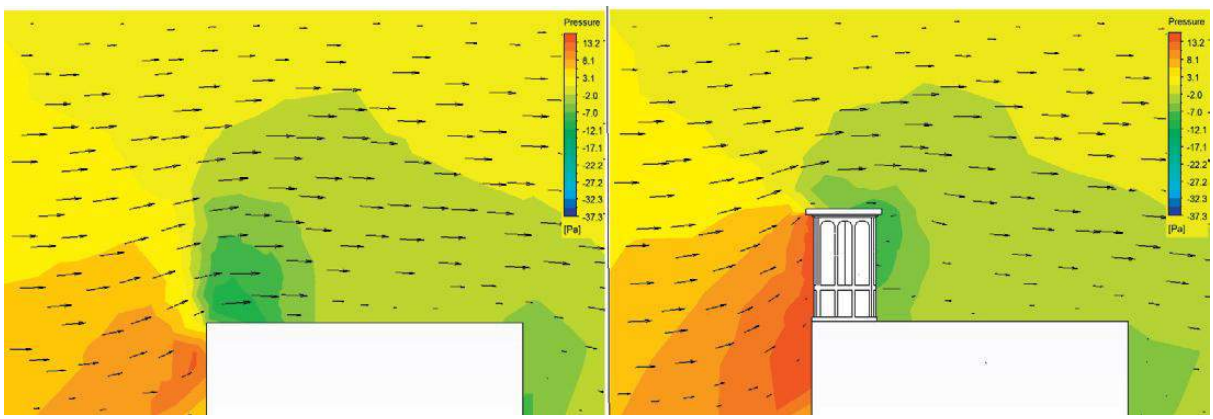

Fig. 7: CFD analysis showing (a) negative pressure over the roof (b) positive pressure on the wind ward side of the wind tower and negative on the leeward.[8]

It is evident that there are a number of conditions which affect the use of wind towers. These will include the:[19]

- Wind speed and orientation,
- Ventilation orientation,
- The height of the wind tower openings,
- Orientation of the room with respect to the wind tower
- The placing and use of doors and windows to the room.

The main urban design elements which can modify the wind conditions are: the overall density of the urban area, size and height of the individual buildings, existence of high-rise buildings, and orientation of the streets, availability, size distribution, and design details of open spaces [20]. Finally, it should mention screening of the wind towers one of the difficulties with having open access is the potential for ingress of:

- Sand and dust,
- Rain,
- Birds, and
- Intruders.

As shown in fig.8. It have dealt with sand and dust with regard to the wind tower.

Fig.8: the screening of the wind towers against sand, dust, rain and birds.[21]

In the areas where wind speed is low, wind towers with wetted surfaces can be used. The surface of the wind tower consists of a series of straws or cellulose called pads commonly used in evaporative coolers Fig. 9. These pads are placed at the apertures on top of the wind tower and are kept wet by spraying water on them. The air passing through these pads is evaporative cooled and therefore its density is increased. Since the cooler air is heavier than the ambient air, there will be a downward circulation of the air [10,22,23]. In Fig.10 wind tower is combined with an air heater or solar chimney [10,24].

Wind catchers are categorized based on their attributes such orientation and plan form which is described in this session.

Wind catchers are categorized into three groups based on their direction.

One-sided wind towers are built in many regions of the Middle East, predominantly on houses in areas where there is a prevailing wind [26].The one directional device will not function when the incident wind blows from a direction other than its design range unless the air inlet is at a sufficiently high level

for the buoyancy forces to overcome the unfavourable wind conditions. In this case, the tower will function as a solar chimney and the airflow will be reversed.[8] Fig. 11 shows a structure with a one directional tower using cross-flow ventilation for cooling. The air enters from its single opening and passes through the living space and exits the window, door and exhaust vents.

A two-sided wind tower has two opening and two separate underneath channels and is often used in areas where there is a strong prevailing wind. The wind catcher is divided into two halves for the purpose of air supply and extraction as shown in Fig. 13.

A disadvantage of multi-directional wind towers is air short circuiting. Short circuiting is a harmful phenomenon in wind tower systems which causes the air to enter through the supply opening and leaves through another without flowing inside the enclosed space.[8] Montazeri et al. [27] evaluated the natural ventilation performance of a similar passive ventilation system but for a two-sided wind tower device. He concluded that the one-sided wind tower is more effective for areas with a prevailing wind from economic and design point of view.

Studies have indicated that four-sided wind tower is the most used wind tower in the Middle East [28]. While the hexahedral wind towers are limited and can be found in the water-reservoirs of Iran. The six-sided wind tower is higher than any other wind towers and was designed in the form of a hexagon, so it will have more flexibility against the wind [29]. Concurrently, the warm and stale air inside the building rises up and out the exhaust of the tower as shown in Fig.14.

Gage and Graham [31] carried out experimental wind tunnel testing to compare the performance of a four and six-sided wind towers and analyze the effect of wind speed and direction on the device. The results confirmed that driving pressure for the wind tower is reduced as the flow rate flowing through the device is increased. The work concluded that in variable wind conditions, multidirectional wind towers with more than four openings have a more consistent and predictable and reliable performance.[8]

Generally speaking, wind catchers can be found in the eastern regions such as Iraq, Afghanistan, Pakistan, and Iran. In Iran they come in variety of cross sections and forms in Iran Fig.16 such as circle, octagon, polygon, square and rectangle. However, no triangular wind catcher can be found in the Middle East [40] Wind catcher with a circular plan is very rare and such type of wind catchers were not used in common houses. One, two and four directional wind towers usually have rectangular plans whereas the square form is used in the four directional wind towers. Eight directional wind towers are those with an octagonal plan

6. Rectangular□ Circular Wind Towers

Traditional wind towers in the Middle East are usually in the form of quadrilateral and regular polygons. Elmualim and Awbi [32] compared the natural ventilation performance of wind towers with square and circular cross-sections using experimental and numerical analysis. The performance of both devices was found to be primarily dependent on the speed and direction of the prevailing wind. The ventilation rate decreases with the increase in the wind direction angles from 0 to 45, measured from the normal to the face of the device. The achieved results showed that the square two-sided wind tower provided a higher efficiency (13□) compared to a tower with a circular cross-section for the same external wind speed. The sharp edges of the square wind tower create a large region of flow separation and a higher pressure difference across the device as shown in Fig. 17. While the fig. 18 are the images of circular □square of wind tower.

7. The Tradition Today

It introduced new forms of building completely different from that of the traditional buildings. These new forms were imported to the Islamic-Arab world from the West together with Western technologies. The following are the examples of wind catchers that used in Islamic-Arab World □ Western World.

Masdar Headquarters was designed as the world's first mixed-use, positive-energy building, using sustainable design strategies and systems to produce more energy than it consumes see Fig.19-20. It was designed as the world's greenest mixed-use building, yielding zero carbon emissions and zero waste (both liquid and solid) and a sustainable measure beyond LEED platinum.

The building's form, sculpted in response to extensive environmental analysis, adapts the ancient science and aesthetics of Arabic wind towers, screens and other vernacular architecture, which emphasize natural ventilation, sun shading, high thermal mass, courtyards and vegetation. Masdar HQ's signature architectural feature is a collection of eleven wind cones which provide natural ventilation and cooling (drawing warm air up to roof level, where wind moves it away) and form oasis-like interior courtyards and/or flexible spaces, each with its own theme, at ground level see Fig. 21.

Other key sustainability design features, systems and strategies include a vast roof canopy, which provides natural shading and incorporates one of the world's largest photovoltaic and solar-panel arrays Fig.23, which will simultaneously harvest solar energy while solar thermal collectors provide solar cooling see Fig.24,25,26.27.

High-thermal-mass exterior glass cladding provides solar heat blocking while remaining transparent for views. Thermal technology in the project also includes earth ducts which reduce temperature of outside air and provide underground pedestrian passages that connect public garden space with the proposed mass transit system. And a lush sky garden on roof level creates a microclimate that includes water features and restful community spaces landscaped with indigenous vegetation.
Another expressive example is the University of Qatar which represented a new interpretation to the form of the wind catcher Fig.28. The building featured number of wind catchers in different levels to catch the prevailing wind. The form of the wind catchers expressed the spirit of its modern time, as well as retained its original function as a generating airflow device in the building. The wind catchers included four open sides covered with perforated geometrical patterns.
The idea of wind catcher attracted the attention of western architects, who revived the traditional Arab wind catcher as a shape and function and employed it in their modern wooden buildings without the addition of any modern mechanical devices as shown in the Visitor Centre at Zion National Park, US Fig.29. This centre represents a successful example of the adoption of energy-saving technologies, such as the windcatcher, which yields a significant, measurable energy savings in the building [38].
Another example is California Building Revives Traditional Middle Eastern Designs. Like many of the climates of the Middle East, Stanford has an arid climate with a long dry summer season, and benefits from northwest breezes. The design of the building applied a mix of natural ventilation and mechanical ventilation, known as mixed mode ventilation, allowing the building to save energy on mechanical ventilation and cooling only in the spaces that need them at the times where natural ventilation was not sufficient. As a general rule, offices were naturally ventilated using operable clerestory windows and ceiling fans, and cooled using a radiant slab, while lab spaces required a higher level of ventilation and cooling and thus resorted to mechanical solutions Fig.30. The design also included natural ventilation of the main building lobby using a wind tower, common in traditional Islamic architecture in Iran, Iraq, the United Arab Emirates, Bahrain, and Egypt. The design of the tower -which was inspired by the traditional Middle Eastern design element as confirmed to us by the principal project engineer was refined by selecting the 2 opposite inlets wind tower to respond to local wind pattern and by modifying the shape of the tower inlets to maximize the volume and speed of air drawn. The wind tower, which is known as a katabatic cooling tower, was also optimized using evaporative cooling to assist downdraft ventilation of the lobby space by spraying small water droplets through nozzles within the tower to cool the air as it comes down the tower and into the lobby. The evaporative cooling strategy is also common in traditional architecture of the Middle East both within wind towers and in the form of courtyard fountains. Fig.31.

8. Conclusion

Many traditional societies in climate with hot seasons were thermally adapted and often lived comfortably for centuries. Wind catcher were the best key to facilitate natural ventilation. This function, in fact, necessary for today's contemporary design architecture. Traditional architecture in hot – arid and hot-humid climate of Iran, rely on renewable fuels, It use from solar energy for heating in the winter. Wind energy for cross ventilation and cooling in the summer. This paper reviewed wind tower designs with respect to traditional techniques such as the badgir wind tower and modern case study which used a wind tower, common in traditional Islamic architecture. This study emphasized the importance of wind towers and gives insight into the application of passive cooling systems as an alternative to the high-energy consuming mechanical ventilation systems. Traditional wind towers have been designed and built using old methodologies; The study's conclusion is based on the research of various case studies utilizing the cooling techniques for their operations. Key parameters including the ventilation rates and temperature were evaluated in order to determine the viability of implementing the devices for their respective use.

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Francesco Mazzei architect (1806-1869). Medieval restorations and inventions: from Palazzo Pretorio, Volterra to the Bargello, Florence.

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Abstract
Between the end of the 18th century and the 19th century in Europe, intellectuals laid the foundation of a modern concept of restoration. At the same time in France, England and Italy, a particular interest in medieval architecture arised. In Tuscany, the attention towards the Middle Ages was felt early.
The florentine Francesco Mazzei grew up in this lively cultural context. Mazzei studied at the Accademia di Belle Arti in Florence and after a long apprenticeship as an engineer, he went to Volterra, a town with ancient origins, where he experienced "his intelligence and his ability" with the restoration work of the "battered" Palazzo Pretorio.
In 1849 Mazzei became "the architect of the Royal Buildings" in the compartment of Florence. Between 1857 and 1865 he directed the important restoration work of the Bargello palace destined to become the National Museum. Mazzei's fame as a restorer of ancient buildings brought him many consultancy works all over Italy. In 1862, together with Camillo Boito, he was a member of the committee, of the second ideas competition for the cemetery in Milan. In the same year he was invited by the city of Gubbio to draw up a restoration project of the Palazzo Pretorio.
Mazzei is one of the protagonists of the period in which Florence was committed to the restoration and transformation works which contributed to create the image of the medieval and renaissance city, still legible on the architectonic and urban development.

Keywords: Francesco Mazzei, architecture, restoration, Volterra, Firenze.

1. Introduction to the revaluation of medieval architecture
The phenomenon of European neo-medievalism can be placed between the end of the 18th century and the 19th century, when intellectuals laid the foundations of the modern concept of restoration. Descriptive monographs on the most emblematic cases of religious building were drafted in the 1840s. The great buildings of the past were studied, preserved, enhanced and replicated. Between the 1830s and 40s, a revaluation of medieval art took place in France, Germany and England, and the idea of an authentically national style began to crystallize.
The "Comité historique des arts" was established in France in the early 1830s, followed in 1837 by a "Commission des Monuments Historiques", for the purpose of conducting a countrywide census of works worthy of restoration [1]. There again, debate in France about restoration arisen out of necessity following the damage and destruction of its historic-artistic heritage during and after the French Revolution.
In German-influenced countries, Gothic - condemned in the strongest terms by numerous scholars - had been undergoing a process of reassessment for some time.
In England, one of the hubs from which the passion for neo-classical architecture spread, a culture shaped by the canons and ideas in force in the late Middle Ages persisted. It was precisely across the Channel that the foundations were laid to preserve Gothic as a national style, to the point of making it official in 1835, when the committee for the reconstruction of the Houses of Parliament imposed the choice of Gothic style on the architects.

At European level, a concomitant interest in medieval architecture developed, at first channelled by Romantic sensibility and subsequently translated into new eclectic buildings, before slowly developing into an initially ethical and patriotic, then scientific awareness of this architectural phase.
From the second half of the 19th century, major monuments everywhere constituted a cognitive and design basis for the medievalist architect.
The archaeology of medieval monuments entered the scene forcefully, and went well beyond "the trite and abused question of styles" [2]. The concept of enhancing architectural heritage intertwined with the set of techniques destined to promote knowledge. The archaeology of the monuments and conservation policies marked the path of a medievalist revival, which materialized in the pursuit of a series of "universal principles".
In Italy, the architectural phenomenon emerged after 1830, manifesting itself in the wake of ideas and trends from other European countries. But interest in the Middle Ages became concrete in the decade 1850-60, in the breakaway from *revival gothic* and its imitative and somewhat superficial nature that has characterized the English fashion [3].
It was not, in fact, a matter of a simple re-evocation of memory, but rather a recovery of knowledge that went from structural design to the use of materials and the treatment of surfaces. The new building site revolved around such values. Here too, the reinvention of the ancient was arrived at through restoration, that is, because of the need to preserve and not lose the authenticity of those values. Italian medievalist architects followed the lines already set out by Viollet-le-Duc in his great work, *Dictionnaire raisonné de l'architecture française*, which began to be published in 1854.

2. Tuscany and Florence: the Athens of Italy

The lure of the Middle Ages was felt early in Florence and Tuscany. Certainly, the English experiences of August Welby Northmore Pugin, William Butterfield, Gilbert Scott and Charles Barry, and Viollet-le-Duc and Ruskin's preachings on *Gothic revival* were obligatory references for Tuscan medievalists [4]. However, the capital of the Grand Duchy and Tuscany had already been described by the French as the "Athens of Italy" as early as the second half of the 1860s.
At the beginning of the 19th century, 1807-1808, Jean Charles Léonard Simonde de Sismóndi's historiographical work, *□istoire des r□publi□ues italiennes du Mo□en-□ge* [5], described the elating traits of central Italy's urban civilization as essential to reclaiming one's past and launching oneself into modernity. The crucial core of this concept became Tuscany and Florence "as capable of expressing a municipal experience, which in its entirety obviously involves a large part of central-northern Italy, in a particularly effective way" [6].
The "medieval revival", therefore, was an integral part of a wider line of thought that involved the process of acquiring and promoting identity. Then again, the pursuit of a modern style to achieve a national identity "would be better connected in some way to one or more architectural styles of the past" [7], meaning medieval above all for past.
During his travels in Italy between 1836 and 1837, Viollet-le-Duc also went to Florence, and paused there to analyse and survey the side walls of Santa Maria del Fiore. He credited Italy with a certain precocity of interest in ancient monuments, and declared that the Italians "with some exceptions, have never stopped loving their monuments and guarding their preservation" [8].
For that matter, he would recommend the recovery of Arnolfo's Palazzo Vecchio in Florence as a model for the reconstruction of the tower during restoration of the City Hall of Saint Antoine in the department of Tarn-et-Garonne.
The fortunate role of Florence and Tuscany in European taste grew to the extent of constituting an indispensable cornerstone in the international collective imagination. It was no coincidence, therefore, that in 1819 the Genevan Giovan Pietro Vieusseux decided to settle in Florence and open a Reading Room on the model of what was already happening in Europe.
Some years earlier, in 1793, Vittorio Alfieri also took up residence in Florence with the Countess of Albany, and their salon became a circle of leading figures of the aristocracy, politics and culture such as Cesare D'Azeglio and Filippo Mazzei, Enlightenment thinker and friend of Thomas Jefferson, and relative of Francesco, the architect who carried out work on the Palazzo Pretorio in Volterra.
At the beginning of the Restoration process, a series of experiments on medieval architecture had already been carried out in Tuscany in the early 19th century, aimed at revaluating the Middle Ages and recognizing the past not as a model to be restored in its entirety, but a heritage on which to draw in order to progress [9].
It should be remembered that as early as 1796, Giuseppe Del Rosso had designed the neo-Gothic Chapel of Madonna del Conforto in Arezzo Cathedral, that in 1821 Gaetano Baccani had included a neo-Gothic tower in the Torrigiani garden, and that in 1822, as an academic essay, Giovan Battista Silvestri put forward a design for the completion in style of the façade of Santa Maria del Fiore. In 1826 Alessandro Gherardesca published his book, *La casa di delizia, il giardino e la fattoria,* illustrating a series of neo-Gothic architectural exercises, some of which were subsequently completed. In 1831 he finished building the silkworm nursery with spinning mills in the garden of Villa

Roncioni at Pugnano (Pisa), perhaps one of the first examples of the application of neo-Gothic features to industrial architecture. In 1833 Francesco Leoni built the delightful cast iron temple-shaped fountain for the main square in Grosseto (fig.1).
Medieval and Gothic styles were also widely used in "period finishes to facades, in a way which differed markedly from the intention of a mere "revival" applied ex novo to buildings" [10].
The two poles of reference in this period were, on one hand Pasquale Poccianti and Luigi de Cambray Digny's "classical vision", and, Alessandro Manetti's international spirit on the other.
Through a series of linguistic experiments, Tuscan architectural culture recognized the stimulus of renewal with good timing and original interpretation.

3. Francesco Mazzei's Medieval

Francesco Mazzei (1806-1869) belonged to one of the most important and illustrious aristocratic Florentine families and was related to others (a monograph on Francesco Mazzei's professional life by Denise Ulivieri and Laura Benassi is in the process of being written).
Francesco was the third son of Cavaliere Mattias and Lucrezia Landi, a poet of some repute, Arcadian writer known by the pastoral name Argone Dulichiense and honorary member of the Florence Accademia delle Arti e del Disegno. Francesco graduated at the age of just 19 from the Florence Accademia di Belle Arti. Appointed as a candidate in the Corpo degli Ingegneri (Corps of Engineers), he began a long apprenticeship [11].
In 1834, Alessandro Manetti, a Florentine architect who had trained in Paris at the prestigious *cole des Ponts et Chauss es* and was constantly up to date about new international technologies, was appointed director of the Corpo degli Ingegneri di Acque e Strade (Corps of Waterways and Roads Engineers). Manetti oversaw each stage of the young and promising architect's career. In 1834 Mazzei was invited to Volterra to take up the position of Municipal Engineer, and in the "ancient city found much to do and was able to put his talent and ability to the test" [12].

1.2 Palazzo Pretorio, Volterra: a "uniform facade with three orders of Gothic Architecture Windows"

As soon as he arrived in the "city of wind and rock", Mazzei was faced with the problem of the Palazzo Pretorio, ravaged "by time" and by "accidents". The complex consisted "of various Towers linked together, with unequal floors made up of massive, inaccessible walls, and for the most part infected by Salt".
In the early decades of the 19th century, a list of illustrious characters was involved with Volterra's ancient Pretorio: Luigi Campani, Zocchi Neri, Pietro Carraresi, Giuseppe Franchini and Giuseppe Martelli. The latter was sent to Volterra in 1823 by Luigi de Cambray-Digny, director of the Scrittoio delle Regie Fabbriche, to inspect the ancient Pretorio and recommend what restoration was necessary. Martelli, young, cosmopolitan and a pupil of Cambray-Digny, moved to Volterra, surveyed the complex in minute detail and designed a new, classic style Pretorio, which, however, remained on paper [13].
In Volterra Mazzei "found much to do" and simultaneously with the interminable renovation of the Pretorio, he worked to "restore the ancient furnaces" in Volterra's Royal Saltworks.
Between 1837 and 1847 he turned "the ancient Fortress of Volterra, where stands the gloomy, majestic tower of the Keep" into a penitentiary. During this time, the system of separate cells was becoming more common and here in 1838 he introduced "the first cells in the Keep enclosure". Mazzei studied the plan of the fortress and adapted it to the American prison cell system (fig. 2).
In 1839 Mazzei drafted the "Project for turning the old Pretorio and Theatre into Offices and dwellings for the Ministers of the Court".
Mazzei scrupulously analysed "the facade of these buildings, which are three distinct prospects and each represents an era" and "the different heights of the windows denote the different Levels of the floors". He was aware that he was working on "the old", that is, on a building that was unsound, abetted by the salt that infected its walls.
Mazzei's lack of experience weighed on the quality of his first design, even if a certain interest in an idealized Middle Ages emerges. Mazzei read the building with almost archaeological attentiveness, noted the "only two windows which are of Gothic architecture", but in the final draft he preferred to go along with the style of each building to preserve its own character.
The Council of Engineers, whose members included Manetti and Volterra native Luigi Campani, who was well informed about all things connected with Volterra and had already worked on the Pretorio, was of the opinion that instead of "cutting dangerously and perforating with arches" almost the entire main prospect as proposed by Mazzei, they should opt for demolition.
In fact, Manetti favoured a facade "of uniform character with three orders of Gothic Architecture Windows" and preserving "the Tower, which must remain in its present state".
The Director General of the Corps of Engineers sent an explanatory table and proposed the use of molten iron – the Royal and Imperial Foundry in Follonica played an essential role in developing the

use of iron in Tuscany – to emphasize the ornateness of “Gothic architecture” in accordance with new architectural trends.
In 1842, meticulously following the Council’s observations, the Volterra engineer reconsidered and integrated the first design, rejected the use of iron for the ornamental part and, while making the surfaces uniform, kept a certain “character” to the various buildings.
The work proceeded slowly, and Mazzei was forced to cut costs.
In 1839 Viollet-le-Duc was occupied with the restoration of the Vézelay church, where he perfected a scientific work methodology based on a material survey of the complex and a study of its history. Mazzei followed this concept and went over the Pretorio “with the analytical lens of a positivist scientist”. He did not completely demolish the façade, but, like the scientist-architect, carried out careful surveys, dissecting the building, “cut, perforate, integrate, regularise, rebuild” almost as if it were a cadaver. After all, Viollet-le-Duc often referred to the need to *diss□□uer.*
The Volterra engineer interpreted the building, studied the medieval structures in depth, and was finally able to pinpoint their architectural character.
Following the earthquake on 14 August 1846, Mazzei rebuilt “the tower in all its length and height”, and took the opportunity to include an unexpected embellishment of merlons.
The new Volterra Pretorio was “one of the most beautiful works of architecture, and does great honour to Mazzei” (fig. 3).
He then put forward his precepts of art, and established his personal way of working, which he would also apply in the renovation of the Bargello in Florence. By 1850 the new Pretorio had almost reached completion.
The remaining buildings, towers and houses belonging to the Belforti and Allegretti families and which were adjacent to the new building, were still in “an indecent condition”. They would have to wait a further thirty years before being restored to their original condition.

1.3 The project to “restore the ancient beauty” of the Bargello in Florence
Between the 1830s and 40s, while Mazzei was drawing up plans for the new Volterra Pretorio, in Florence the debate about stylistic directions centred around the possible completion of the facades of Santa Croce and Santa Maria del Fiore. In 1842 Gaetano Baccani designed the bell tower for Santa Croce, “that is, probably the most convincing Tuscan neo-Gothic monument”.
In 1843, the Padua marquis and art critic, Pietro Selvatico, declared his amazement that “the city which built the Santa Croce and Santo Spirito churches…did not think of completing such works with appropriate facades that add such glory…But amazement grows that an equal fate concerns that graceful and at the same time gigantic Santa Maria del Fiore cathedral” [14].
The vicissitudes of the new facade for the cathedral unfolded in crucial years for the development of scientific restoration, running from 1842, the year of Matas’ first design, to 1887, the year when De Fabris’ facade was unveiled.
As a result of the clamorous discussions about the facade, and its unexpected nomination as capital (1865-1870), Florence found itself the centre of the attention by European press (fig. 4).
The three competitions that followed shot Florence onto the international scene, and involved illustrious names in modern architecture as competitors and as judges on the three panels [15]. In this period, great building sites sprang up in Florence to upgrade the street plan and modernize Florence, the capital of Italy [16].
Mazzei was one of the members of the Technical Committee for examining the works needed for Florence as capital of Italy, and oversaw architectural and urban works in that role. Mazzei went back to Florence, and Manetti appointed him architect and inspector for the “Direzione Generale dei lavori di Acque e Strade e delle Fabbriche Civili dello Stato” of Florence (Directorate-General of Waterways and Road Works and Civil Buildings of the State).
Mazzei was responsible for “care of the monuments appertaining to the Government”, which included the buildings of the Uffizi, the Ambrogiana prison, Palazzo Pretorio and its annexes, Palazzo Medici Riccardi and the Medici villa at Cafaggiolo. Over the years he carried out a series of “laudable works” and restorations in Florence, including a new ramp of the stairway leading from the Uffizi’s Palatine Library to the rooms of the State Archives, conversion of the San Matteo hospital in Piazza San Marco to the seat of the Academy of Fine Arts and restoration of the Convent of San Marco [17].
While the fate of the cathedral facade was being debated and Matas worked on that of the convent church of Santa Croce, in 1857 Alessandro Manetti assigned Francesco Mazzei the onerous task of restoring the Palazzo del Podestà in Florence.
The 1840 discovery in the old Podestà chapel of the oldest portrait of Dante, attributed to Giotto’s workshop, had opened the way for relocation of the prison and restoration of the Palazzo.
Mazzei studied the history of the building, read the material structure with a philological approach and compared the situation with other medieval buildings “for which Italy is so admired”. “I will not speak about those of San Gimignano and San Miniato al Tedesco. In Tuscany I greatly admire that much celebrated one in Poppi from which I gathered much that was useful to me” [18] (fig. 5).

On the other hand, Viollet-le-Duc also maintained that “nothing should be invented in a restoration; when the ancient traces are lost it is wiser to copy the similar motifs of a building from the same era and the same province”.
According to Mazzei, everything had to correspond with the age of the building; where modern needs required variations, he recovered the shape. A case in point was that of the old windows, which Mazzei traced after removing the plaster and scraping the walls, but as they were too small, he was obliged to enlarge them while keeping the same shape. The same operation was also carried out in Volterra, where Mazzei exactly reproduced the shape of the only two Gothic-style windows, and slavishly replicated the scaffolding holes that rhythmically mark the sequence of the six openings.
It was the French architect, a corresponding member of the Florentine Academy since 1860, who maintained that “restoring a building is not preserving, repairing or remaking it; it is returning it to a state of completeness that may never have existed at a given time”.
In 1859 the Tuscan Government decided that the Bargello should become the site of a “Museum of ancient monuments”. In 1863 Mazzei took over from Manetti as chief engineer of the Regio Genio Civile of Florence (Royal Civil Engineers).
Restoration of the Palazzo continued, and critics were not long in coming forward. The controversy mainly concerned the way in which the walls were decorated. The dispute became so inflamed that Massimo D’Azeglio, writer, artist and medieval expert, and at that time President of the second Committee for the cathedral facade, was consulted. According to D’Azeglio the restoration had been done well, and Mazzei had renovated everything “with the greatest taste”.
So in 1865 the Museum could celebrate its official opening (fig. 6)
As his fame as a restorer of ancient building spread, Mazzei, who in the meantime had become a professor at the Accademia di Belle Arti, was called on to consult on many works in Milan, Pisa, Gubbio, Bari and throughout Italy.
12 April 1862, the Mayor of Milan, Antonio Beretta, invited Mazzei – probably on the recommendation of Camillo Boito, who almost certainly knew the Tuscan architect’s work – to be part of the judging committee for the second competition for ideas for the “great Milan Cemetery and those for the small Cemetery used by the Spedale Maggiore”.
Boito, who during the same period was called on to judge the project for the facade of the Florence Cathedral, was also on the committee alongside Mazzei, together with architect Giovanni Brocca, professor Giuseppe Bertini, sculptor Vincenzo Vela and Emilio Bignami. However, no project “was judged of eminent merit and no-one was awarded the prize”.
It was not until 1863 that the City Council chose the work conceived by architect Carlo Maciachini.
In the same year, the City Council invited Mazzei to be part of the “artistic committee that will judge the project for the creation of the new Piazza del Duomo and Via Vittorio Emanuele”.
The committee was formed on 28 May, but did not reward any of the projects, but gave a special mention to that by Giuseppe Mengoni for its substance and realism.
Various letters from Beretta to Mazzei tell of their mutual esteem, the meetings with Boito at the Caff Cova and the mayor’s invitations to sit in his box at the Teatro della Scala [19].
Around that time, on 17 May 1862, the Gubbio Town Council asked Mazzei to come to visit the Town Hall to draft an opinion on “the way to repair the damage suffered by it and restore it to its original architectural and monumental glory” [20].
“Mazzei’s Medieval”, as Enrico Fiumi affectionately referred to it [21], flourished in the fertile ground of Volterra, and spread through Tuscany, a region ready to welcome it.
As in the case of the Volterra Pretorio, restoration of the Florentine Pretorio was the invention of a medieval building, with its structure strengthened and shapes regularized, which became an example of study and an immanent cultural model.

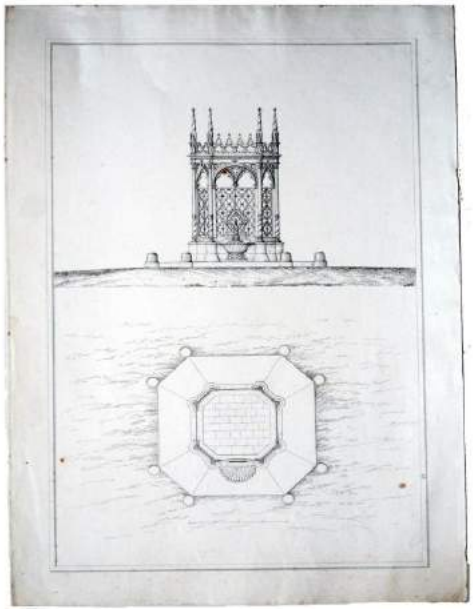

Fig. 1: Study of a temple-shaped fountain in neo-Gothic style, Francesco Mazzei, Archivio Mazzei di Fonterutoli, *cartella di disegni e studi giovanili*.

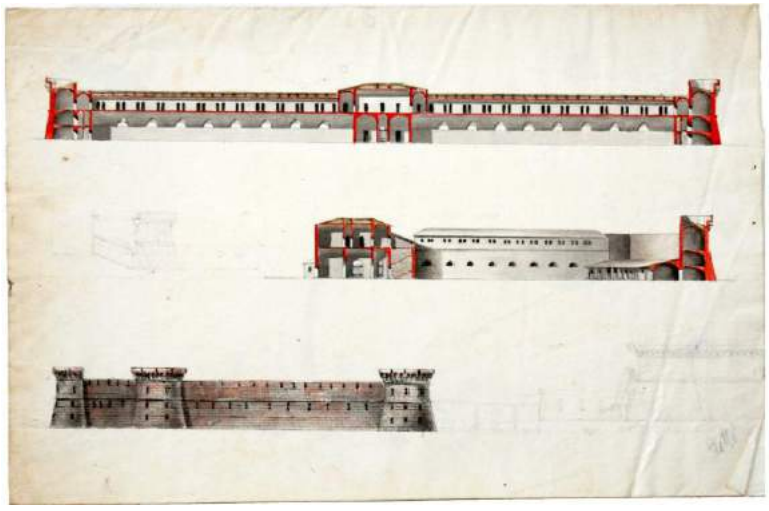

Fig.2: Project for turning the ancient Fortress of Volterra into a penitentiary, Francesco Mazzei, 1837-47, Archivio Mazzei di Fonterutoli, *cartella di disegni e studi giovanili*.

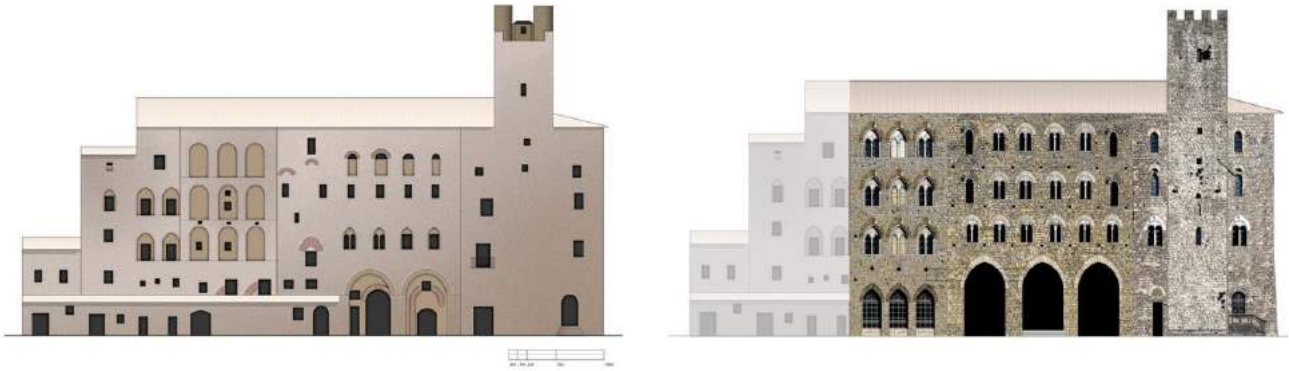

Fig. 3: On the left, Palazzo Pretorio, Volterra, survey of Giuseppe Martelli, 1823. On the right, the new Pretorio of Volterra, after the restoration designed by Francesco Mazzei, 1843-1850. Virtual modelling realized during the programme of **"**Drawing Architecture 2" and "Architecture Survey Methods" courses in the Degree Course of Civil Engineering and Architecture of the University of Pisa, 2010-2011. Professor Engineer M. G. Bevilacqua. Students: R. Bartali, F. Chiappa, L. Daddi, G. Grassi, G. Frosini, A. A. Terranova, M. Valenti.

Fig. 4: Drawing of the façade (probably this is the study of Santa Maria del Fiore's façade), Francesco Mazzei, Archivio Mazzei di Fonterutoli, *cartella di disegni e studi giovanili*.

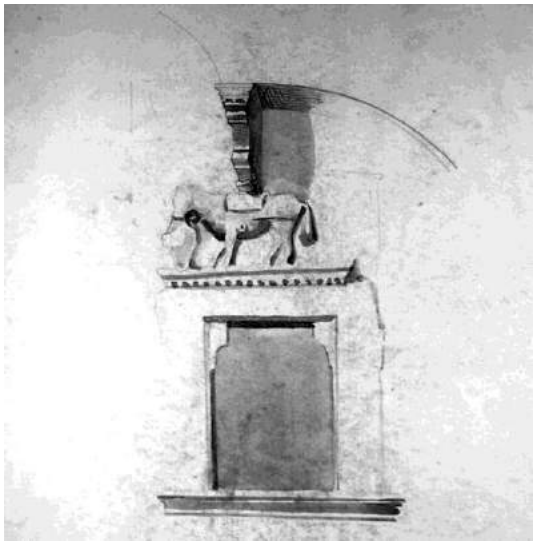

Fig. 5: Poppi's Castle, detail of window, Francesco Mazzei. Archivio Mazzei di Fonterutoli, *cartella di disegni e studi giovanili*.

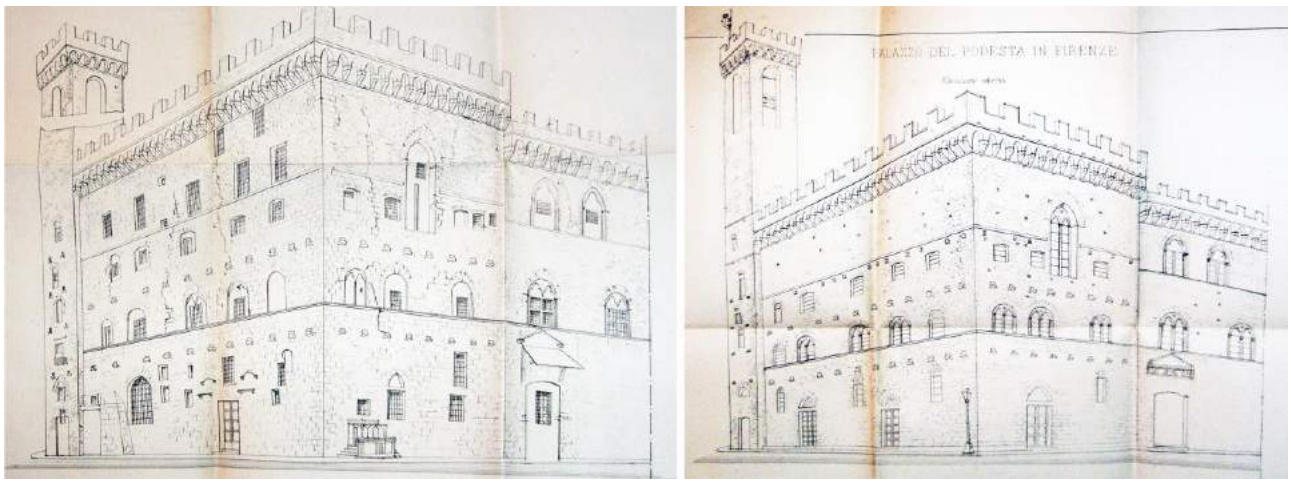

Fig. 6: The Bargello, Florence, before and after the restoration designed by Francesco Mazzei, 1857-1865, B. Pazzagli, *Biografia dell'architetto comm. Francesco Mazzei*, Firenze, 1870 in Archivio Mazzei di Fonterutoli, *Filza L□□□VII.*

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Methodology for Rehabilitation of the Water Supply System of a Heritage Building

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Abstract
Rehabilitation as an alternative to new construction is an expanding market due to a growing cultural awareness for the need to promote conservation actions and rehabilitation of the built heritage.
This line of research aims to contribute to a better understanding and characterization of the processes that is involved in rehabilitation works. The water supply systems are a major cause of appearance of building damages, especially in cases of improperly done interventions. Old buildings are treasures of surprises; the structure may not be coherent through out the building; plants, if available, may not be reliable, and all in all many surprises show up with the progress of rehabilitation work. These obstacles complicate technically and economically the rehabilitation and consequently lead to common mistakes and wrong decisions which reduce the durability of the recovery.
This case study of a 19th Century Romantic mansion in the World Heritage City of Sintra that has been converted to a small hotel is considered for analysis to study a methodology for proposing a new water supply system, aiming to adopt efficient construction solutions, less intrusive and economically viable, to meet the building's comfort needs within their constraints. Preferably the methodology to develop should be of general interest.

Keywords: Rehabilitation, Conservation, Renewing, Recovery, Water supply system

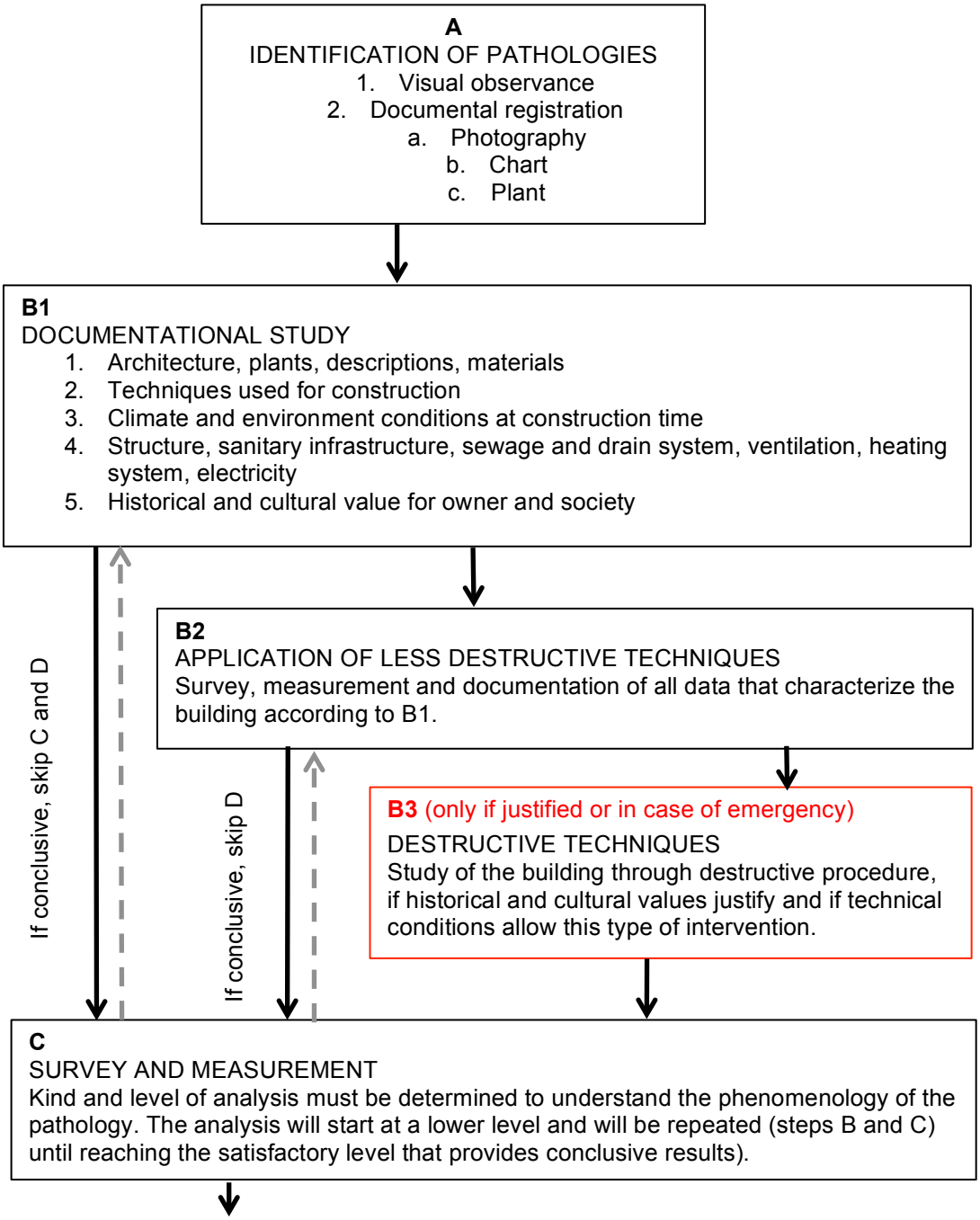
1. Introduction

The rehabilitation project of the private property Quinta das Murtas in Sintra offered an opportunity to study a methodology for rehabilitation and analysing the appropriate options for the recovery of the water supply system including renewing. The property had after 15 years of use as a small hotel unit numerous pathologies. The first impression was that the causes for the pathologies might vary very differently. In many cases the cause of the pathology was not clear. Additionally because of the architectural complexity it urged the necessity to develop a methodology how to proceed to identify the causes of the pathologies. One of the objectives of this paper is to keep this methodology general, applicable also on other projects of rehabilitation. Another objective is to present the appropriate solutions for recovery.
As the study started and the planning work was on going new pathologies occurred and called for immediate action. In one case the water supply system was not functioning in a bathroom in the last floor, in another case, at the opposite end of the hotel, water was dropping from the ceiling of a bedroom in the second floor although the bathroom of the upper floor is in 5 meters of distance. These situations forced to interfere with destructive methods to diagnose the pathology and recover at least temporarily the pressure loss and the infiltration of water. At that time the hotel was still not closed for the rehabilitation work and hosted guests. This situation caused that methodical steps like study of documents, less destructive or non-destructive interventions as well as destructive interventions happened sometimes simultaneously and didn't quiet permit to follow the methodology as desired.

Despite of these problems, it was possible to develop a general methodology that could be tested practically for accuracy. The methodology is not very much detailed in all its steps to allow adaptation for specific needs like recovery of plaster, roofing, structure, water supply or this alike [1] [2].
After testing and application of this methodology the diagnosis and causes of the pathologies could be identified and according to the classification of the building regarding its cultural value, solutions for recovery of the pathologies could be analysed and compared for application.

2. Methodology

First some randomly chosen pathology was diagnosed. In all cases the diagnosis revealed unexpected causes for the pathologies. This fact emphasised the necessity for a methodology that goes beyond the normal procedure of identification, survey and diagnosis of the pathology and finally elaborating possible solutions.
The methodology is divided in six steps A to F. Step B is divided in three independent and separate steps B1 to B3, which refer to different levels of survey according to the necessities to finalize the diagnosis.
Having in mind the conservation of culture and architecture, and in search of the correct rehabilitation, after visualization and detailed registration of the pathologies (A), the history of the building must be studied.



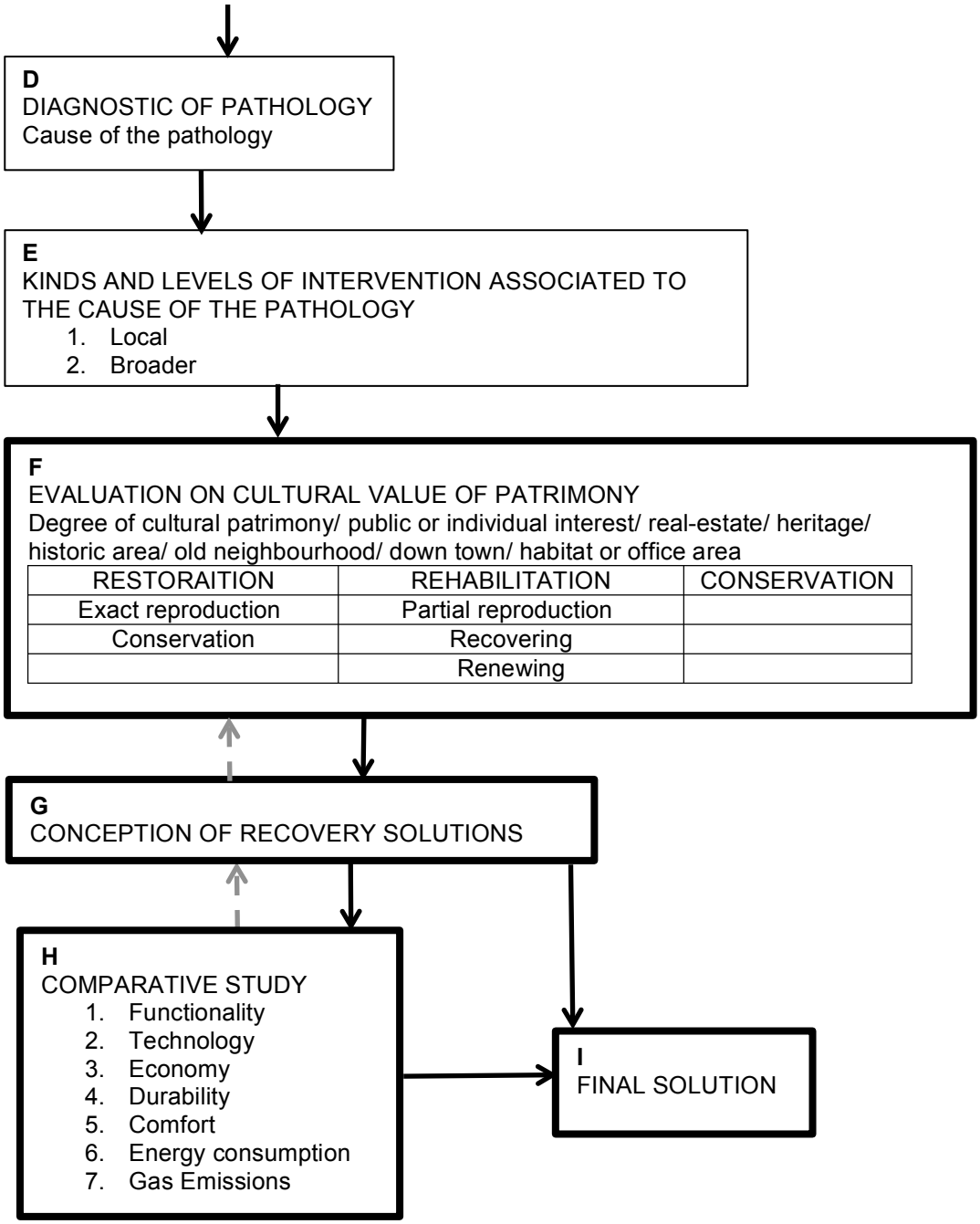


Fig. 7: Flowchart of rehabilitation methodology

This includes the architecture, the plants, descriptions and the materials used as far as available. In case of materials, specially the application of render and construction of walls, the techniques used should be studied to understand the grade of quality. If documents miss, documents of similar projects of the same area and culture can be studied.

It can also be of interest to understand at what climate and environmental conditions the construction was executed. All these information refer to the quality of the construction that has to be conserved, rehabilitated or improved.

To understand the structure of the building, the water supply, the sewage and drain system, the heating system, the ventilation system as well as the electricity in case of more recent buildings are further fundamental studies according the pathologies encountered. The reason is to find the ducts and shafts of the installation.

Finally the value of the object for the owner and the society are further elements that determine the search for the next steps, as the economy is dominant in the choice of the interventions (B1).

Once these readings are accomplished and the information gathered is satisfactory, survey and measurement may be continued, otherwise less destructive techniques must be considered to obtain

the missing information. Among these survey techniques are electrical tools that enable the measurement of humidity like hygrometer, the quality of materials, the visualization of hidden elements and laboratory analysis to define material composition or specification (B2).
These steps can be approached at several levels to gradually progress and as long as the results achieved are not conclusive they must be repeated. If all these efforts are not satisfactory or in case of emergency, destructive techniques must be applied, as opening of walls or ceilings where less damage can be expected, to discover the cause of the problem (B3).
For technical and economical reasons B1 and B2 can be started at low levels and repeated until satisfactory data is obtained for survey and measurement (C) to understand the phenomenology of the pathology, which enables to formulate the diagnosis and the reason for the appearance of the pathology (D).
Several possible interventions associated to the cause of the pathology have to be elaborated, which can rehabilitate and recover the damaged elements (E). In the next step the cultural value must be evaluated, it depends on public or individual interest, its real-estate value, type of heritage, if located in a historic area, in an old neighbourhood or down town area and if it is in a habitat or office area. According to the historical and cultural value it has to be decided if it is a case of cultural patrimony where only restoration can be applied to maintain the architecture and the materials, if it is a case of rehabilitation, which in accordance of the cultural value a gradual renewing of materials is acceptable, or if it is the case of conservation of the existing architectural elements and materials (F). This defines the conception of the recovery solutions, which has to be compared in the next step (G). In some cases like restoration of decorative elements or paintings, the conditions for the selection of the solutions might be so limited that only one final solution can be considered (I). But usually the possible interventions must be compared concerning functionality, technology, economy, durability, comfort, energy consumption and gas emissions to find the appropriate solution (H). These solutions might need a reconsideration of the conception or even of the cultural value as for example the rehabilitation or installation of the water supply system or the seismic reinforcement of patrimony might cause changes in the architecture.
Three points are exceptional and imperative in the methodology elaborated. First, between identification and survey several steps are needed to proceed to an effective survey and measuring. Second, to substitute the expression solution with intervention, as solution has a very rigorous aspect and is only used in the final steps. Instead, the intention is to find intervention possibilities that must be analysed carefully and compared to meet the final solution that satisfies the necessities of the users and owners of the building. The latter is the third point that completes this procedure.

3. Case study

In the mentioned rehabilitation project the methodology was developed although it couldn't be fully applied, because much pathology were encountered in a state of emergency where immediate destructive intervention was inevitable to prevent further severe damages. Nevertheless, we start describing in brief the history and the culture of the zone and than move to describe the object.

3.1 History and architecture of Sintra

The landscape of the Sintra hills favoured the interaction between nature and human action, creating a landscape with high cultural value. Nature, architecture and human occupation show a unique cultural landscape in the panorama of Portuguese history. Secular buildings of historical and cultural value are visible, like the Moorish Castle (Fig. 1), a mark of Arab presence, the Sintra National Palace (Fig. 2) whose shape and volume of the chimneys protrude from the rest mass, seeming to give it continuity, the National Pena Palace (Fig. 3) and the Palace of Monserrate (Fig. 4) as marks of the period known as Romanticism or even the Palace and Quinta da Regaleira (Fig. 5), testimony to the eclecticism of the late nineteenth / early twentieth century. They are also visible numerous summer farms, palaces, mansions and homes scattered throughout the mountains surrounded by extensive parks and gardens.
In the fifteenth century the court settled in Sintra. In 1481, Alfonso V died in the Sintra National Palace where he was born and also there, King João II was acclaimed king of Portugal, justifying once again the growing importance of Sintra in the royal itineraries.
The situation of the Restoration and its wars with Spain (1640-1668), the statement of Mafra in the reign of King João V (1706-1750) with the construction of the Convent and, finally, the construction of another royal palace in Queluz from 1747, departed the village of royal and aristocratic circuits. The 1755 earthquake caused enormous damage, which is most evident in the Royal Palace, the Moorish Castle and the Monastery Nossa Senhora da Pena.
The revival starts multifaceted processes in this new era, giving relevance to new conceptions and methods based on the rediscovery and the desired revival of antiquity. In the late eighteenth century, Romanticism emerged as a European cultural movement, whose influence was consolidated until the

mid-nineteenth century. The application and combination of appropriate elements of different historical styles facilitate the emergence of new buildings, often developed from a different technical basis of the original. Continued loan of historical styles is manifested as denial of the development of science, industry and technology, advancing to audacious results.

Fig. 1: Moorish Castle, (from: http://www.ecotravellerguide.com/2014/08/wandering-sublime-sintra/)

Fig. 2: Sintra National Palace, (from: http://janemariag.blogspot.pt/)

The charm of Sintra, its climate and its unique landscape, is rediscovered by the romantic spirit of foreign visitors and the Portuguese aristocracy. The National Pena Palace and its surrounding parks were sent to build on the ruins of the Monastery of Nossa Senhora da Pena in 1838 by Ferdinand II in accordance with the aesthetics of Romanticism, incorporating artistic elements of other epochs. The emergence of the Romantic Movement in the XIX century gave Sintra a great reborn with the installation of many European aristocrats. The Monserrate Palace, Quinta da Regaleira and Quinta de Relógio are also examples of the importance of this movement and the transformation of the Sintra landscape into a mystery and magic environment.

Fig. 3: National Pena Palace, (from: http://www.serradesintra.net/palacios-de-sintra/palacio-da-pena)

Fig. 4: Monserrate Palace, (from: http://liveportugal.pt/parque-e-palacio-de-monserrate/)

Fig. 5: Quinta da Regaleira, (from: http://atracoessintra.no.sapo.pt/regaleira.htm)

Sintra is since 1995 declared as a World Heritage City. Our object of study, although not of cultural importance, is situated within the protection zone of this city.

3.2 Quinta das Murtas

The mansion is of the late nineteenth century (about 1880), built by Eduardo Van Zeller (1819-1889), a gift to his daughter Cecilia Maria van Zeller (1867-1959) who married in May 1885, with one of the descendants of King João VI, D. Manuel Rodrigo de Castro Pereira (1858-1921) (Fig. 6) [3].

Fig. 6: Quinta das Murtas

The property consists of a main building and two service buildings of inferior importance. The main building full of architectural influences is subject of this study. These influences are brought by Portuguese and European artists who spread a wide range of examples of revivalist architecture throughout the landscape, which results in a combination of decorative elements with proportions and combinations, which do not obey any constructive rules [3].

The mansion was initially composed of three floors: basement, ground floor and first floor. It was inherited by Rodrigo de Castro Pereira (1887-1983), one of the sons of Manuel Rodrigo de Castro Pereira and his wife. They ordered to raise another floor in the building, the second floor, keeping the original design of the facades but increasing the variety of styles [3].

On the first floor, there is the central balcony window double arched the Neo-Manueline (Portuguese variant of Neo-Gothic manifested in large scale in the National Pena Palace) which develops a pediment with balusters in stone.

The northern facade of the building is attached to a hidden tunnel; a passage to the garden, ornamenting the surroundings with a wooden structure used as recreational space.

The exterior doors arched in Tudor style, the English taste, which show the evolution of the pointed arch, thanks to construction technologies, start to "shoot down" until almost be horizontal lintels. The windows in double arch show the Neo-Manueline, Portuguese variant of the Gothic Revival.

Pretended corners on the façade of the mansion represent geometric figures, which represent the foundation of the traces of the middle ages.

The triforium made up of the interior arches recalls the features of the architect António Tomás da Fonseca Quinta do Relógio built around 1850, which is assumed as the first fully Neo-Arabian building. The columns of eastern style that support it, recall the features of the Monserrate Palace and the feigned entrance ceilings urge romantic manifestations.

The building and its surroundings assume oriental aesthetic with its lush gardens where the climate favours the cultivation of plant species from all over the world.

The interior spaces decorated with classicism refinement welcome noble leisure moments of everyday protocols.

3.3 Recovery planning

The recent owners found this mansion in an abandoned and very degraded position. As the building is situated in the patrimonial protected zone of Sintra, according to the existing regulations the external elements of the building cannot be changed. Therefore, the new owners, without changing the entrance of the property, the front yard, the façade and the roof, remodelled and transformed the interior of the building to a small hotel. After more than 15 years of successful use, various severe pathologies where encountered, which originated this study.

In the first two visits the pathologies were identified and registered. Technical documents, neither architectural nor engineering, where available, even not in the archives of the municipality, only a few historic literatures making mention of this building could be found. The process of transformation of the

building was gradually. The landlord gradually expanded the hotel, at the beginning in the first two floors and later in the third floor. The lack of documents showed that nothing had been designed even not the water supply system that had been installed in accordance with expansion of the hotel. Therefore, for our planning the building had to be measured and plants had to be designed to complete the registry of the pathologies identified.
As mentioned before, a few new pathologies concerning water infiltration occurred with severe damages that requested immediate action. The roof and two ceilings in the second and third floor had to be opened to find a rapid intervention possibility. Some structural problems were detected but mainly most of the pathologies like damaged or humid plaster, rotten wood bars or low pressure in a few bathrooms of the last floor were caused by infiltration and the latter because of missing design of the water supply system, which couldn't support the variation of pressure in the tubes and altered sooner as expected.
This study treats the recovery of the water supply system, and as such, after the formulation of the diagnosis, it was clear that recovery of the water supply system could only be realized through total renewing and design of the system. The question is which kind of supply system and tube material to choose and if the hot water supply should have a return system. Many options are available in the market and it depends now on the owners and the users of the building to decide what system to choose. As mentioned before the cultural value is restricted to the exterior and as the building is functioning as a hotel the main users of the building are temporary short-term users and only interested in a primary comfort as hotel guest, naturally the landlord inclines in such a case for an economic solution with reasonable durability.
One of the structural conditions that had been discovered is the fact that in each floor the wooden bars in the pavement have perpendicular directions in each room. This made it impossible to install the tubes in the pavement because of lack of continuity. Technical floor baseboards had to be excluded too, as corridors do not offer the necessary space. The theoretical option of installing the water supply system behind a false ceiling in the corridors was rejected correctly by the owner the hotel staff, as it would totally change the original architecture in the old fashioned corridors with high ceilings pleasing through its simplicity. Finally, we decided to conduct the plumbing run on top of the walls close to the ceilings, partially passing through the ceiling or pavement whenever the change to other rooms or divisions allowed it, and from there to supply the equipment beneath. This reduced the pressure drop, facilitated to maintain water quality across the installations and turned the system more economical. Regarding all these points, even the hot water supply with return system turns to be less economical, considering the energy saving. The hotel has very little clients through the winter months and very little hot water use through the summer months because of the outside temperature. So far the functionalities and technologies of the possible systems are compared. The study about the energy saving of the hot water recirculation systems will be published in a further paper, which is studied for another application.
The final decision now concerns the materials considering their costs, durability, environmental comfort, embodied energy and gas emission through fabrication.
In this study the tubes of synthetic materials used for potable cold or hot water supply under pressure are all considered as multilayers according to the state of the art with a layer of aluminium in between. These tubes made of cross-linked polyethylene (PE-X), polypropylene (PP), polybutylene (PB) and chlorinated polyvinyl chloride (PVC-C) are compared with conventional materials as copper or stainless steel (simply inox from French inoxydable). As the synthetic materials have very similar technical specifications regulated by EN 806 (Specifications for installations inside buildings conveying water for human consumption), they are joined together in table 1 for simplicity. But in figures 7 and 8 the synthetic tubes are separated concerning their distinguished data for comparison.

Tab. 1: Comparison of materials specifications for potable water tubes

MATERIAL	UNITY	SYNTHETIC PB, PP, PE-X, PVC-C	COPPER	STAINLESS STEEL
NORMS		EN 806	EN 1057	EN 10088
WEIGHT	kg/m	0,137 - 0,193	0,486	0,426
THERMAL CONDUCTIVITY	W/mK	0,41 – 0,43	305	15
DURABILITY	Years	50 - 60	no limit	no limit
COSTS	€	2,38 – 3,30	7,04	2,50
THERMAL CONDUCTIVITY with 20mm rock wool	W/m^2K	0,17	0,17	0,17
EMBODIED ENERGY tube only	MJ/m	9,25 - 16,20	20,41	8,43
GAS EMISSIONS	$kgCO_2e/m$	0,44 - 0,49	1,32	0,62

The comparison shows first that regarding durability there is no specific concern, as the hotel needs to update its style regularly and is planning to remodel again in the next 20 years. The thermal

conductivity is calculated according to the EN ISO 12241, which regulates the thermal insulation of building equipment and industrial insulation. The numbers show that the insulation is so dominant that in all cases the thermal conductivity of 0,17 W/m^2K turns to be equal for all materials.
About the costs it has to be said that stainless steel tubes, although reasonable in material costs, turn to be more expensive regarding the work time and the number of connections to install that are much more complicated as the multilayer tubes that can easily be formed and hooked together. The costs vary between all the tube kinds and are shown separately in figure 7. The polypropylene PP multilayer tube is the less expensive alternative considering the material costs.

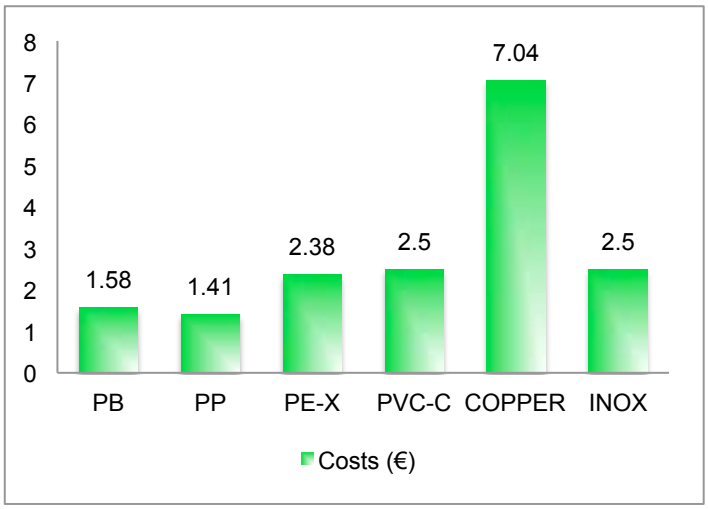


Fig. 7:Cost comparison of tube materials

The embodied energy is calculated for a meter of tube, as the run is equal for all tube kinds. It includes the energy consumed for manufacturing until fabric's gate. Likewise the gas emissions, additionally they are "converted to CO_2e which captures more than just carbon dioxide (methane, PFC's...etc.)" [4]. Figure 8 shows the distribution of these indicators for the chosen tube kinds. As mentioned before the synthetic tubes are listed separately as the embodied energy varies very much. Once more in case of inox and copper must be mentioned that connections raise the energy consumption and gas emissions, more than in case of the synthetic tubes that need less connections. These details will be studied in a further study when detailed plumbing planning for all the tube materials are available and a righteous comparison can be realized.

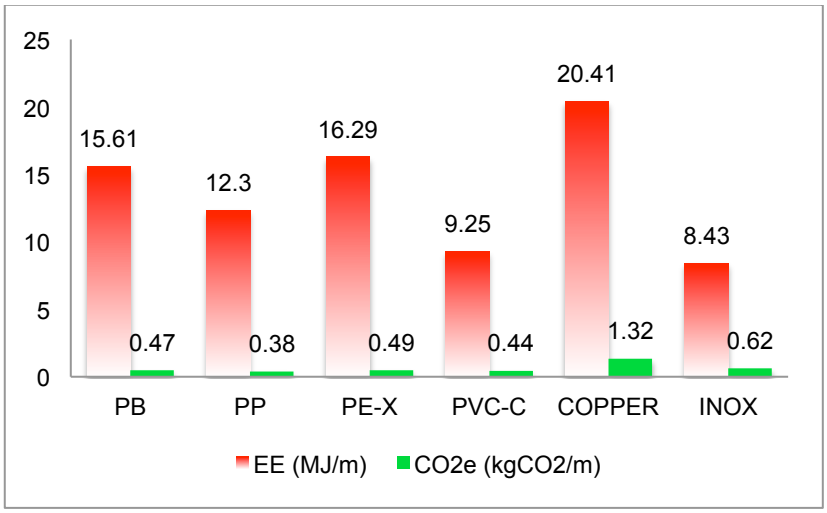


Fig. 8: Comparison of Embodied Energy (EE) and Gas Emissions (CO2e) of tube materials [4]

4. Conclusion

The developed methodology was applicable on the case study and very close to real procedure of decision-making. Although for the landlord the decisions to make where merely dependent to the economy, but the methodology showed ability in all stages of decision-making capable of leading and guiding through the procedure of identification of pathologies to survey, to diagnosis, to define the heritage and its cultural value, to elaborate intervention possibilities and finally conducting to the final decision how to rehabilitate.

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Medieval Archaeology in Montella: traces of ninth century settlement in *Rasola* 7.

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Abstract
The archaeological investigations conducted by Prof. Marcello Rotili walled area of Monte of Montella (Avellino) between 1980 and 2007 revealed the many phases that affected the settlement between the sixth-seventh century to the twentieth century. The contribution focuses on the analysis of material evidence of the ninth century inside the terrace (*rasola*) 7 placed in the north-east of the walled area. In the ninth century the fortified settlement of Montella was seat of a "gastaldato" (Lombard administrative district) as evidenced in *Radelgisi et Siginulfi principum division ducatus beneventani* of 849. Numerous traces of the fortified village of ninth century identified in the course of the archaeological researches; excavations have revealed parts of the walls along the slopes of Monte and residential buildings identified in the numerous terraces; these terraces are related to the transformation of the site in terraced park built by Charles II of Anjou or Philip of Taranto. The structures of the early medieval village were severely damaged by the earthquake of 989 that led to a reorganization of the entire settlement. The excavation of trenches 12/88-89 and 1/87 in *rasola* 7 revealed traces of the fortified settlement of the ninth century that have been identified in other terraces: the investigations revealed a wall and a walking surfaces refers to a residential building (trench 12/88-89) and a cistern (trench 1/87) cut by the walls of the thirteenth century.

Keywords: Medieval archeology, archaeological excavation, fortifications and settlements

1. Historical Context
The fortified settlement of Montella (Avellino, high valley of Calore river), which has been affected by archaeological investigations conducted between 1980 and 1992 and more recently between 2005 and 2007 [1], dominates the current village that arose with merging of the hamlets located in the valley in the late Middle Ages. The research carried out on "Monte", a hill where it arises the fortified center, showed the complex nature and settlement history of the site, whose first phases date back to the sixth-seventh century, when it was founded a village of huts (in material perishable with stone plinth) due to the progressive abandonment that affected the valley floor. The settlement, which evolved into a "curtis" between the seventh and eighth centuries, as evidenced by judgement by Arechi II in 762 [2], took a well-defined configuration with significant defensive structures by the middle of the ninth century when Montella became the seat of a "gastaldato", an administrative district that found itself on the border between the principalities of Benevento and Salerno after the division of the Duchy of Benevento in 849 [3]. The "gastaldato" of Montella stretched between the high valley of Calore river and that of Sabato river and bordered to the north by the "gastaldato" of Quintodecimo north, to the west with that of Avellino, to the east with that of Conza and south with that of Rota. The settlement, characterized by defensive systems that surrounded the area of "Monte", by residential structures of Lombard gastald (the so called "gastaldaga") located in the upper part of the hill and by houses developed in the bottom of the hill which is defined as "area murata" for the presence of the walls, was damaged by the earthquake of 989 [4], whose devastating effects led to a settlement reorganization.
A significant reorganization, especially in the area previously occupied by the "gastaldaga", came in the twelfth century when it was built, at the highest point of the hill, the cylindrical "donjon"; the

construction of “magna turris” was part of a broader project of reorganization of the summit of the hill which was refortified.
However, it is between the end of the thirteenth and fourteenth century that the “Monte” area was affected by a series of transformations that radically changed the “area murata” structure: the definition of terracing (“rasole”) and the building of its walls containment, which covered the traces of the fortified village structures, was part of a set of measures aimed at creation of a park equipped with complex water supply systems useful for powering fountains. These changes, together with the renovation of the walls and the “palatium” structures [5], are due to the aristocratic presence, starting from Charles II of Anjou, which interested Montella. The abandonment of the castle and the “area murata”, already affected by decay events in the second half of the fifteenth century, came in the first half of the sixteenth century after the siege operated by French troops under the command of Lautrec (1528).
By the second half of the sixteenth century, the Franciscan monastery was built together with the renovation of S. Maria del Monte church located in the western part of “area murata”. The “area murata” was partly used for agricultural purposes by the friars who used the convent until the first half of the twentieth century.

2. The Rasola 7

The terracing (“rasola”) 7 is located along the northeast side of the “area murata” of Montella castle (fig. 1), at an height of -6,01m at 0.00 point (this point is set at 796.26 meters a.s.l.). The archaeological investigations conducted in this area in the years 1987-90 showed the remains of the village of sixth-seventh century, identified the remains of a hearth (stratigraphic unit 6, trench 1/87) and a postpit probably relevant to a building of perishable material (trench 12 / 88-89).
May be related to the ninth century, when Montella took connotations of administrative and military center, the remains of the walls (trench 4/90), a tank (stratigraphic unit 4008, trench 1/87), a wall and a mortar floor of a residential building (stratigraphical units 63 and 61, trench 12 / 88-89).
The current shape of this terracing is the result of the excavation operations, the dumping of terrains and the construction of containment walls for the construction of the terraced park between the thirteenth and fourteenth centuries. The realization of the forecourt of the church and the excavation of bedrock modified extensively the original conformation of the terracing.

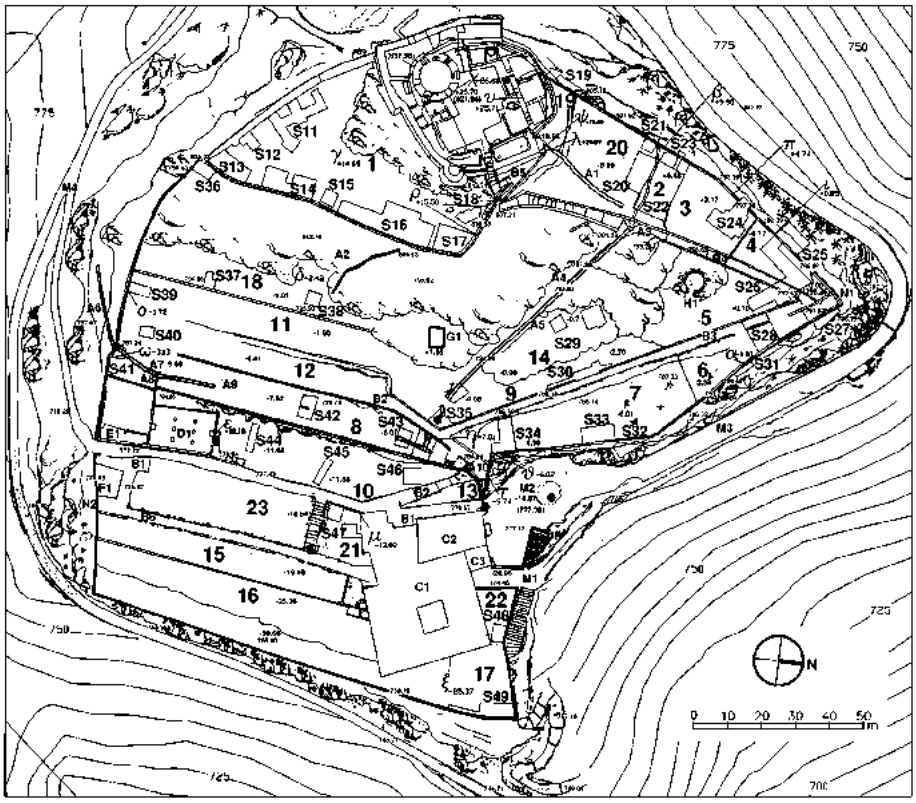

Fig. 1: The “area murata” of the “Monte” hill (Cordella-Rotili).

3. The trench 1 87

The southern part of “rasola” 7 was affected in June of 1987 from archaeological surveys with the opening of a rectangular trench (trench 1/87; 4x9,26/9,90 meters) to concentrate the exploration on a portion as close as possible to 4301, containment wall of “rasola” 7 which has a north-northeast/south-southwest orientation.

The excavation was concentrated in the area between the dry stone wall 3105, the access road to the castle (stratigraphic unit 3301) and the wall 4301. The progress of the investigation along the south side leads to a further expansion of trench (3x2,50 meters) which assumes a permanently an "L" form with sizes of 9x5,80 meters.

The removal of the turf has revealed, on the whole excavation surface, the stratigraphic unit 1 (initial height -78 centimeters; final height -122 centimeters) which is a soil of dark brown color with a compact texture and full of crushed stone; this stratigraphic unit also returns numerous potsherds, iron pieces, carbonized seeds and two coins. The same soil, referring to the late phase of the agricultural exploitation of the area (*phase*), is highlighted and subsequently removed even in the expansions carried out close to the wall 4301.

The excavation revealed, under several backfill stratigraphic units, the presence of three medium size limestone which formed a circle (stratigraphic unit 6) located in the lower portion of the north-eastern enlargement of the trench. Such stones (diameter of 0.50 meters), arranged in a semicircle without the use of mortar, can be referred to the remains of a hearth relevant to the village of sixth-seventh century (*phase*), whose evidences were found in different areas of “area murata” and the highest part of the hill.

Nearby enlargement of 3x2,50 meters of the excavation area, in the eastern portion of the trench, close to the containment wall 4301 and stratigraphic unit 1A, there are the remains of a tank (4008) which was partly demolished on the east side by the wall 4301 (fig. 2).

Realized by shaping the bedrock 7, the tank has a quadrangular form (1,30x1,90x0,90 meters) with rounded edges, vertical slope walls and a flat floor (stratigraphic unit 14); characterized by a masonry in medium size limestone with the use of gray mortar, the structure, relevant to a residential building of the ninth century village (*phase*), is distinguished by a hydraulic mortar coating that covers the inner walls and the floor 14.

The excavation of the tank nearby to the northwest corner revealed the stratigraphic unit 8A (height -233 centimeters), a semicircular structure leaning on the north wall and the northeastern portion of the western wall which is characterized by the presence of a postpit (element A). The postpit has a diameter of 10 centimeters and is located at the northeast angle of the tank at about 20 centimeters away from the northern wall of the same cistern.

The hole is filled by a black-colored soil that has a sandy texture and is delimited by a well-polished pebble.

At the north-eastern side of the tank, inside of the filler soil of the cistern (stratigraphic unit 3), there are two other postpit (elements B and C which have a diameter of 10 cm) which have the same characteristics of element A: it’s possible that these pits were relevant to the installation of a scaffold useful to building up the upper portion of the wall 4301 (*phase*).

At the southwest angle of the tank 4008, the continuation of the removal of stratigraphic unit 3 shows, at the height of -259 centimeters, a fragment of a pavement made of mortar (element E).

In the southwest portion of the trench and in the west of the tank 4008, nearby the containment wall (3105) of the access road to the castle (3301), it’s found a part of a compact geological bench, consisting of a light brown pozzolan (stratigraphic unit 9, 6x3,50 meters) covered by soil 1 and 1A.

The pozzolan bench leans on the outcrop of limestone 2 (height -133 /-155 centimeters), also covered by the stratigraphic units 1 and 1A; close to the rock bench it’s found a small coin.

In the northwest area, below the soils 1 and 1A, between the rocky banks 2 and 7, is identified a second frequentation level, called stratigraphic unit 11 (0,30x0,40 meters), similar to that found in southeast sector: this floor, which is also constituted by compact mortar with grit, it has been realized above the bedrock 7.

The floor 12 may be attributable, for the constructive characteristics, to the ninth century and be relevant to a walking surface of a residential building (*phase*) which clearly referred the cistern 4008 (fig. 3).

The discovery of the tank 4008 is part of a broader perspective that concerns the whole hilltop village, where similar findings have been documented in the excavations that have affected the archaeological site; possible comparisons can be made with the cistern 1000-1003 identified in “rasola” 4, built simultaneously to the settlement of the ninth century and then reused for funerary purposes between the tenth and twelfth centuries [6]; with the widest tank D 10100-10106 pertinent to “gastaldaga” on which will be built the Norman “donjon” [7]; with tank J, located in the area of the castle courtyard enclosed by the walls of the ninth century and the later walls built by Charles II of Anjou [8], a rectangular plan (244x517 centimeters), characterized by coating mortar hydraulic and covered by a barrel vault.

Further similarities can be found with the rectangular tank 36 found in “rasola” 20 and built directly on bedrock specially shaped and sealed with hydraulic mortar. The use of cisterns for the storage of rain water dates back to the Roman period [9]: in private houses the cistern was located below the bottom of the “atrium” and connected to “compluvium” through a pipeline; the water supply was through a completely waterproofed well, with a clay or marble facing, located in the “atrium” or peristyle. This type of structures, intended for water supply for different categories of buildings, found in later centuries a wider spread.
The size of the tanks vary according to their destination; in the private sector generally they had a capacity of not more than 2 cu.m and were waterproofing with a mixture of lime and crushed bricks. In the Middle Ages the practice to build reservoirs for rain water storage is well documented in hilltop contexts: the adopted practice is also well documented in the case of Montella.
The tanks mentioned above are relevant to small masonry buildings, one of which has been documented in the trenches 12/88-89 and 4/90.

Fig. 2: “Rasola” 7, trench 1/87, tank 4008 (property of M. Rotili)**.**

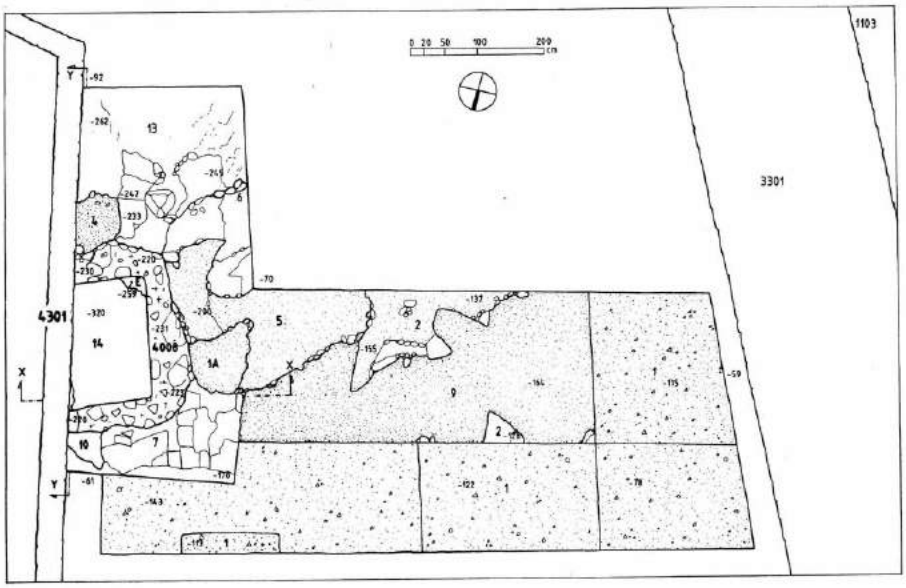

Fig. 3: “Rasola” 7, trech 1/87, the excavation area.

4. The trench 12 88 89

Between July of 1988 and July of 1989 archaeological surveys conducted in “rasola” 7 are focused in the eastern portion of this terracing with the opening of the trench 12, which occupies an area of 4x4 meters, later expanded northward by about 2 meters.

The removal of humus has revealed a dark brown color ground with a compact texture that is called 1; this stratigraphic unit is related to the late phase of agricultural use of terraced area (*phase*).

The excavation has evidenced, under numerous soils relevant to the terracing works (*phase*), the presence of stones joined by mortar (stratigraphic unit 41); the partial removal has revealed a dark gray and sandy soil (stratigraphic unit 39) with traces of burning; that ground covered numerous fragments of tiles mixed with bone fragments not in anatomical connection (element B).

The continuation of the investigation shows, in the northern portion of the trench below the stratigraphic units 39 and 60 (*phase*), a walking surface that is documented and recognized as stratigraphic unit 61 (*phase*); this surface, a mortar floor with a thickness of about 3-4 centimeters, is characterized by an irregular surface (with many gaps) and with an inclination tending towards the east.

The removal of the soil 5 in the south portion close to the walking surface 61, at the height -272 centimeters, shows the top part of a wall in “opus incertum” with the use of limestone blocks of small and medium sizes set with white and solid mortar.

This structure, called stratigraphic unit 63 (*phase*), is 410 centimeters long and has a 52 centimeters thick and a southwest-northeast orientation; for the constructive characteristics and after the analysis of pottery finds, this structure can be interpreted as the perimeter wall of a residential building, referring to the fortified village of the ninth century, which was characterized from the walking surface 61 (fig. 4).

The phase of the ninth century is characterized in fact by residential buildings that affected several areas of the “area murata”: archaeological investigations have documented a prestigious residential nucleus (the “gastaldaga”) and other structures at the highest point of the hill that, in the twelfth century, it will be occupied by defensive structures and the “turris magna” which obliterated and partly reuse the previous structures [10].

In the underlying “area murata”, which has an extension of three hectares, are evidenced housing structures of the village built on the previous VI-VII century settlement structures (*phase*).

In the southern portion of the trench, the archaeological survey finds, at height -390 centimeters, the stratigraphic unit 73, a soil composed mainly of red clay mixed with coal pieces and traces of burning.

The ground 73 covers the stratigraphic unit 74 (initial height -425 centimeters; final height -460 centimeters) which is characterized by black color with coal traces and clay inclusions; this soil presents a particular circular shape.

The analysis of 74, an organic deposit characterized by a considerable number of seeds finds (legumes and cereals), bones and potsherds (coarse ware, cooking ware, painted ware), made it possible to assume that this stratigraphic unit (fig. 5) is the filling ground of a postpit (stratigraphic unit 75). This postpit has a diameter about 30 centimeters.

The ceramic material found in the filling of the postpit allows to bring this evidence to a chronological horizon sixth-seventh century (*phase*), a period characterized by the attestation of a village, also marked by the presence of a small necropolis discovered in the north of “area murata” (“rasole” 4, 5 and 6) [11], on the “Monte” hill whose faint traces have been documented in several areas of the site [12].

Fig. 4: “Rasola” 7, trench 12/88-89, structures 63 and 61 (property of M. Rotili).

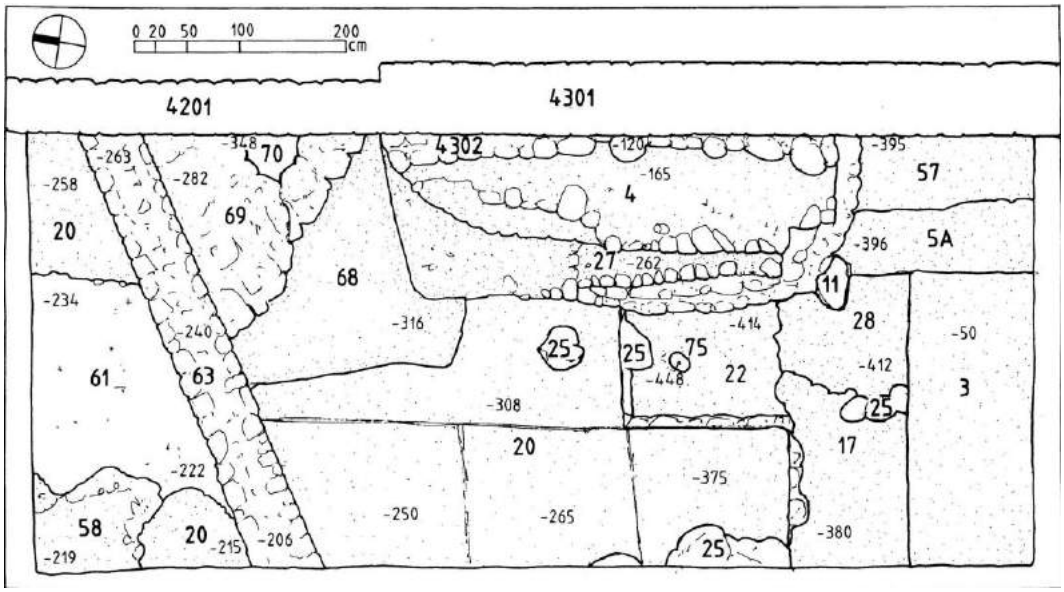

Fig. 5: “Rasola” 7, trench 12/88-89, the excavation area.

5. The trench 4 9

In June of 1990 is opened the trench 4 at the outside of the rasola 7 and at the angle formed by the containment walls (4201-4301) of the terracing. This trench is also located at a level significantly higher (about 8 meters) of the forecourt of S. Maria del Monte church.

The square was built with the excavation of the bedrock and with the simultaneous moving back of the walls built between the thirteenth and fourteenth centuries.

These changes were carried out after the construction of the church and the convent in the mid-sixteenth century, probably in the first half of the eighteenth century for the construction characteristics and for the presence of a “riggiola” (a decorated tile), dating back to that period, incorporated in the masonry.

The removal of topsoil 1 (initial height -60 centimeters; final height -160 centimeters), covering the containment walls 4201 and 4202 of the “rasola” and which is characterized by the presence of potsherds and brick pieces, highlights 4250 (figg. 6, 7), a section of the wall of the ninth century

(*phase* □) and the floor 2, a mortar floor which is located on the edge of the trench located at an height of -250 cm at point x (fixed on the containment wall 4201).
The area of “Monte” was equipped with massive walls characterized by a wall with a thickness of 150-160 centimeters; this structure consists of two facades in limestone with mortar and core of masonry blocks of the same litotype. The boundary wall has been identified and documented in various sectors of the settlement in correspondence of the rasole 19, 20, 3, 4 e 1 [13].
The excavation of the archaeological deposit located in the space formed between the high part of the oldest enclosure wall 4250 and the containment wall of the “rasola” 4201 highlights the soil 3 (initial height -42 centimeters), a filling layer between the two structures which presents the same features of the stratigraphic unit 1.
The removal of topsoil 1 and 3, in addition to highlighting the stratigraphic unit 4, a dark brown and compact layer that returns pottery finds, and the clay soil 5 (height -109/-126 centimeters) which is characterized by the presence of potsherds and of human bones, allows to better highlight the early medieval walls 4250 (*phase* □).
The structure, with a variable height from 0.2 to 0.68 meters and a length 6.40 meters, has a slightly curved shape from northwest to southeast. It is also clear that part of this structure is covered by 4202 (can be interpreted as the foundation of the containment wall 4201 of the “rasola”; *step* □). The continuation of the investigation has also permitted the identification, at the height of -42 centimeters, a further wall structure (stratigraphic unit 4260), also covered by the foundation of the containment wall of the “rasola”; It is also clear that 4260, which forms a right angle with 4250 and leans right to the walls.
With the continuation of the excavation, it was possible to document that the 4202 foundation of the containment wall of “rasola” 7, in addition to covering the 4250 wall, covering the bedrock 8; on this bedrock, characterized by a slight slope from north to south (height -113/-132 centimenters), it was also made the foundation (4270) of another structure that has a parallel trend (west-east) to 4260. It is conceivable that the identified foundation may belong to a residential building (*phase* □) whose structures seem to also continue in the trench 12, where the wall 63 (which binds to floor 61) seems to be the continuation of the wall documented in the trench 4.

Fig. 6: Trench 4/90 (property of M. Rotili).

Fig. 7: Trench 4/90 (property of M. Rotili).

6. Rasola 7 stratigraphic interpretation

The study of the structures and the macroscopic analysis of the artifacts found during the archaeological excavation allowed to highlight five main phases that affected the “rasola” 7.

- *Phase* □ (VI-VII centuries): The area was the seat of some houses of the village; this area is not far from the small graveyard found in terracing 4, 5 and 6 [14]. At this phase refers the postpit (stratigraphic unit 75) found in trench 12/88-89 and the hearth (stratigraphic unit 6) found in the southeastern sector of the trench 1/87. The hearth found in rasola 7 is not dissimilar to the contemporary structures identified in terracing 1 and in the P room of the “palatium” [15].
- *Phase* □ (VIII-IX centuries): The settlement defensive strengthening, evidently due to the growth in importance of Montella culminated with the establishment of “gastaldato”, can be recognized in the construction of massive walls. Traces of the walls were found in trench 4 (stratigraphic units 4250 and 4270).

Some structures refer to brick houses: in the trench 1/87 was found a small tank which was partially demolished with the construction of the containment wall of “rasola” 7 (stratigraphic unit 4201) built in the modern age, and a mortar floor (stratigraphic unit 12) pertaining to the same residential building; to another residential building, located in the trench 12/88-89, refer a mortar floor (stratigraphic unit 61) and the wall 63 that seems to continue in the trenches 4/90 where was documented a foundation (4270) that rests on the bedrock 8.

- *Phase* □ (X century): Montella was struck by the earthquake in 989 which caused extensive damage to the defensive walls (trench 4/90) and to the houses in the trenches 1/87 and 12/88-89; the effects of the earthquake are documented in the trench 12 by a layer of collapse (stratigraphic unit 60) that covers the residential building structures (stratigraphic units 61 and 63).
- *Phase* □ (XIII-XIV centuries): The creation of the park, between the late thirteenth and early fourteenth century, led to a series of transformations in the “area murata”, such as the creation of terracing, construction of containment walls and the reconstruction of the walls; these walls are smaller in size than the high middle ages walls (*phase* □); in some cases was built over the older [16].

These works affect the oldest stratigraphy covering, as evidenced by the powerful soil layers documented in excavation trenches, the evidences of early medieval fortified village. It was built the enclosure wall 4201 which, in rasola 7, was demolished during the modern age earthworks for the construction of the square opposite S. Maria del Monte church.

- *Phase 5* (XVI century): It assists the abandonment of the settlement and “area murata” of “Monte” hill. In this phase we are witnessing the construction of the Franciscan monastery together with the renovation of S. Maria del Monte church.
- *Phase* □ (XVI-XX centuries): after long abandonment following the expedition of Lautrec in 1528, the castle was given to “frati minori conventuali scalzi” (Franciscan friars) who in 1587 settled in S. Maria del Monte convent where they remained until 1603 when they were replaced by “minoti riformati” friars. In this phase refers the excavation of the bedrock north of the church for the construction of the square.

This operation also led to the demolition of the XIII-XIV century walls and the reshaping of the rasola surface, which was significantly decreased in the eastern portion; it was therefore necessary to build a containment wall (4301) of the overlying land, the construction of which disturbed the oldest stratigraphy and led to the demolition of the tank 4008 found in trench 1/87. The useful comparison had with Prof. Marcello Rotili, excavation director, the hypothesis that the containment wall of rasola 7 could fall in works created in the thirteenth-fourteenth century to the times of the park construction is to be confirmed: it is conceivable in fact that 4301 was built above the fourteenth-century structures. The agricultural use of the area is documented by the eighteenth-century plant “Pianta di tutto il Monistero*”* in which the “rasola” 7 is described as “decima prima rasola di terra coltivabile” (eleventh terracing of arable soil) wide 392 steps.

□I wish to thank professor Marcello Rotili for the opportunity given to me and for all the essential advices received during the researches.

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From Carlo to Ettore Bugatti: The language of Movement

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Abstract

Carlo Bugatti (Milan 1856 - Molsheim 1940) belonged to a family of artists and creative minds. He trained at the Brera Academy in Milan, before dedicating himself first to architecture and then to furniture design, characterised by exotic and original forms. Well-known in his lifetime, his contribution to Italian design is not properly recognised today; he reached the high point of his career in 1902 with his contribution to the International Exhibition in Turin. Of his sons, Rembrandt Bugatti chose sculpture, while Ettore Bugatti (Milan 1881 - Neuilly sur Seine 1947), who was equally creative, chose a path that was only apparently unrelated, by founding a car company, Bugatti, which remains synonymous with excellence and artisan uniqueness. In this paper, we will consider Carlo Bugatti's formal vocabulary, and his use of original materials such as leather, painted parchment, pewter and copper, which he combined to create compositions developed during the Art Nouveau period but removed from contemporary trends. The originality of Carlo Bugatti's pieces, of his work, does not represent an exotic exception, as his work presents surprising similarities with elements of Ettore's design, in a complex and intriguing burst of interaction and inspiration. And all of this against the backdrop of the avant-garde movements of the time, such as Futurism, which played a key role, and which help shed light on the Bugattis' artistic journey, something which deserves a closer look.

Keywords: Carlo Bugatti, Ettore Bugatti, furniture design

1. Carlo Bugatti, the d□but

Inspiration and inventiveness were common qualities in the Bugatti family [1]. Carlo was an artisan in the truest sense of the word. His ability to work with any type of material – from wood to metal – and his artistic creations, served as an important lesson and a source of inspiration to his sons. His father, Giovanni Luigi Bugatti, was a sculptor and designer, as well as an amateur designer of mechanical devices. Particularly noteworthy are his monumental fireplaces, created for important homes in Milan. In this sense, the Bugattis embodied the ideal profile of artists of the late 19th/early 20th century, producing total works of art – simultaneously designing and creating models to be translated into completed works, built with artisan care, conceiving of a space and bringing it to life in all of its detail. Carlo Bugatti did not create prototypes for subsequent serial production; rather, he was an excellent artist and artisan creator of unique pieces. In this sense, he cannot be regarded as a pioneer of design in the contemporary sense of the term unlike, for example, William Morris. In those years, dominated by eclecticism and revivals, Morris demonstrated regional tastes, drawing on tradition while looking towards the future, and embraced each individual detail of the interiors, created according to the concept of the complete artwork, but with a spirit that quickly evolved from artisan to modern design, in the sense of the mechanical reproduction of a prototype. Bugatti, who had studied architecture at the Brera Academy, focused little on architecture, and quickly moved into furniture design, using the most disparate selection of materials. The creative direction of his works was influenced, from the outset, both by his architectural studies and by very influential figures such as the well-known artist Giovanni Segantini, whom he met during his time at the Academy, the composer Giacomo Puccini and the sculptor Ercole Rosa. Both Bugatti and Segantini collaborated with the furniture maker Mentasti in Milan. In 1880, Carlo married Teresa Lorioli, with whom he had four children – Dejanice, Ettore, Rembrandt and Francesco. In that year, he also built furniture for his sister who, in the meantime, had married the painter Giovanni Segantini. This was his first complete artwork, in which all items of

furniture exuded his unmistakeable style, with the addition of floral motif decorations painted by Segantini.
In those early years of his work, he created various architectural models, such as a funeral mausoleum designed in the organic Art Nouveau style of Victor Horta, and massive and static works of architecture, featuring the Moorish-style motifs that often appeared in his works. The transition from architecture to furniture design is fluid: they represent different steps, but the methods and vocabulary are the same. According to Saverio Simi :"*his ine□haustible architectural imagination □..□, which could not be applied to large-scale urban furniture*" found "*its place and was defined in the smallest technical details and the various uses of different materials in furniture ma□ing*" [2]. Subsequently, however,

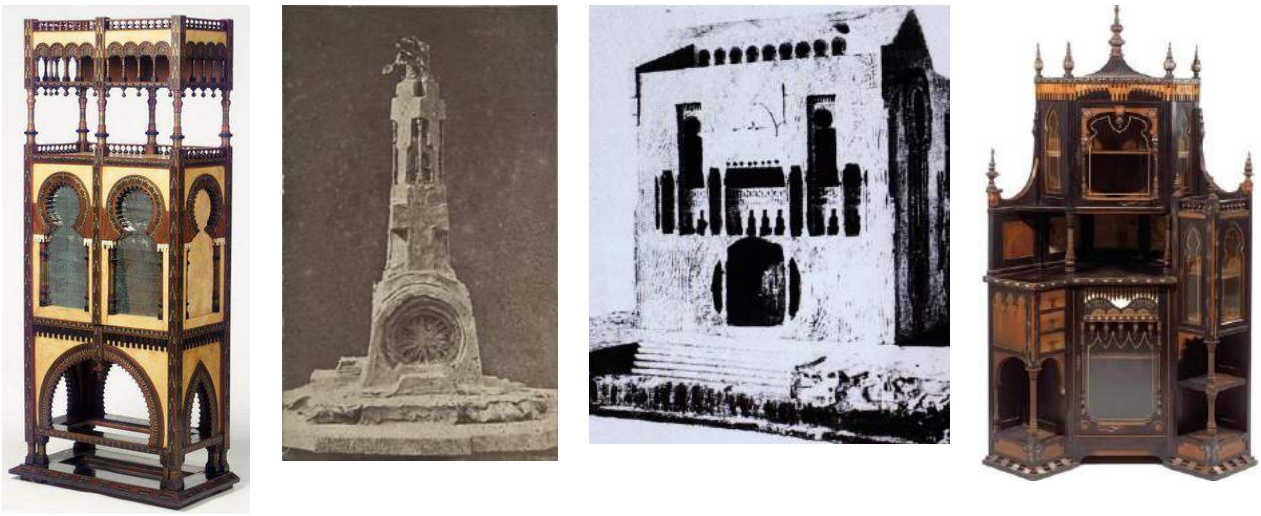

Fig. 1: Carlo Bugatti□ Cabinet 1898/ photography of a model for a funerary mausoleum/ photography of a model for Villa Mirafiori project/Carlo Bugatti□Cabinet 1898

Bugatti was driven by an urge to break free of the classical patterns of proportion and symmetry, and he dabbled in free modelling before arriving at a sculptural and three-dimensional equilibrium.
The functionality of the object also came to represent an obstacle to overcome rather than an objective. Carlo Bugatti's creativity was best expressed by pursuing different forms, and new static and dynamic equilibriums, beyond the restrictions posed by function. In addition, the high-quality, non-resistant materials employed indicated an approach to design that was not bound to the mere concept of use.
Carlo Bugatti was also a capable promoter of his work, and participated in the most important exhibitions of his time [3]. In 1888, he exhibited at the Fine Arts Show in Milan. In that same year, he participated in the Italian Art Exhibition in London, which was fundamental to his work being recognised abroad. On that occasion, he exhibited an ornate silk and leather table, some chairs, a wall étag□re featuring a canopy with mother-of-pearl inlays and ivory and metal adornments, and a screen characterised by rich decoration and coated with painted parchment. His work earned him a Diploma of Honour, and illustrations of his creations appeared in well-known publications of the time, including “The Queen, The Lady’s Newspaper”, “The Journal of Decorative Art” and “The Cabinet Maker and Art Furnisher". The latter publication noted that Bugatti's chair was similar to "some of the most original forms created by Dr. Christopher's pen", referring to Christopher Dresser, a very influential designer and critic of the time. In stark contrast to the Japanese style typical of English creations of the period, Bugatti's Moorish style of furniture design was referred to, at the time, as "Granada Furniture", a reference to Alhambra in Granada. He drew much inspiration from his contemporary world, rather than from travels or from experienced reality. Though his work was rich with exoticism, with images of faraway lands of which he only dreamed, Bugatti did not in fact travel, and barely left his studio except for shows and exhibitions [4].

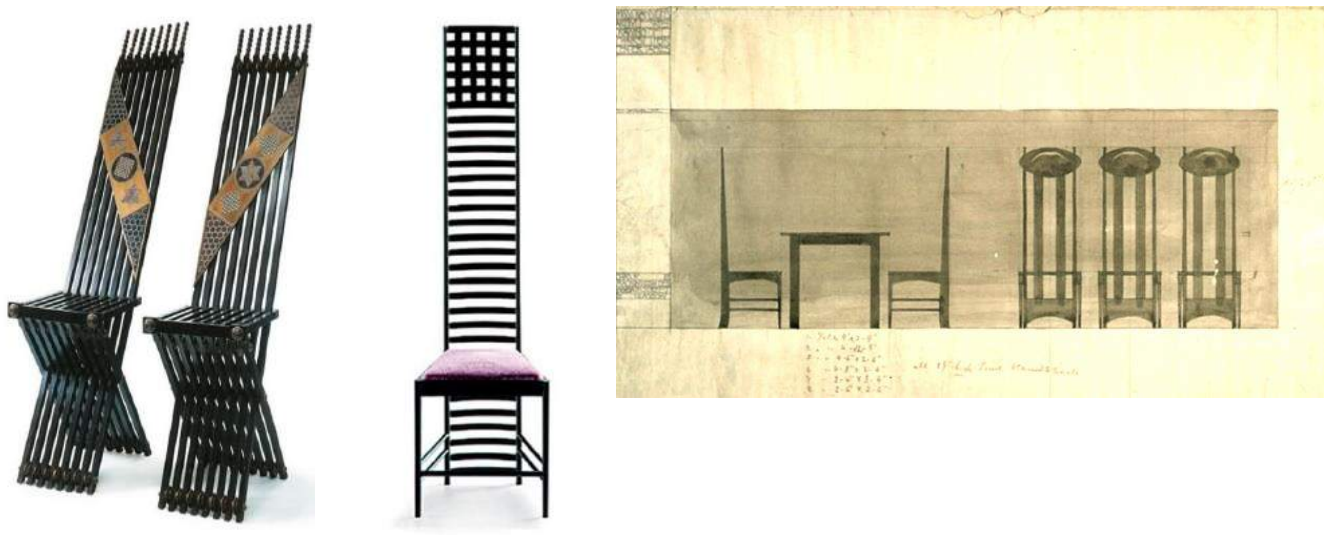

Fig. 2: Carlo Bugatti's High backed chairs, 1900 - C.R. Mackintosh, Hill House Chair 1902- C.R. Mackintosh, Chair and tables for Miss Cranston's' Tea Room Argyle Street Glasgow 1898

In 1900, he was awarded a Silver Medal at the International Exhibition in Paris. His creative and original project earned him the commission to furnish the Turkish Room in New □ork's Waldorf-Astoria Hotel, the task of creating furniture for the villa of Luisa Amman, who had recently married the Marquis Camillo Casati Stampa di Soncino and, in 1901, the commission to furnish the interior of the London residence of Cyril Flower, First Baron of Battersea. Far removed from New Renaissance and New Gothic styles, and similarly detached from the canonical formalities of Art Nouveau, Carlo Bugatti created a unique repertoire by experimenting with various forms and techniques, in an imaginative combination of elements inspired by exotic sources, from the Islamic and Japanese worlds. This is particularly evident in his earliest works: these feature towers, pinnacles and teeth, drawing on Islamic, oriental and medieval traditions and created using various materials such as pewter, brass, copper, bronze, ivory, bone and mother-of-pearl. The objects were also enhanced with silk and cord edging, and decorated with embossed and engraved metal. His fascination with the oriental world brought him into contact, in this period, with one of the leading names of the time – Charles Rennie Mackintosh. Like Bugatti, Mackintosh mixed decorative motifs from the Scottish regional tradition with oriental-inspired techniques, both in his use of materials and in his decorative patterns, although the Scot's greater sense of rigour distinguished him from Bugatti's exuberant style. The assonance is evident, however, and is influenced, in part, by turn-of-the-century eclecticism, and undoubtedly by reciprocal familiarity. In 1897, the architect received his first commission from Miss Catherine Cranston to refurbish the tearoom on 114 Argyle Street, Glasgow. Mackintosh handled both the architectural project and the design of each individual item of furniture, and presented his high back design for the first time, something that became characteristic of his work. A new version of his chair design, in coloured and painted oak, was presented at the Vienna Secession Exhibition in Vienna in 1900. His work had a big impact on the aesthetics of Wiener Werkst□tte.

Like Bugatti, Mackintosh exhibited his work in Turin in 1902 and, in that same year, was awarded the commission for Hill House in Helensburgh by the Blackies. It was for Walter Blackie's bedroom, in 1903, that Mackintosh designed the Hill House Ladder Back Chair. Here, the Scottish designer departed from floral naturalism, adopting a linear and geometric style inspired by Japanese design. The dark ash wooden structure contrasted with the wall of the room, which was white; the height of the chair served as the ordering element of the space in the room in which it was placed; the long back is regulated with bars, which, at a certain point, are interwoven with other small beams, creating a motif of orthogonal slats that are very characteristic of his style.

Before Mackintosh's Hill House Chair, William Morris had presented a version inspired by the Egyptian world. The model, based on ancient tradition, was leaning, and was reinterpreted to suit the tastes of the time. Bugatti also presented his own version of the high back chair, inspired by Japanese culture and the use of thin wooden beams, but the prototype must have seemed too austere and rigid to him. In fact, although he was a contemporary of Van de Velde and Mackintosh, Bugatti was not inspired either by the former's deference to the *coup de fouet* style, or by the latter's geometric rigour; he preferred to work outside of the confines of pre-established methods, drawing upon a repertoire inspired by various sources. He was drawn to asymmetry, to a limitless richness of materials and, finally, to a plastic density, which evolved, over time, into sculpture. It is no coincidence that he chose to abandon furniture design in favour of carefully modelled intricate objects.

His most anarchic gesture was not, therefore, his choice of materials, but rather the sharp asymmetric lines of many of his pieces. An asymmetry that we encounter to a much lesser extent in some of his contemporaries, such as Henry Van de Velde, Hector Guimard and Victor Horta [5].

From surface to volume

The First International Exhibition of Modern Decorative Art in Turin in 1902 made him famous, and certainly represented the peak of his creativity [6]. On this occasion, he took a decisive turn towards three-dimensionality and plastic modelling of forms. He set up three spaces for the exhibition, the most famous of which is the snail room. Here, the walls were decorated with a circular pattern, coated in parchment, and the room was furnished with plastic seats (cobra chairs) arranged around a table, and a horseshoe shaped couch finished off with a spiral. An organic and imaginative set of pieces,

Fig. 3: Carlo Bugatti, Toilette and chair Torino 1902

Fig. 4: Carlo Bugatti, chair and desk, Torino 1902

demonstrating creative tension and imagination, which, according to some critics, saw him approaching the boundaries of kitsch, and certainly fuelled a degree of negative publicity, so that Bugatti was relegated to the sidelines of "high" design. Indeed, some were disoriented by the extreme variety of Bugatti's repertoire: the Japanese-style painted parchments, the Moorish arches, the Gothic pinnacles – the syntactic elements drawn together but also amalgamated, to produce a highly recognisable and coherent lexicon, clearly identifiable as the "Bugatti style". And this is something of which he was aware, as is demonstrated by the anecdote in which the queen of Italy, visiting Bugatti's exhibition in Turin, defined the artist's style as Moorish, and he interrupted her, declaring: "□ou are mistaken, your majesty, this style is my own" [3].

Mixed material work was not an absolute novelty at the end of the 19th Century, but Bugatti's originality lay, in part, in the fact that he brought together furniture-making, sculpture and painting techniques in the same piece. In his *Toilette,* presented on the same occasion, the form of the piece no longer relies on the modular assembly of various sculpted elements, modelled separately and then put together; rather, it is a dynamic composition, arranged around circular elements that make the piece fluid in the style of a mechanical device. An elastic and whirling motion, in a system of perfectly balanced thrusts and counter-thrusts. The two taut arches, which support the mirror by way of two ropes, appear to remain taut thanks to the weight of the mirror and the rear feet, which are larger than the front feet to support the overall piece. The large, embossed, copper-coated circles resemble hinges or toothed wheels; the metal coating seems to accentuate the effect. The *Toilette* top also contributes to the tautness of the arches, balancing the centre of gravity thanks, in part, to its significant projection. The same thrust and counter-thrust mechanism is alluded to with the chair, in which the seat itself appears to provide balance to a system that is otherwise precarious and rotating.

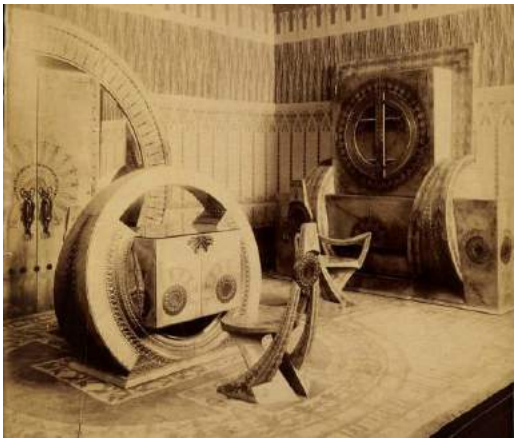

Fig. 5: C. Bugatti, toilette and chair **Fig. 6**: C. Bugatti, table, 1902 **Fig. 7**: C. Bugatti, Torino 1902

The greatness of Bugatti's art is also expressed through these details, which serve to create a static effect and an overall dynamism [7]. He is an artist who sculpts each element, and assembles them in an artisan way, demonstrating their static mechanisms. et, while his decoration may be complex, Bugatti's basic ideas are always very simple: a composition of shapes, squares, circles, spirals and arches. However, there is another matrix that Bugatti favoured too, the animal world: the motif of stylised insects that was common in this period, and employed by various great masters with whose work Bugatti was familiar, including René Lalique [8]. Stylised flowers and dragonflies decorate the parchment that coats the cobra chairs, so that the seat appears to be sculpted from a single block, and maintains a formal and material sense of continuity, reminiscent of a sculpture [9].

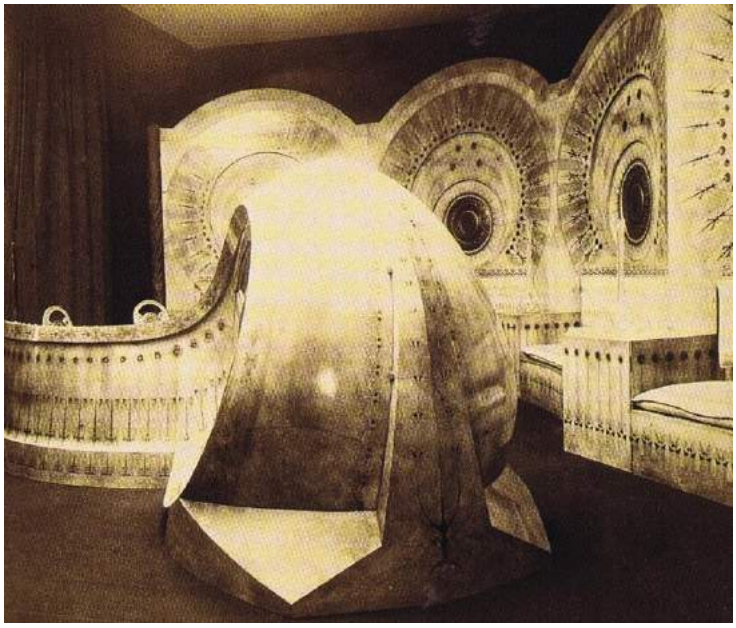

Fig. 8: Carlo Bugatti, snail chair Torino 1902 **Fig. 9**: Carlo Bugatti, snail room, Torino 1902

The cobra chair is an organic and mobile piece, devoid of any reference to classical vocabulary, or to the basic elements that make up the seat. Similarly, the tabletop partially resembles a circumference, but it is an irregular form, which does not allow a chair to be drawn up to it because of its base, which protrudes as much as the tabletop. Its shape is sculpted and curvy, futuristic for the period, and contrasts with the use of the materials, and in particular the decorations, because the concept of coating furniture-sculptures with painted parchment gives the piece an even more antique effect [10]. This is reinforced by the fact that the parchment tends to take on a "gloss" effect, making the object seem older than it actually is. Overall, with his tables, chairs and surfaces, Bugatti created an installation of inanimate objects that seem on the verge of coming to life: the shapes of the chairs and tables are inspired by snakes, and the bodies and shells of snails. The use of parchment serves to emphasise this effect, as explained by his granddaughter bé Bugatti, because the parchment channels the colour and texture of the invertebrate.

His creativity was also encouraged by the principles expressed by the Exhibition's Artistic Committee: it was first stated that, with the need to "bring Art closer to life". they intended to "*shed light on the minor arts, previously suffocated by the purely mechanical expansion of the industry*" and, again, that they should "*only consider those interesting originals that demonstrate an effort to engage in the aesthetic renewal of form*". And so "*all objects that are simple reproductions of existing styles, or produced in an industrial factory and not inspired by artistic ideals*", were excluded from the exhibition. In this context, our protagonist's exhibition gained reasonable prominence: "*Bugatti's is a highly unique exhibition, and the artist himself is also highly unique, inspiring the liveliest of discussions or, rather, the most blazing of rows among the jury and the visitors*" [11]. His effective response to the Artistic Committee's requirements earned Bugatti Carlo Jr., furniture maker, the majority Diploma of Honour.

In any case, Bugatti's objective was not to create furniture that was useful and accessible to all, but rather to create works that were refined in every detail, and designed according to aristocratic commissions. He did not seek to satisfy the general public, nor to create serial pieces of furniture. He made a couch in the same way that a painter paints a picture, or a sculptor sculpts a statue – focusing on creating an artistically complex work [12].

And his son, Ettore, would take this same approach, following his example perfectly.

2. Moving sculpture

Fascination with movement was a key trait of the Bugatti family. Carlo, the father, invested significant resources in futile research into perpetual motion and, the year prior to the exhibition of his *Toilette* in Turin in 1902, his son Ettore presented his first car at the International Exhibition of Livestock and Sport in Milan, thus realising that aspiration to engage with movement – rotating movement of lines and masses – that his father only managed to express through the tension of wood and metal [13].

Carlo alluded to movement in various ways, both by combining contrasting elements in a relationship of tension, and through the shapes and decorative details used. For example, his interconnected, copper-coated half-wheels closely resemble the front chassis of a turn-of-the-century car.

Those years saw a firm dialogue being established between functional kinetic elements and decorative elements. The functional kinetic elements often took on decorative significance, which, rhetorically, served to underline their very function (in cars, carriages and fans for example). The static functional elements, which in turn provide support, took on kinetic significance, drawing on specially designed mechanisms to create a linear transfer effect, contributing to the decorative nature of the overall piece (as in the system of taut arches, the connection of the *Toilette* feet, and in the embossed copper discs).

Bugatti's furniture, which, unlike Ettore's cars, was not designed to "move", nevertheless expresses a strong sense of rotary or shifting motion. His works are immobile objects, which seek to allude to movement; not through the simple static representation of an object capable of moving (a car or a train), but rather through the representation of lines, curves and tensions [14] [15]. This concept, expressed and employed by Carlo Bugatti, would go on to be developed and explored in all of its forms by the Futurists. The formal link between avant-gardism and the work of his son Ettore, and, later, his grandson Jean, was reinforced over time, evolving into a system of participation and exchange. While, according to Boccioni, "aesthetic concerns and culture" "impede all innovation", Futurism ultimately created its own aesthetic, supported by fruitful interactions with other artistic forms. And if, for the Futurists, architecture was guilty of being archaically dominated by eclectic scraps, and by the archaeological habit of adhering to classical orders, the car – in and of itself a symbol of total liberation from aesthetics – was transformed, in Bugatti's hands, into aesthetic representation and design.

3. From virtual motion to the automobile

Bugatti, at the height of his success in 1904, moved to Paris, selling his company in Milan to the De Vecchi firm. He spent a number of years in Paris, dedicating himself to jewellery design and silverware, featuring stylised animal and insect motifs. He then moved to the “La Roulotte” villa in Pierrefonds, and finally settled in Molsheim, where his son Ettore lived [16] [17].

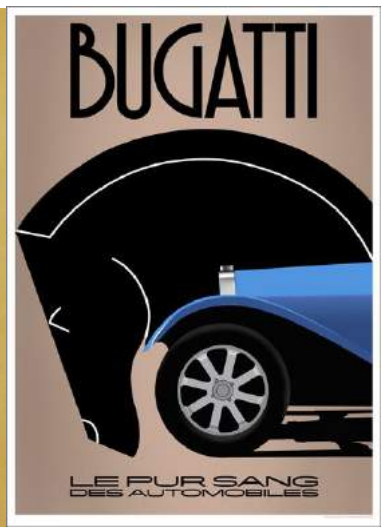

Fig. 10: Ettore Bugatti,1902 **Fig. 11** Poster by A. M. Cassandre 1925 **Fig. 12** Bugatti poster 1930

His son Ettore Arco Isidoro Bugatti (1881-1947) [18] also studied at the Brera Academy, and then at his father's laboratory, where he soon demonstrated a keener interest in the wonders of all things mechanical than in sculpture, which is where his brother Rembrandt's passion lay. From a very young age, he worked to modify an engine produced by the engineer Pinetti and the entrepreneur Stucchi. The latter invited him to work for his company as early as 1898. But it was counts Olao and Gianoberto Gulinelli who gave him his first major opportunity. At just twenty years of age, Ettore travelled from Milan to Corso Ercole I d'Este, Ferrara, to meet the counts, who were as passionate about cars as the young Bugatti [19].

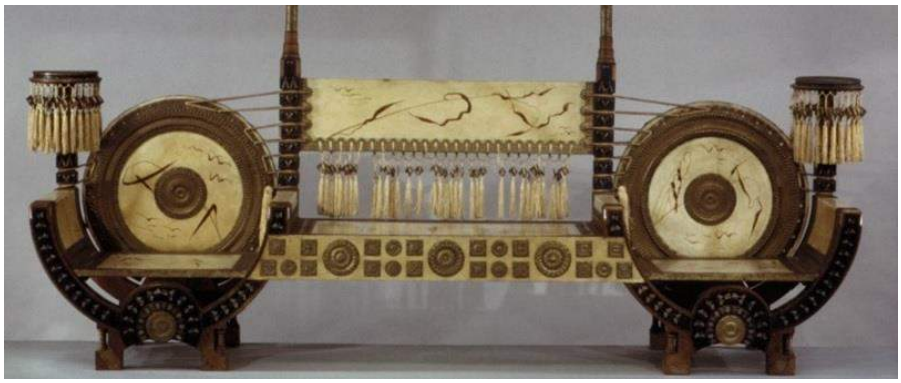

Fig. 13: Carlo Bugatti, Bench, 1898

Fig. 14: Bugatti Type 57SC Atalante 1937

They agreed to build a car, starting with a frame not dissimilar to a farm cart, featuring a bench seat, a motor, and wheels with wooden spokes. The Gulinelli counts were delighted, and approved of the design, which was rudimentary but which drew on advanced technical solutions, and the first and only

Bugatti-Gulinelli model was produced in the Benvignante stables (Argenta), with a 4 cylinder engine and a maximum speed of 60 km/h. Bugatti won a Grand Prix and a French Automobile Club medal with this model. It was at this point that the Alsatian industrialist Baron de Dietrich offered him a seven year-contract at his factory, which was signed by his father Carlo because Ettore was still too young. When the Dietrich company ceased production in 1904, Ettore did not lose heart, and sought new sponsors to enable him to continue to produce vehicles. The first engine bearing his sole signature dates back to 1907, and was produced by DGF (Deutz Gasmotoren Fabrik) [20] [21] [22].

In 1909, thanks to the financial support of the North Alsatian governor, he opened his first Bugatti plant in Molsheim. He was just 28 years of age. He was immediately successfully, and his employee numbers tripled over the course of just a few years. He even designed vehicles for other companies, such as the “Bébé Peugeot”, 2500 of which were produced. The end of the First World War marked a new departure for the Molsheim factory, and his vehicles were regularly used to participate in car races. The peak of his career came with the development of the impressive Royale Type 41 model – 8 cylinder, 200 hp, 3 tons – in 1927, only 6 of which were produced. In 1936, he produced just three of the magnificent Bugatti Atlantic. His son Jean continued the family tradition, designing the Type 57S chassis.

At the Bugatti plant in Molsheim, work on cars was carried out with artisan care. Each piece was conceived of and designed specifically for Bugatti cars, which were customised for each client. The same care was taken with the racing models and with the "series" models, although the term "series" does not do the latter cars justice, given the manufacturing excellence adhered to in their production. Bugatti himself boasted of using the same materials, the same workers and the same devices both for the race cars and for the models for rich clients.

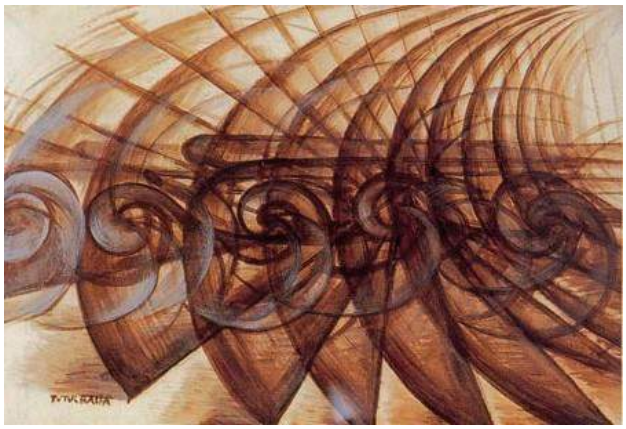

Fig. 15: G. Balla, Speed of a motorcycle 1913

Fig. 16: Bugatti Type 57SC Atalante 1937, detail

And it was certainly the case that, in the early 20th century, a car was not simply a means of transport; rather, it represented a mythological creature capable of opening up new spaces and horizons to mankind. The Futurists had elevated the car to represent an incarnation of the new, the future, the modern. Futurist painter Giacomo Balla presented the car in a series of images, which defined it not as an object, but as the concept and essence of speed and dynamism, through his use of curved lines and spirals, which overlap to create a series of vortices. And while Carlo Bugatti had used the device of curves and circles with intersecting axes to suggest movement, Ettore took a firm step forward, by designing some of the most famous models featuring mudguards characterised by curved and fleeting lines. The graphic matrix is the same: elements with a combination of axes and curves, vortices and spirals, graphic elements capable of creating aerodynamic tension. And there are a number of very compelling parallels, such as the design of Carlo's mirrors and Ettore's radiators which, while characterised by traces of Deco, represent a conscious act of repetition, so much so that, even today, Bugattis draw on elements of traditional models, with the repetition of lexical features such as the small radiators at the front and the fleeting curves characteristic of 1930s Bugattis.

A canonical link between the Bugatti and the avant-garde was established in Tamara de Lempicka's symbolic 1932 work *Self-Portrait in the Green Bugatti*, an icon of the female liberation of those years, but also an aesthetic and artistic icon, in which modernity and innovation are associated with the race car – the symbol of modernity par excellence and the embodiment of the futurist aesthetics.

Fig. 17: Marcello Dudovich, Bugatti Advertisement, 1922

Fig. 18: Tamara de Lempicka, Self- Portrait in a green Bugatti, 1929

De Lempicka's portrait capably represents not only the dynamism and aesthetics of Futurism, but also its provocative and transgressive power. By choosing a Bugatti, rather than any other car, she reinforces the message, and implicitly emphasises the notion, that standing out is an expressive opportunity that belongs to an elite world.

Conclusions

Carlo and Ettore shared many common elements, including their approach to applied arts, which led them to take a relaxed attitude to the creative process – from design, to plans, to the construction of models and finished objects. This approach was also typical of the dawn of the 20th century. Working manually with an object was not regarded, in that period, as any less important than aesthetic philosophies. Indeed, the theoretical approach at the end of the 19th century focused on integrating conception and production, on regulating the creative process, an effort that led to the formulation of the concept of industrial design as it is understood today. This approach is the first common point that links the Bugatti family. An interest in mechanical devices and movement aligned them with the avant-garde movements of their time, and also with others that were yet to emerge, such as Futurism, the Manifesto of which was published in 1909. Carlo Bugatti's design of a mausoleum, which was never built, is the forerunner, in terms of its plasticity and sculptural appearance, to works such as Mendelsohn's Einstein Tower, one of the most famous examples of expressionist architecture. Even while remaining within the confines of trilithic forms, Carlo Bugatti managed to push the boundaries of their fixedness and their borders with his compelling decoration and metallic touches, though he came to focus, over time, on pure, sincere, plastic forms. This was the starting point for Ettore Bugatti, and the legacy left by the Bugatti family in the modern history of design.

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Environmental protection in western Balkans: compared analysis of enforcement problems after democratic transition

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Abstract
The present work has been inspired by the will to research and analyse the administrative profiles and peculiarities of environmental law in the western Balkans area, which has been recently interested in a democratic transition process, following the implosion of the socialist system and the consequent progressive approach by these Countries to the European Union and its political criteria.
First of all we focused on the geographical, historical and normative context, in order to obtain a multidimensional approach to the object of investigation. Afterwards, referring to EU principles in matter of Balkans constitutional protection of fundamental rights, particular attention has been paid to the protection of the environment, as it represents the principal expression of these countries' cultural heritage: environmental rights as "third generation rights" have been analysed by an anthropocentric and multidimensional perspective through participation and pluralism, in observance to the so called "environmental democracy".
In conclusion we underlined – in comparison with our judicial system – the relationship between citizens participation to administrative decisional proceeding in environmental matter and the right of access to the environmental information, according to Aarhus Convention, in a comparative perspective with our EU principles.

Keywords: Environmental protection – Balkans – Democratic transition – Citizens participation – Aarhus Convention

1. Geopolitical analysis of the Balkans: perspectives of comparative law.
The Western Balkan area is, to date, an interesting scenario of survey for comparative law academics, thanks to the rapid changes and developments that have affected both the political and institutional life, both the legislative and constitutional experience of these countries in the last two decades. Of particular significance and worthy of attention from the European and international observers, appears to be the analysis of the transient and unstable nature of the advancing path of the Western Balkan countries towards democratization, together with the acquisition of the status of *EU Candidates* or *Members*. The mentioned legal systems do not belong to the so-called *Western Legal Tradition* area (however, the foundation of the *acquis communautaire* is significant), because they derive from the socialist legal experience of the soviet womb [1].
In regards to the Balkan Peninsula, our survey is confined to the analysis of the evolutionary profiles of the environmental legislation of the Western Balkans' legal systems: here it is found in fact, a slow but inexorable process of constitutional, legislative and ideological approach to the Community experience and to its legal - economic tradition.

2. The Constitutions of the Balkan countries as the product of contemporary European constitutionalism.
The Balkan area was affected after the fall of the communist regime in the former Soviet empire by a complex constitutional process carried out by the countries which fought for their independence, some of which, first, were under the auspices of the Social Federal Republic of Yugoslavia's Constitution:

there have been two, sometimes three, constitutional cycles that have changed, in the course of a little more than two decades, the socio-political-institutional arrangements of the Western Balkan countries. The first constitutional cycle begins in the nineties and starts the transition process by the adoption of new constitutions in a scenario of known conflicts affecting the area; the second constitutional cycle coincides with the beginning of the new millennium and is characterized by a phase of constitutional review which takes place in Slovenia, Macedonia and Croatia, in addition to the adoption of the new Constitution of Serbia and Montenegro; the third constitutional cycle begins with the secession of Montenegro from Serbia in 2006 and sees to the adoption of the new Constitution of the State of Serbia and the State of Montenegro, together with a failed attempt to introduce a Constitution in Bosnia and Herzegovina. Even the Kosovo experience falls into this stage, despite all the difficulties and peculiarities appearing on the international scene due to its constitutional process. The new Constitutions, which are expression of autonomist pressures and desire to clear change, have in common the apparent derivation from the theories that inform the contemporary European constitutionalism, despite the Balkan countries have met – in their historical experience – more than forty years of socialism and have suffered from the influence of a strong social paradigm. These Constitutions (Albania, Slovenia, Croatia and Bulgaria in the 90s; recently, Serbia in 2006, Montenegro in 2007 and Kosovo in 2008) now represent the new legal trends of constitutionalism in Europe, characterized by encoding needs, guarantee and protection of fundamental rights, incentive for pro-European economic and political parameters, openness to the Niece Charter requirements and to the treaties drawn up within the ECHR, UN and EU.

3. The new Western Balkans Constitutional rights catalogue.

Such Constitutions express the overcoming of the functionalist conception of rights [2], heritage of the former socialist past, and include real catalog of fundamental rights combined with appropriate means of protection, which in some cases have proven to be just formalistic reproductions of Western legal traditions, but in others have been able to be positively influenced by social, historical and political-legal peculiarities typical of those countries in which they were adopted.

In such catalogs, in addition to the traditional spheres of freedom, it was given attention to the so-called new rights, also provided by the latest Western Constitutions as influenced by the international conventions, such as the safeguard of minorities, the development of culture, the right to privacy and the protection of the environment.

Within the European Union law, which influences the Western Balkans' legal systems as potential EU members, the environmental law develops as a procedural law, under the banner of participatory pluralism in the spirit of democracy: the aim is the participation of citizens in decision-making that will affect every level of production of the environmental legislation. At the national level each individual will have access to all the information held by public bodies that affect the environment, as well as guaranteeing the opportunity to participate in an actual decision-making process. The environmental right is regarded as both a procedural and substantial right of the individual. As a procedural right, or rather, proceeding right, recalls the assumption that a democratic and well informed society influences the environmental policies by determining the institutional actions in an interaction osmotic system [3][4][5]. For example, at the European level, the Directive 2003/4/EC on public access to environmental information has guaranteed the right to information as outlined by the Aarhus Convention.

Both the right to information and the right to participation in environmental matters would be meaningless if the opportunity for citizens or organizations to enforce their rights in judicial proceedings in the event of unjustified impairment was not provided.

The European Union's influence, combined with the increasing interest of the civil society on environmental issues, has allowed the Balkan countries to develop and improve their environmental legislation by including its general principles in the constitutional texts, signifying therefore the recognition of the environment as a fundamental right which the state is committed to protect and enhance through a detailed, complete and in line with European and international protection standard sectorial legislation.

In Eastern Europe, before the transition, the current Constitutions provided for the environmental protection to be inserted in the context of the state's obligations, whose intervention in the economic sphere would secure forms of protection if required. The constitutional texts following the transition considered the environment as a right and duty of each individual [6]: the articles dedicated to the protection of the environment regulate both the right to a healthy environment and the right to information and the right to compensation for environmental damage. The environment, then, is regulated in relation to other rights – in particular to the right to health – according to the classic scheme of the individual substantial rights, and as a procedural right, distinct and separate from other rights.

By analyzing the various constitutional experiences of the Western Balkans on the issue of environmental protection, we notice that the Albanian Constitution includes environmental protection

as a fundamental value, stated in Article 56 the right for any citizen to information regarding environment and its protection; in addition, in Article 59, it arises among the social objectives the pursuit of an environment which must be healthy and ecologically suitable for the present and future generations.
The Slovenian Constitution provides for everyone's right to a healthy living environment by including it in Article 72, among the tasks of the State, as a subject to specific statutory requirements, and what is more, protectable through the express requirement of the compensation obligation for damages against those who cause damage to vital environment; in addition, Article 73 introduces the natural and cultural heritage protection among the fundamental values, which must be enforced by the State and the local communities.
Croatia includes the protection of nature and human environment in Article 3 of its Constitution, which is among the fundamental requirements; Article 52, however, states peculiar protections and special conditions and exploitation limits in reference to the protection of natural resources, flora and fauna, cultural, historical and economic resources; the right to a healthy life is also the subject of a stated constitutional requirement provided for by Article 69, moreover it is put in correlation with the right of every citizen to a healthy environment, which is not only a task of the State, but of the citizens, the government, the public and economic bodies and associations.
The Serbian Constitution provides in Article 74 the right to a healthy environment and to access full and timely information about its status. The responsibility for environmental protection is guaranteed as a general rule with respect to each individual citizen, and in a more "strict" way against the Republic and Autonomous Provinces.
Bulgaria refers to environmental protection and nature conservation and biodiversity in Article 15, matching this statement with the prediction of a sensible and rational use of natural resources. Article 55, instead, highlights the recognition, among the fundamental values of its legal system, of the right to a healthy and "favorable" environment corresponding to the standards and rules laid down in this regard.
An exception of particular significance is the absence, in the Constitution of Bosnia and Herzegovina, of any references to the environment.
However, the Montenegrin Constitution, in Article 19, provides for the right of every citizen to a healthy environment and proper information on its state while stating the duty to preserve and protect its integrity; Article 65 states that the environmental protection is expressly recognized as a duty of the state, and provides for the limitation of exploitation and private economic initiative.
The general principles underlying the primary and secondary environmental legislation of the Western Balkan countries find themselves specified in the laws on environmental protection and on environmental impact assessment, as well as on sustainable development, thus in general laws, which are flanked by special disciplines also of secondary rank, regarding specific issues such as waste management, energy, pollution, climate change, genetically modified organisms, biodiversity, water and natural resources. The importance attached to the principles of prevention and precaution cannot be disregarded, according to which all human activity must be planned and timed to cause minimum damage to the environment, especially in view of safeguarding human health and ecological sustainability by using innovative technologies that address the human activities in the direction of sustainable development. In addition, the recognition of the principle "polluter pays" and "user pays", combined with the requirement of a subsidiary responsibility of the State, whether it is impossible to identify the individuals that have polluted or caused any damage to the environment, it helps to enforce an effective system of protection for the environment, which is enhanced thanks to the provision of government incentives in the event of improved management of natural resources. Furthermore, the express recognition, not only at the primary legislative level, but also at the constitutional level, of the right of everyone to receive clear and timely information on the state and management of the environment, as well as the right to participate in environmental decision-making issues, helps to complete the reference systematic framework. These requirements, which are an expression of a democratic society sensitive to public opinion, presuppose the existence of a Public Administration closer to citizens, that is transparent in its actions and linked to the principle of "rule of law"; to give effect to the rights described above, it was also granted access to justice in order to enforce the right to a healthy environment as provided by law.

4. Particular application profiles of environmental legislation: the enhancement of the right to environmental information

The process of democratic transition in the Balkan has above all focused on a Public Administration emphasis based on the principles of participation, transparency and accountability, in order to bring the Authority closer to the democratic society which establishes the new *good governance* [7].
The emphasis that the right to information gains within the administrative regulation is even more meaningful if we reflect on the environmental law, considering the peculiarities of property subject to protection and its close connection with the rights of both individuals and the community. In fact the

access to environmental information is guaranteed by specific legal provisions and differs from the access to public information provided for in the administrative procedure codes, as it reflects the influence carried out by the international conventions on the subject, including the Aarhus Convention. The latter, adopted in 1998 and enforced in 2001, regulates the access to environmental information, public participation in decision-making on issues relating to the environment and finally access to justice to enforce and guarantee these rights.
Moreover, in addition to the individual right to access, the Aarhus Convention, thanks to the establishment of public registers and computerized databases, also provides for the distribution of environmental information between citizens in the largest and most transparent way possible. The Administration has the duty to publish and make available, also in electronic format, reports on the state of the environment, legislation, national and local plans and strategies, together with requirements of international law-making treaties and agreements that are important for the protection of the environment. The Aarhus Convention alongside the right to information prescribes the requirements designed to ensure public participation in the development of projects, programs, plans and environmental policies. In facts, Article 6.2 of the Aarhus Convention provides that citizens are informed and included in decision-making procedures on the environment, with the provision of adequate and effective instruments to guarantee their rights. Every single national legislation must provide the timing for participation, the procedures to follow, the safeguards that must be applied: Article 7 and Article 8 tend to make effective the right to participate in environmental decision-making, within the recognized possibility for citizens and NGOs to express their own opinion about the adoption of measures relating to environmental care. Participation and access to environmental information are supported by the provision of the right to access to justice for the resolution of environmental disputes, in order to record the violation of environmental rights and thus enforce the "*environmental democracy*" that public administrations have the duty to pursue and support; Article 9.1 of the Aarhus Convention states that the Contracting States, within their own national legislation, should ensure that everyone whose request to access has been ignored or unfairly rejected, the right to appeal administratively or by an independent and impartial judge in accordance with the statutory requirements.

4.1 Albania.

In compliance with the Aarhus Convention's provisions, in Albania the right of access to public information has been stated in general terms by the Constitution of 1998: article 23 of the Republic of Albania Constitution, as amended in 2008, states that "*Everyone has the right, in compliance with law, to get information about the activity of state organs, as well as of persons who exercise state functions. Everybody is given the possibility to follow the meetings of collectively elected organs*".
The stakeholders right to information is also provided, in general, by Law no. 8503 of 30.06.1999, *On the right to information on official documentation* and by Law no. 8485 of 12.05.1999, *On Administrative Procedures in the Republic of Albania*. On environmental matters, the right to information is also regulated by law no. 10440 of 07.07.2011, *On Environmental Impact Assessment* and Law no. 10448 of 14.07.2011, *On Environmental Permitting*. In reference to the environment, the right of access to public information has been stated by the Environmental Protection Law of 2002, as amended in 2011: Article 77 of that law, in fact, requires that *"the public and non-profit organizations are informed about the state of the environment through the publications of the information made by the state bodies and physical and legal persons, as well as by requesting data from state bodies"*. It is up to the Ministry for the Environment to define the arrangements and procedures for the publication and monitoring of the environmental information: thus the principles prescribed by the first pillar upon which rests the Aarhus Convention are followed. Particularly significant for the effectiveness of the right to environmental information is the provided disclosure for the environmental impact assessment proceedings: the Law on Environmental Protection, indeed, requires that all the stakeholders, including government bodies, NGOs and citizens can participate in the proceedings in question. The competent authorities make available for inspection all the documentation provided by the applicant the environmental impact assessment [Article 33 of Law no. 8934 of 05.09.2002, *On environmental protection*, amended by Law 10431/2011], thus allowing all the interested parties to participate in the decision-making process in accordance with the principle of transparency and publicity. Noteworthy is the reference, in a separate chapter [Chapter VII, Monitoring and data, Articles 52-58, *Law on Environmental Protection*], to the compulsory nature of monitoring, publication and storage of data relating to the state and protection of the environment, in line with the Aarhus Convention's provisions. The information concerning the state of the environment are collected by the Ministry for the Environment and regional agencies, as well as other concerned ministries and central and local institutions, which are required to publish them in the media or other appropriate means in a clear and understandable form. Anyway, according to Article 56 of the Environmental Protection Law, the persons required to hold the environmental information must inform people on the management strategies concerning the environment and on the negative and positive choices that may influence it.

However, exceptions are provided for by law about confidential content disclosure, which thus cannot be published for reasons of public order or national security, as provided for by Law no. 8457 of 11.02.1999, *On information classified as state secret*. Within the Albanian Law on Environmental Protection there is the second pillar of the Aarhus Convention, given that Article 78 is dedicated to public participation in environmental decision-making. It is thus ensured the active role of citizens and NGOs, which are also entitled to submit complaints to the competent Public Authority regarding harmful or polluting activities. Actually, Article 78 of the Environmental Protection Law provides that such complaints must solicit a Public Administration's written response within a month from receipt. It also states the right for citizens and NGOs to apply for general or partial referendums on laws concerning environmental issues. Article 79 emphasizes, in fact, the role of Non-Profit Organizations in the management of the environment. Finally, access to justice is also guaranteed to the citizens and public and non-profit organizations since it is provided for by law the right to enquire before the competent authorities the appropriate intervention measures to safeguard the environment as well as the right to take action before the courts and in accordance with the Civil Procedure Code against those who have damaged it. In fact, Article 81 of the Environmental Protection Law is in line with the statement made by Article 9 of the Aarhus Convention and still has effectiveness both because it provides the appropriate control procedures by administrative action and provides for the penalties applicable to infringements of the environmental law.

4.2 Serbia.

The right to access information in the Republic of Serbia is guaranteed in general terms by the Constitution of 2006: Article 51 co.2 of the Constitution of the Republic of Serbia states that "*Everyone Shall have the right to access information kept by state bodies and organizations with delegated public powers according to the law*". The right to access information for stakeholders is generally stated also in the law no. 120/04, as amended in 2010, *On Free Access to Information of Public Importance* and the *General Administrative Procedure Law* of 1997. On environmental matters the right to access information is also regulated by Law no. 72/09, *On Environmental Protection Fund* and the *Regulation published in the Official Gazette* no. 112/09, *On Contents and Methods of Management of the Environment Protection Information System, Methodology, Structure, Common Bases, Levels of Categories and Data Collection*. In environmental issues, the right of access to public information has been stated by the Environmental Protection Law of 2004, as amended in 2009: Article 9 of this law, in fact, among the principles on which the protection of the environment must be based, includes the principles of public information and participation, the principle of publicity of the data relating to the state of the environment and the principle of access to justice for the protection of the right to a healthy environment, which also includes damage to the right to accurate and detailed information concerning the environment. In the chapter devoted to information and public participation, Article 78 states that "*State authorities, those of the autonomous province, local self-governance units and authorized and other organizations shall be obliged to regularly, timely and objectively inform the public on the environmental status*". Therefore, the first pillar of the Aarhus Convention is respected, as it is stated that anyone who is interested has access to state and local registers which contain information and relevant data about the environment, by making a special request. Article 79 of the Environmental Protection Law indicates the timing which the government must follow to responding to the request for access to documents: within 30 days for the request in general; within 60 days in exceptional cases, in case of complex circumstances. In addition, Article 80 shows exhaustively the cases in which the request for access must be declined, in accordance with the principle of legality that in environmental right is strongly felt. Likewise, all the rules which are found in the Environmental Protection Law on access to information are present in articles 5, 15 and 16 of the Law on free access to information of public importance, cited above. As provided for by the Albanian legislation, the Serbian Environmental Protection Law, in a separate chapter [Chapter IV, Environmental Monitoring, Articles no. 69-77, Law on Environmental Protection], also regulates the monitoring, publication and storage of data relating to the state of the environment. The monitoring activity is up to the Republic, the autonomous provinces and the local governments, within their respective competences: there is an information system on environmental protection that lists all the parameters used as a reference for the monitoring, also in relation to the pollution levels. The key issue is the activity of the Ministry and authorized organizations, both local and state: the institutions are required to submit the monitoring results to the Agency for Environmental Protection, as provided for by law. Therefore, according to the requirements of Articles 74 and 75, the Government is required to annually report to the Parliament the feedback of the monitoring carried out; the competent authorities of the autonomous provinces or local governments are required instead to provide this feedback every two years, in relation to their territory. The report on the environment's state is published in the Official Gazette, to give legal disclosure to it. The Serbian Law on Environmental Protection also attributes value to the second pillar of the Aarhus Convention: Article 81, devoted to the decision-making public participation, grants anyone who is interested to participate, in accordance with the law, in decision-making concerning environmental

impact assessments of heavily polluting or harmful to human health projects; a strategic environmental impact assessments for industrial development plans; to approvals of new or existing installations that have implications on the environment. Participation in these activities include the right to be informed and to be consulted and is regulated specifically by Law No. 135/2004, On Strategic Environmental Assessment and Articles 10, 11, 14, 15, 20, 25, 27, 29, 32 of Law no. 72/09, On Environmental Impact Assessment. Article 81 of the law on environmental protection, by referring to the subject holder of the right of participation, talks about "the public", including citizens, citizens' associations and non-governmental organizations for environmental protection within its definition. Article 82 of the Law on Environmental Protection also provides for the limitation of the right to participation in cases of safety and national defense. Finally, access to justice is also guaranteed because citizens and non-governmental organizations, while exercising their right to a healthy environment, may require to revise the resolution both administratively and in the courts, in accordance with the statutory provisions. Article 81 of the Environmental Protection Law is aligned to Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003. In May 2013 the Ministry for the Environment of the Republic of Serbia, with the support of the Organization Security and Cooperation in Europe, has launched a project for the creation of a guide on the right of access to justice with regard to disputes relating to environmental protection in administrative procedures, in order to raise awareness and improve the quality of civil service in relation to knowledge and implementation of environmental law. The alignment to the third pillar of the Aarhus Convention is not complete yet, but Serbia is improving its environmental legislation on access to justice. With respect to the duration of administrative procedures relating to environment, as well as the specific requirements that regard access, administrative justice procedures are supported by the requirements provided for by the Law on General Administrative Procedure and the Law on Civil Proceedings. In addition, with regard to the right of access to justice for non-governmental organizations, there are no specific conditions that differentiate such organizations from private citizens, both in administrative or judicial procedures (as is clear from the Law on Environmental Protection, the Law on Environmental Impact Assessment and the Law on Integrated Pollution Prevention and Control).

4.3 Bulgaria.

Like the other constitutions which are a result of young European democracies, the Bulgarian Constitution of 1991 contains general provisions concerning the recognition of the right to access public information: Article 41 of the Constitution of the Republic of Bulgaria, as amended in 2007, states that "*Everyone shall be entitled to seek, obtain and disseminate information. This right shall not be exercised to the detriment of the rights and reputation of others, or to the detriment of national security, public order, public health and morality. Everyone shall be entitled to obtain information from state bodies and agencies on any matter of legitimate interest to them which is not a state or official secret and does not affect the rights of others*". With reference to the environment, the right to access information can be found in the *Environmental Protection Act* of 2002, as amended in 2011. Article 3 provides, among the fundamental principles inspiring the environmental legislation, the principles of participation, transparency and access to information, as well as the right to access to justice. There is a specific chapter dedicated to environmental information: Article 17 states that *anyone shall have the right of access to available information relating to the environment without having to evidence a specific interest*. The law refers to the term "available" even afterwards, where it clarifies that environmental information can be of three types, also according to the opportunity to access due to the fact that they exist in a format that can be reproduced. Article 18 of the Environmental Protection Act states that the information relating to the environment must be available as: *primary information; pre-processed information and processed information*. Article 19, likewise, reproduces the content of Article 2 of the Aarhus Convention, while listing all information related to the environment that can be accessed; Article 20, in the same way, reproduces the criteria already provided for in the abovementioned Convention to deny access to information. This refusal is also allowed to protect personal data, according to what is required by the *Personal Data Protection Act*. In the same chapter a list of the competent state and local authorities who are responsible for collecting and keeping information on the environment is also given. The Ministry for the Environment is required to adopt and publish annual reports which monitor the state of the environment, in accordance with the contribution provided for by the National Agency for the Environment and the Regional Inspectorates. Articles 25-25 of the *Environmental Protection Act* also provide for the duty to prepare a periodically updated computerized database for information on the environment, such as progress reports, strategies, plans and national programs, as well as the texts of International treaties. Although the national level of information is generally improved, the regional and local information level remains weak. Article 31 of the *Environmental Protection Act* provides for an emphasis of active dissemination policies on environmental information: the national public service broadcaster is entrusted to disseminate information relating to the protection and management of the environment, in order to increase awareness among citizens on issues concerning the environment, not only of a legal nature

but also scientific and technological. By express precept of the *Environmental Protection Act*, the procedures required by the *Access to Public Information Act* [Access to Public Information Act, published in Official Gazette no. 55/2000, as amended in 2006] are also applied to the access to environmental information. In any case these are in line with the Aarhus Convention: the law in question states that the request to access to public information must be made in writing or orally, with a specific content and must be excluded in the exhaustive list of cases provided for by law. Deadlines by which guarantee access or administrative appeals against rejects are still provided [Chapter III, Articles 24-41]. The second pillar of the Aarhus Convention, which states the right of public participation in environmental decision-making procedures, regarding the environmental impact assessment, is found in the Environmental Protection Act, in which the principles of publicity, transparency, and participation of citizens through public discussions and consultations tools are guaranteed [Articles 97-99 Environmental Protection Act]. Finally, access to justice is also guaranteed since it is ruled the right to take administrative or judicial action against refusals of the access requests, in accordance with the requirements of the Code of Administrative Proceedings. Article 27 of the Environmental Protection Act is aligned to Articles 40-44 of the Access to Public Information Act. Bulgaria still needs to make improvements in the field of access to justice, particularly for the professional training of judges, for procedural deadlines and the impartiality of decisions.

4.4 Croatia.

Croatia has ratified the Aarhus Convention only in 2007, but has implemented its own national legislation provisions, guaranteeing the right to access to information both in general through the Constitution of 1990 and, with specific reference to the environment, through the *Environmental Protection Act* of 1994, as amended precisely in 2007. In fact, Article 38 of the Constitution of the Republic of Croatia, as amended in 2010 states that "*The right to access to information held by any public authority shall be guaranteed. Restrictions on the right to access to information must be proportionate to the nature of the need for such restriction in each individual case and necessary in a free and democratic society, as stipulated by law*". Article 3 of the Aarhus Convention, with regard to the right of access on environmental information, has been implemented not only in the Environmental Protection Act, but also in many other texts of secondary legislation such as *Regulation on Information and Participation of the Public and the Public Concern in Environmental Matters* (OG 64/08), the *Regulation on Strategic Environmental Impact Assessment of Plans and Programmes* (OG 64/08), the *Regulation on the Establishment of the Croatian Environment Agency* (OG 75/02) and the *Regulation on Environmental Information System* (OG 68/08). Article 16 of the Environmental Protection Act lies in the principles that inspire the protection of the environment, which states that "*The public has the right of access to environmental information held by public authorities, persons supervised by public authorities and persons holding information for public authorities*". A special chapter is devoted to the three principles which characterize the Aarhus Convention: the right of access to environmental information is also regulated in great detail by Article 132 of the *Environmental Protection Act*, with reference to the way users log on to the accessible documents [Chapter IX is entitled *Public Information, Participation of the Public and Public Concerns and Access to Justice in Relation to Environmental Matters*]. In addition, the procedures to be followed to request environmental information is standardized both in relation to the timing that the Public Administration must comply in responding to the access request, and in relation to the cases where it is possible to reject the request for access. Article 135 of the *Environmental Protection Act* provides for both the cases in which the government can reject the request for access, and cases where the right can be denied because it is contrary to superior rights that the State has the obligation to protect (public security, national defense, protection of personal data and protection of commercial information). Particularly significant for the effectiveness of the right of access to environmental information is the discipline of environmental impact assessment, which allows a high degree of public participation in the proceedings, accompanied by the possibility for those involved to be informed promptly and in detail on the initiating proceedings and the documents on which it is based [Article 71, *Environmental Protection Act*]. The NGOs' activity has a considerable weight in the proceedings affecting the environment, since to these non-governmental organizations is assured a financial support by the Public Authority for their monitoring and cooperation activities in the management of environmental resources. In fact, the principles of sustainable development are contained in periodically updated documents, plans and strategies that also concern the local communities: while monitoring and collecting of data relating to environmental management, the Ministry for the Environment cooperates with the National Environment Agency and also with the NGOs, as well as with the competent local authorities, then publishing and spreading the information thus held [Chapter VII, the *Environmental Protection Act, On Environmental Monitoring*: Articles 120-130]. Also in compliance with Article 19 of the Civil *Servants Act* [OG 92/05]*, On Duty of Providing Information and Explanations in Administrative Matters*, the public authorities have adopted decisions to improve the skills of those responsible for the relevant offices on the right to access environmental information. The Croatian *Environmental Protection Act*

implements the second pillar of the Aarhus Convention, since it is already in the general principles of law that finds the recognition of the right belonging to citizens, NGOs and all stakeholders to participate in procedures for the improvement of environmental regulations, the development and adoption of plans, strategies and programs to be adopted [Articles 16 co.3, 4, 5 of the *Environmental Protection Act*]. The guaranteed participation must be preceded by an appropriate, timely and effective information, to enable the effective expression of opinions, proposals and objections on environmental policies. The right to access to justice, stated in Article 18 of the *Environmental Protection Act* and in six articles of the Law Chapter on the transposition of the Aarhus Convention, is also guaranteed: the rights of individuals and associations to take appropriate measures to protect the environment before the competent authorities is provided with the right to act in judicial proceedings in order to stop the violation of their rights. Indeed, the right of access to justice provided for in Article 18 of the Environmental Protection Act is very detailed and shows the parties that consider that their request for information pertaining to environmental protection matters has been neglected, unfoundedly refused, either in entirety or in part, or that their request has not been answered in an appropriate manner, have the right to defend their rights before a court of law, in accordance with a special regulation on access to information. In addition to citizens, groups, associations and organizations are also allowed. Peculiarities of the process before the competent courts are provided and underline the importance given to the principle of access to justice as a guarantee instrument and protection of the rights relating to the environment [Articles 146-148, *Environmental Protection Act*]. The access granted to citizens to data and environmental information demonstrates their importance in the determination of policy on the environment: it helps to strengthen their active role and make them feel more responsible towards administrative action. Article 4 of the Aarhus Convention provides that the environmental information shall be made available by the public bodies as soon as possible and at the latest within one month after the request has been submitted, unless the volume and the complexity of the information justify an extension of this period up to two months after the request has been made. The applicant shall be informed of any extension and of the reasons justifying it [8].

5. Conclusions.

Such principles of European derivation, also inform the Italian legislation on environmental matters; in fact, while in general the right of access is recognized by Law 241/90, Article 22 ff., in environmental issues it is also regulated by the Legislative Decree no. 195 of 19 August 2005, which transposed the European Directive 2003/4/EC concerning access to environmental information. Such discipline, in fact, "*provides for a system of almost full environmental disclosure, both regarding the locus standi, thus greatly expanding the circle of persons entitled to access to environmental information, and the objective point of view, requiring an access area to environmental information free from the most restrictive conditions stated in Articles 22 et seq., L. 7 August 1990 no. 241*" [Consiglio di Stato section IV, 20 May 2014, no. 2557]. It is therefore clear that the interest to access environmental information is "to be considered intrinsic in every human being or body representing him, in accordance with Article 3, paragraph 1, of the aforementioned D. lgs. no. 195" [Tar Calabria, Catanzaro, sect. I, 19 September 2011, no. 1231]. In other words, the instance of acceptance is not subject to the existence of a qualified specific interest ascertained by the public administration. This shows the transposition into national law of the EU principle that "the requirement that environmental information shall find wide spread is essentially based on the fact that knowledge of this kind of information (and access to the documentation) does not simply carry an interest of the private applicant but it is a condition for the realization of a public interest to protect the environment and also, very often, the health of the community" [European Court of Justice, sect. III, 28 July 2011, no. 71].

In analysed countries' judicial systems, access to environmental information, citizens' participation in environmental decision-making processes and access to justice have been fulfilled by constitutional charts and sectorial legislation.

In Albania and Croatia, the publicity of the environmental impact assessment procedure is particularly relevant. Ministry of Environment's activities, together with those of local authorities and NGOs, seems to be fundamental in all the analysed experiences in order to provide monitoring and storing of data related to environmental governance.

Public participation in environmental decision-making process and access to justice in order to obtain environmental protection interventions are found in every country: citizens' and NGOs' participation has an important role in implementing environmental legislation, plans and strategies.

The analysis shows how Aarhus convention's fundamental pillars and EU directives concerning environmental protection have been substantially honoured as the alignment with the *acquis communautaire* on environmental matters represents a key step to enter the EU.

Anyway, the examined environmental protection system will be better put into effect if these countries realize organic reforms of public administration, as recommended by the European Commission [Brussels, 16.10.2013 COM(2013) 700 final, *Communication from the Commission to the European Parliament and the Council. Enlargement strategy and main challenges 2013-2014. Conclusions on*

Montenegro, Serbia, The Former Jugoslav Republic of Macedonia, Albania, Bosnia and Herzegovina, Kosovo, Turkey, and Iceland].
Taking into account that many environmental protection principles and criteria are often in conflict with simplification measures, governments have the difficult duty to search and find the best balance between efficiency and legal guarantees, not just accelerating or reducing the procedural stages but implementing their rationality. [9]
In conclusion, only the transparency of the activity carried out by the public bodies makes it possible to accentuate their responsibility to the citizens and prevent abuses, in this way compensating the democratic and representativeness deficit in the functioning of the Public Administration's previous experiences [10]. In the participatory model of the *new good public governance*, the right to information is the pillar on which a Public Administration example of effectiveness and democracy is founded, and this must be followed by the citizens' right to participate in decision-making processes relevant to the exercise of their rights [11].

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Restoring the emotions: the religious buildings between memory and value enhancement.

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Cultural heritage belonging to religious institutions represents a significant part of the whole artistic estate of our country. Today, one of the main problem affecting the church properties is in the abandoning of those places - due both to the loosing of their old use and their closing to the public. The perspective for this kind of heritage is sometimes to get a new function, or to suffer degradation and demolition.
Religious architectures are still today an exceptional part of the landscape. They survived through many centuries, even if they lost their original dedicated value. The religious heritage was part of a cultural and perceptive net that is still today an immaterial inheritance, as we can see it in the landscape nowadays. This kind of approach, based on a multidisciplinary contribution, allows the understanding of traces continuity in landscapes. And even traces that today are lost, they are still part of a cultural set. Thankfully to devotional paths, we are able to recreate the ancient images of places and their territorial value.
A good governance model has to be done carefully with the support of multidisciplinary analysis. Especially in case of religious heritage it's important to enhance the immaterial aspect, sometimes even more than the material one.

Keywords: culture heritage, religious building, memory, enhancement, immaterial inheritance.

1. The religious properties

Cultural properties belonging to ecclesiastical entities and institutions represent a significant portion of the entire artistic and historical heritage of our Country. One of the main problems currently affecting the ecclesiastical properties and, generally, the whole religious heritage, is represented by the phenomenon of abandoning churches and shrines - either because they lost their ancient intended purpose, both for simple closure to the public - . For those buildings there's the prospect of a new use or a slow process of degradation until the extreme solution of sale or demolition.
The problem of decommissioning is an incumbent reality today in Italy and Europe, both because of the effect of secularization and the spread of new cults, and the urban planning effects, which often determined the depopulation of the countryside and mountains, and nowadays a gradual abandonment of city centres. Other reasons for decommission are the expansion of new suburban areas and the risk of deterioration and abandonment of the historical and artistic heritage, most of religious interest; furthermore the drop in priestly and religious vocations, the increase in costs and maintenance of buildings and the public finance limits [1].

2. The ecclesiastical cultural heritage in Italy: the protection and the problem of disposal

According to a study carried out by the Italian Episcopal Conference, the religious property appears in a huge size: about 85,000 churches, 3,000 libraries, approximately 28,000 parish and diocesan archives, etc. This situation stands in the great problem of protection and conservation of the Italian

artistic and cultural heritage. Italy, according to UNESCO estimates, owns approximately 50% of the

Fig. 01. Santa Maria delle Grazie Shrine, Dogliani (Cuneo). Sketch of the author. 2012.

cultural heritage of the whole world, of witch ecclesiastical goods are around 70-80%, a particularly large and important section [2].
In 1939 the Italian government issued a basic law on the protection of heritage of historical and artistic interest, including the provision of the protection of «things belonging to ecclesiastical entities» (art. 8 of the law n. 1089). A key step in this process - which committed the Holy See and the Italian Republic to cooperate in the order of protection of the historical and artistic heritage - is represented by art. 12 in the revision of *Concordato* agreement (1984). It says «in order to harmonize the application of the Italian law according to the religious requirements, the competent bodies of the two parties will agree on appropriate measures for the protection, enhancement and enjoyment of the cultural heritage of religious interest belonging to ecclesiastical entities and institutions».

2.1 Italian constitution and the agreement

The Italian Constitution recognizes the value of religious culture, in particular, the art. 9 states that «the Republic promotes the development of culture and the historical heritage of the nation». The revision of *Concordato* agreement, art. 9, paragraph 2, states: «The Italian Republic recognizes the value of religious culture and takes into account that the principles of Catholicism are part of the heritage of the Italian people». The State therefore first-hand assumes this particular attention to the historical religious heritage but, in particular, realizes the cultural heritage as a founding element of national identity.
These prerequisites are followed by the two Agreements, one of 1996 (concerning general forms of cooperation between Church and State) and that one of 2000 (which only refers to archives and libraries). The first Agreement refers to the forms of cooperation between the parties, providing that the ministerial bodies organise special meetings with corresponding ecclesiastical bodies to define the programs or proposals for annual programs of action for cultural heritage. The second Agreement, however, refers to archives and libraries, providing the Ministry and the Bishop Italian Conference (CEI) to ensure their safety, while the Church, for her part, takes care in opening archives to the public consultation, and in inventorying.
In recent years the discipline of Italian law in cultural heritage has been hit by a number of reforms, including the role of the Regions, the structure and organization of the Ministry, as well as the

substantive law (including the Consolidated Act in 1999 and then Code of Cultural heritage and Landscape in 2004). Thanks to those agreements, a new one of 26th January 2005 is signed by both the Minister of Cultural Activities and the President of the Italian Bishops Conference, as a reform of the art. 12 of the 1929Agreement.
This change has to be applied to the cultural heritage of religious interest belonging to church institutions. The Agreement of 2000 on archives and libraries is still valid with an express clarification. Among the innovations in the Agreement of 1996 there is also the guarantee for access and visits to cultural properties. In the case of buildings with ecclesiastical functions, the access and visits are permitted in respect of religious needs. The Agreement also determines that the exhibit of cultural heritage belonging to ecclesiastical entities and institutions is authorized in accordance with local government regulations.

2.2 State and Church in Italy

In Italy the property of the religious heritage - especially those with monumental and historical-artistic interest, which constitute a large part of the national cultural heritage - is for mostly distributed between the State and the Church, through the Agency of the State Property, and the Fund for Religious Buildings (FEC). This is a consequence of complex historical events dating back to the Napoleonic occupation and the Risorgimento.
This kind of properties is then subjected to an absolute or relative inalienability that safeguards the original devotional function. Naturally, the Church remains the real owner, through ecclesiastical bodies, of diocese, parishes and religious institutions, scattered throughout the country [3].
So the massive storage costs and maintenance of this heritage, almost entirely made up of properties of historical and artistic importance - therefore subject to constraints for having public protection - fall on several subjects. That avoids each other from the situations of almost exclusive property in relation to a single subject, as it happens in France on the public finances. A key element is the publicly funded possibility in the Italian Regulation: it consists of eight per thousand of taxation which is annually divided between the State, the Church and other religious institutions based on the choices expressed by taxpayers in the tax statement. But the interesting thing is that the law states that this contribution can also be used for conservation purposes of cultural heritage (art. 48, law 222/1985). So in the last years this eight per thousand of taxes has sometimes used to finance interventions for recovering ecclesiastical historical and artistic buildings.
Italian legislation requires that buildings for public use of Catholic Church celebrations - even if they belong to private individuals - are subject to a obligation of the cult (*Deputatio ad cultum*). This cannot be taken away «even for alienation effect, up to that the destination itself did not cease in accordance with the laws that affect them» (art. 831, par. 2, Civil Code). The law therefore reserves the ecclesiastical authority of any decision on the matter.
Before incurring cases of total degradation, with attached disposal of an unsafe building, it would be useful to reconsider the importance of routine maintenance that, in synergy with the European co-financing strategies, may prove useful for the protection and enhancement of the artistic and architectural religious heritage. In most cases, these sites do not have a reference entity manager: therefore a strategies program becomes fundamental.
What makes unique this property is in addition to their incredible historical value, even their uniqueness to evoke strong emotions. The ability in transmitting these perceptions into good behaviour is a designer responsibility, but also of those who manage these areas. This model of governance is therefore a task to be done with caution and with a multidisciplinary analytical support: in the case of religious heritage has to be guarded not only the building itself, but also (and especially) the immaterial sensation.
In some Italian cases the integrated management of the sites led to their protection and development. A quite good example is the Sanctuary of Mount La Verna, a place of reconciliation within the memory of the national community. It's also defined a particular religious landscape, included in the definition of *Landscape* by Article 131 of the Urbani Code. (La Verna is considered of great interest along with the Forest Monumental nearby, still intact thanks to the wise work of the Franciscan Friars, who have treated it over the Centuries in a perfect harmony between man and nature). The same case is represented by the Sacred Mountains, places of pilgrimage throughout Europe and even more present in Piedmont and Lombardy, included in 2003 in the World Heritage list by UNESCO. The local authority of Sacred Mountains preserves and maintains the artistic and historical complex of all environmental Sacred Mountains through specific funds and specialised employees [4].
In other cases, the alienation of a part of the church property led to a different type of recovery. The church of the Confraternity of San Michele in Asti, formerly Catholic place of devotion and desecrated in the late Twentieth Century, was a focus of restoration and renovation work, now headquarters of cultural Associations [5].
In Naples as in Venice, there are historic churches transformed into schools or banks. One example is the scientific high school of Venice, Santa Giustina, which is based in the homonymous former church.

In some cases, the facade is preserved but the interior is demolished and it has changed destination of use.

3. The European situation: the French and Spanish case

The awareness of the disposal problem is felt even in Europe. It emerged during the Parliamentary Assembly of the Council of Europe of May 1989 - dedicated to the theme of the protection of religious buildings in disuse. During that occasion, authorities responsible for churches governments and local communities were invited to collaborate with relevant organizations and experts to ensure the preservation of such buildings. Even more, they have to promote projects for a compatible use with their original destination and to provide funding and tax benefits for their restoration and enhancement in order to avoid their dispersion [6].

France and Spain are the two European countries in which the religious heritage is quantitatively more present, although always a lesser extent than in Italy. Nevertheless, they moved very differently from each other. Spain activated, as Italy, a regulation with the Catholic Church and made arrangements with other religious confessions. France instead moved in the opposite direction, different not only from Italy and Spain, but also from other European countries that had found in agreement an appropriate instrument: With its mood, France triggered a mechanism of separation of Church and State.

3.1 France and protection of religious heritage

In France, due to the breakaway legislation, Catholic buildings are properties of the State or local communities, which therefore have almost the entirety of the religious assets. Obviously, there are problems for the heavy maintenance burden, entirely borne by the public finance. With a juridical view, the system of *affectation légale*, which these churches are currently subjected, ensures their destination to the worship in forms sometimes even stricter than in other countries, offering legal protection against the risk of potential divestitures. The *désaffectation* proceeding is provided only for specific cases identified by law, but normally it requires the consent by the *affectataire*, it is also to say that the ecclesiastical authorities, the prefect and the State Council must approve it.

The management case of Abbot René Bolle-Reddat, chaplain of Notre-Dame-du-Haut (opera-manifesto of Le Corbusier) is quite unique. The chaplain, worried to safeguard dignity and decorum of the ecclesiastical building, tried to free Le Corbu masterpiece by the sordid appearances constituted around, to ensure the best visibility conditions such as the religious attitude to face the exceptional work of architecture. In compliance with the importance of the monument, the chaplain suggested the elimination even of trees and of some buildings. In these cases, a special attention to heritage and an estimate of *routine* maintenance - maybe entrusted to an on-site supervision - can be a first form of protection.

3.2 Spain and devotional properties

In Spain legislative interventions of greatest importance on the cultural religious heritage are connected to three historical periods of the Nineteenth Century, during the Franco dictatorship and later after the Democracy restoration (in the Seventies). Only in the Twentieth Century the Spanish State realises the devolution of powers in protection and promotion of cultural heritage, following the closure of the two Royal Academies - deputies to the care of antiquities and monuments - and the creation of the Department of Fine Arts within the Ministry of education.

A few years from the Constitution establishment in 1931, the Spanish State emanates an organic measure: the *Ley de 13 de mayo de 1933* concerning the *defensa, conservaciòn y acrecentamiento del patrimonio històrico-artistico nacional*, which will remains in force for over fifty years. The Law to the Article 41 limits and obstacles alienation by providing that, in case of sale of Church heritage with public auction, the State can use an option to purchase it, with the obvious aim of avoiding the exit of properties from the national territory. The Constitution of 1978 is intended later to support the level of cooperation between the State, the Catholic Church and other confessions.

In Spain there are several examples of conversions of desecrated churches and subsequently put to any other function. An example is the former convent dedicated to Saint Francis in Santpedor with adjoining cloister near Barcelona in a state of serious deterioration, now used as an auditorium. The church, built in the early Eighteenth Century by the religious order of the Franciscans, almost immediately fell into decline due to a major looting occurred in 1835. The building underwent deterioration such that in 2000 the Authority was forced to demolish only preserving the church, although it still poured in serious state of degradation. The architect David Closes designed a project in which the additions are recognizable as supplements. He didn’t seal the roof holes but turn them into windows through which daylight penetrates for the first time in a space of darkness, by changing the atmosphere of the former church.

4. Concluding remarks

Fig. 02. Devotional path in Dogliani (Cuneo). Sketch of the author. 2012.

The consideration of cultural heritage of both a social growth and financial instruments led Giovanni Urbani in 1981 in a public intervention on restoration. According to his mind the concept of cultural heritage has to retract in that of commons [7]. By considering religious heritage as a common one, it could be a starting point for identifying new ways for promotion and preservation. It's important in fact to limit the financial burden of public intervention and consider the cultural heritage as a direct or indirect vehicle for economic resources [8].
In this perspective the dialogue with the various authorities is very important. The Institutional Observatory for cultural heritage of ecclesiastical property is a first step towards direction of preservation (art. 7 of the Agreement in 1995). Another key task is to involve both private foundations and voluntary associations in specific recovery project for buildings at risk. Naturally, it is fundamental to involve population - today more sensitive to the protection of traditions and local identity - because churches and other places of worship are an essential identity component [9].
A balance between cultural protection and both religious and economic interests is quite difficult. Also citizens should be involved as civil community in preserving and enhancing religious sites because they represents cultural assets and, for the ecclesiastical community, a witness of faith. Devotional buildings are as also important elements of cohesion and they are still today part of our identity.

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Heritage promotion through food design

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Abstract
What is design There are many visions and experience more than one century. Design is different from styling. The product is a product system and design isn't give an appearance but it is innovation, that's to say new meanings, new needs, new values: cultural, symbolic ... new contexts of use.

A design driven innovation is a product system, that's to say the object and the immaterial elements, togheter: services and comunication. Design identify new codes (morphology, icon, mark) linked to product and act on taste – functional side and symbolic-cultural side by visioning, like perspective of new scenary and sensemaking that become a translator of cultural values. The concept is not a lifestyle but life moments.

What's food design? There are just some of the most important keywords and parameters analysed during a Food Design process, and which also form the basis for research; It's activity of integration through technical productive and social-cultural dimension that's to say it's a wealthy element for cultural renewal and promotion.

There are new way to connect with food for example Martí Guixé, Fulvio Bonavia with it's "A matter of taste", "Italian food collection", I also think about the Petersham Nursery, "good, clean and fair", the historic experience of wine-making factory Mastroberardino for the archeological area of Pompeii.

We can image food design like a cultural business model, which a new claim connected to the product that established a technologic change syde by syde cultural factor.

Keywords: Tradition, Communication, Culture

1. Section Arial – 11 pt – Lower case letters - Bold – Left aligned

The main problem when we talk about design is define the object. There are many visions and experience about design, for example the Italian dictionary "Devoto Oli" define it as " conception and design object of use produced on sequence, according to good shape in relationship to object features"; It underlines the manufacturing process and the relationship between shape and function. There is a disagreement about design definition, if we think about the English definition of the verb "to design", it' s translation means the relationship with the project and the object of the project, that's to say it's immaterial side like communication and services. Design means " Organize, complete and structure all those factors that, in any event, take part to the constitutive process of the shape product. And exactly calls to mind the factors about use, consumption, singular or social (the functional, symbolic, cultural factors) as well as those about its production (technical – economic, technical – executive, technical – systemic, technical – productive, technical – distributive)" (Maldonaldo T. 1976)
Tom s Maldonado suggests the design activity such as knowing skills, so it can define the industrial design activity like an integration between two appearance: technical-manufacturing and social – cultural dimension. The industrial design department "Politecnico di Milano" define positioning design such as: " the project of industrial product define functional, technical, material, stylish features of the individual manufactured. The application setting of industrial design includes consumption object such

as capital goods, transport, home furnishing, exhibition until the whole product system design: product system, communication, marketing strategies". This definition allow to increase in several ideas of industrial design present in the Italian manufacturing process. The object of this "extension" of cognitive survey is the relationship between the industrial design and the Italian manifatcturing knowledge, with a lecture model well structured and flexible adapt itself better the living condition and the peculiarity of our country. The Italian Design is characterized by two dimension: technical-manufacturing and community-cultural that cannot exclude manufacturing and cultural system development, so we talk about product system.
Design have to upgrade itself to transformation in progress about the way to produce material assets but it have to open itself up to a new project due by the culture influence in the manufacturing operate a new way to connect traditional activity to innovative management, new way to propose, services and communication management, linked to different object.
What is Food Design ADI Food Design Commission define it in 2006 in this way:
"Official constitution of the ADI Food Design Delegation
Contents edited by Paolo Barichella (coordinator) and agreed and approved by the members
- Food Design is the culturally-aware design of products in which food and tools work closely together, blending the features necessary to meet a requirement linked to the consumption of a food product, into a single interface. Phenomena that can be described as 'trends', such as Show Food, Food Art, Media Food and Concept Food, should be seen as a form of 'spectacularisation' and a long way from the concept of a design culture, which is behind the fundamental idea of the studies of Food Design as a discipline. Ergonomics, divisibility, contextualisation, functionality, problem solving, practicality, technology, innovation, progress, research, economies of scale, correct price/quality ratio, customer satisfaction...these are just some of the most important keywords and parameters analysed during a Food Design process, and which also form the basis for research. Food Design does not accept the folkloristic 'spectacularisation' of food, created with the sole aim of generating curiosity and of amazing interlocutors with visual and choreographic creative effects designed to fulfil their own end. Food Design should be a tool with which the best possible result can be obtained with the least effort, whilst keeping to a good price/quality ratio, thanks to economies of scale that make it possible to optimise company design and production costs. Maximum productivity allows for the constant control of the quality of industrial products (sensorial, hygienic, sanitary aspects) and makes it possible to guarantee maintaining these standards through processes of reproducibility.
There are 3 different approaches to Food Design:
1) Designing places or tools for the production and/or consumption of food (only admitted if the product is the starting point of the design of a concept store)
2) Food design (designing food products made from edible materials)
3) Design capacity (the simultaneous design of foods and/or related necessary tools)
- In all three cases we can use the term 'Food Design' only if we know the exact distinction that is made at the time of consumption: nutrition, socialisation, pleasure. Food Design means solving service problems related to the moment of food consumption in these three main moments.
- In all three cases, operators and designers should be suitably prepared from a sensorial point of view
- In all three cases, there should be an awareness of the process that brings us to the identification of the form as the final phase of the project.
- In order to work in Food Design, you must have good, in-depth knowledge of the characteristics and techniques of the transformation of food (cooking), and of all the basic disciplines needed to work with food, so as not to create consumer health risks.
- The fact that a product designed is contextualised in the area of Food, is not a necessary and sufficient reason for it to be called an article of Food Design. Fields of application divided into 2 macro areas:
1) Companies working within the food sector (Food Beverage, agricultural food
products, food and wine producers)
• Companies producing the raw materials for food products
• Companies producing the semi-finished materials for food products
• Companies producing food products
• Companies distributing food products
• Companies that transform and serve food products
• Places where food products are served and consumed
- We can use the term 'Food Design' in this sector only where there is activity showing an indisputably correct approach to the design culture and to all relevant legislation within the design process.
- We can use the term 'Food Design' only where there is a clear distinction drawn between art, styling, and design.
- Those working in Food Design, within the food section, must know how to evaluate the area o application of the work, making the difference between Art, applied Art, craftsmanship, and Industrial

food production.
- We can use the term ‘Food Design’ only where there are correct examples of design that see the form of the food products as dependant upon the contexts of consumption of a food product (time and place)
- Food Design does not mean attracting and stimulating consumer curiosity by means o ‘spectacularisation’ carried out by superficial means and excessively linked to the 2 words.
2) Companies operating in the food service industry
• Tools for food production (software/hardware)
• Tools for food preservation
• Tools for food service
- We can speak of ‘Food Design’ in this subsidiary field of the food sector, only when a design is unequivocally seen as a function of the first field.
- We can speak of ‘Food Design’ only if the design is aimed at improving the organoleptic characteristics of food beverages, agricultural food products, or food and wine produce, or at effectively encouraging its service.
- We can speak of ‘Food Design’ only if in planning, you are well aware of the problems, legislation, make-up, characteristics, history, structure and quality of the food products that will come into contact with the tools to be designed. As a practical example, we would refer to a recurring question: “What is the difference between food design and product packaging"
We can only speak of 'Food Design’ in Packaging when the design of the container serves consumer requirements, otherwise it becomes mere graphics or marketing, designed to boost product sales.
It is not ‘Food Design’ if the packaging is limited to the ability of a box to attract a consumer. In Food Design too, the product and its form serve consumer needs, and are not an end to themselves or to other parts of the production system, unless expressly requested in the project brief, and declared in advance.
Industries (Fields of application understood as the lifecycle of a Food Design product)
• Producers of raw materials (start of the chain and of the sector of agricultural food products, animal rearing, crops, mills, up to semi-finished products,…)
• Industrial food transformers and producers (e.g.: Barilla, Nestlè, Unilever, Kraft, …)
• Food distribution and logistics (mass distribution, places of administration, cold chain, …)
• Systems of storage (packaging, MAP, vacuum packed, Tetrapak …)
• Hardware tools to transform/regenerate (ovens, vacuum packing machines, cookers, production lines, …)
• Software, tools to transform food products (saucepans, knives, electric mixers, moulds, …)
• Software, tools for the consumption of food products (plates, glasses, crockery, …)
A sociological analysis starts from the mass distribution model and looks at craftsmanship, small and medium-sized businesses and large companies, each with their own, distinctly different approach to design, in relation to the different economies of scale and production technology.
Participants:
•Designers
•Companies and businesses
•Training institutes and students
•External technicians
Disciplines and themes for further study:
•HACCP health and hygiene regulations
•Biochemistry, microbiology, organic chemistry
•Nutritional aspects of food science
•Sensorial anatomy
•Synaesthesia
•Ergonomics of food products
•Preservation
•Regeneration
•Analysis of the physical and chemical processes of molecular gastronomy
•Technology of the processes of food transformation
•Marketing and the economies of scale in the field of F&B.

Our cultural heritage is not only archeological, historical, architectural, landscape goods but also food, because food is culture and food design is a favorite element for the requalification and the promotion of the habitat.

There are new way to connect with food, for example Marti Guixe wrote in 2010 one of the first book about food design published by Corraini Edizioni, the cover is interesting because represents an image of a cake decorated by a the graph of the percentage of their ingredients, this is an example

how decoration becomes information. His work about Alessi is based on interaction object that's to say the idea is that when we use the object we can take possession of it by integrate with an action its sense, like "Communicator Balloons" a recipient with 3 speaking balloons, which can be used as boards to write messages on. The fruits, the personal items, or anything you put in the container will in this way speak or communicate through the balloons: an indirect way to display thoughts or daily instructions; like "Seed safe" Seeds are in some way more valuable than money. Therefore the seed safe is a must in each home. Keep the seeds you get from eating fruits, and then plant them to become a rich person.

Food, Fashion and heritage promotion are the tree keywords that rappresent the work of Fulvio Bonavia.
Fulvio Bonavia is an award-winning advertising and editorial photographer known for his uniquely inventive imagery. He has used food to create haute couture apparel inspired by designers such as Alexander McQueen and Prada; crafted jewelry, accessories, handbags, and shoes out of edible elements for his book A Matter of Taste; and produced advertising images for clients like Pirelli, Montblanc, Sony and Adidas.
Born in Italy, Fulvio started out as a graphic designer and illustrator of film posters before devoting his energies to photography.
As a photographer, he brings his artistic and design sensibilities to each and every one of his pictures, doing all of postproduction himself so that his photographs are infused with his vision from start to finish.
His work has been honored by Communication Arts, PDN, the Italian Art Directors Club, and the IPA, among others, and Luerzer's Archive has named Fulvio one of the 200 Best Ad Photographers Worldwide, choosing one of his photos for the cover of its in 2008/2009 400-page book. In 2010, he was selected Photographer of the □ear by the Mobius Awards. He is based in Milan.
When Fulvio Bonavia takes pictures the most unusual images result: a belt made of dough or cookies, an artichokes hat, his photo join together the two most important Italian features food and fashion creating edible accessories, the idea is simple, first he photograph "broccoli" then the real handbag, on the computer he brings the picture togheter to generate the unexpected image; The idea is to combine two special skill about Italy that is fashion and food. Fulvio Bonavia find inspiration walking along the streets, it's here that he finds substance for his masterpieces. The book of this edible accessories is called "A matter of taste" was published 2008, it's made of a large number of photo of edible accessories. It's advertisement work is equally unconventional, it's hard work is design what people thinking, the photo motives due to unexpected.
The Italian food collection was created by Cayenne Italia for the Italian Trade Commission (in Italian ICE Istituto nazionale per il commercio estero), this Agency, in fact, matches the local production offer with the needs expressed by foreign markets and assists local companies in their international activities, it used the picture of ham ring, cheese handbag, it's an ironic way to mix different material and so on to communicate in the way that the people doesn't expect; it's an example how design can be a useful tool to support cultural heritage.
The last scenary refers to spread responsibility, in this last years appears a task about eco-friendly and social sustainability. Consumer behavior complete in itself awareness of a responsibility to a space less singular more common expression, like green consumerism that recognize the complexity of interaction of the physical and social structure like typical of creation of a new project. This loyalty is made of the globalization that put us in front of the necessity to take on this problems in a different way. Deterioration of the environment, the pollution and the use of the physical resource rappresent important motive of suspicion about the validity of the man action on his surrounding.
Petersham Nurseries is one of those spaces that we can define new luxury, it is able to demonstrate its commitment to remunerated appropriately and able to live with dignity. It is a place of calm, away from the bustle of London, somewhere that respects and is in tune with nature and positive living. In the caf□ they create an evolving menu inspired by what is growing in the garden, the changing seasons, and our connection to the environment. This is an ethos that they uphold throughout them organization and across all business functions from the sourcing of our seeds and the selection within our shops, to the quality of the food leaving the kitchen. Petersham Nurseries Cafe won runner-up in "Best Slow Food Restaurant / Eatery" in the 2014 Slow Food London Awards. good, clean and fair ingredients 'Good' describes the quality and taste of the food you are eating; 'clean' refers to the standard of production and consumption without damage to the environment, animal welfare or our health; and 'fair' ensures that the farmer, cheese maker, fisherman (or fisherwoman), hunter or baker, is respected.
Sustainability, outsourcing productive, cycle of life, are the main words to explain the most important experiment of food design for the cultural heritage. The studies have been carried out and coordinated by the **Applied Research Laboratory's staff of the Soprintendenza Archeologica of Pompeii**. The Laboratory, set up in 1995, is now directed by the environmental biologist Annamaria Ciarallo, with the

collaboration of several Italian and foreign Universities, and the collaboration with the winery Mastroberardino, chaired by Prof. Piero Mastroberardino, now affects all areas of vineyards of Regions I and II of ancient Pompeii, for an extension of a little more than one hectare spread across 12 parcels of different extension and a potential production of about 30 bushels by hectare.
Here, following the same cultivation techniques previous to the great eruption local vines have been planted, Piedirosso and Sciascinoso chosen on the basis of archaeological discoveries, botanic, bibliographic and iconographic studies, also carried out on ancient Pompeian frescoes.
Pompei is the symbol of Italian culture and our civilization, 2.978.884 visitors in 2015, so the wine "Villa dei Misteri" become a communications medium of this ancient world, culture and tradition.
It's all? We can do more□ Food Design is a new idea of project culture in the sector of additional services of cultural heritage, Cultural Tourism and Culture Economy join together for the Strategic development of cultural product linedin to mkt strategies; The Food Designer work together the archeological site to define strategy to improve cultural achievement able to compete, get better communicative perspective, promotional appearance and develop innovative cultural product to make visible all the ancient human activity that we can define clear design that's to say the official system of the activities and responsibilities that belong to this branch of knowledge to with join all that activities that the research define implicit design, follow the parameter of quality planning, eco-friendly manufacturing and distribution. Food Design becomes a cultural distribution channel less linked to gadget but more combined together the target of Cultural growth of tourists, so become a means to cultural detailed study and an unconventional reading tool.

1.2 Subsection

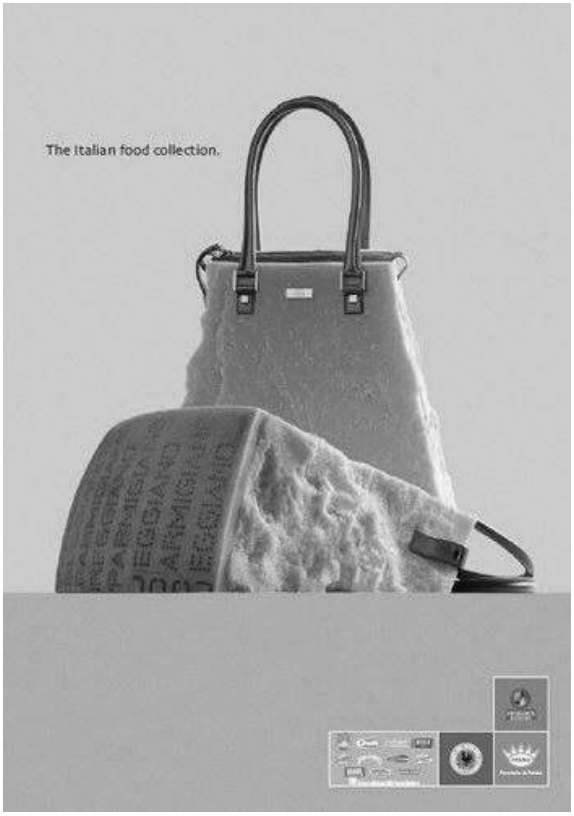

Fig. 1: The Italian Food Collection by Cayenne Italia

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The Landscape Suitability as a sustainable aspect of Architectural Cultural Heritage. Case Study of Ria Formosa Natural Park

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Abstract

Since the 1970s, the heritage classification system has been including both tangible and intangible cultural expressions and more integrative criteria, depending on the ability of what is classified to be recognized by its community, contributing to the characterization and perpetuation of cultural identity.

Within the landscape framework, that cultural identity is built through a codification process based on the interaction between the communities and their places according to the ecological conditions. As a result, the architecture has become the collective life of communities' expression and the unique character of landscape manifestation.

However, the recent urban occupation, special in coastal areas, has been incompatible with the landscape transformation processes, by which was created a set of management tools and restrictive areas – like Natural Parks - to protect its values. Nevertheless, this kind of limited approach has been damaging in keeping the landscape alive and its communities have lost the "sense of the architectural place".

In this sense, the present paper seeks to describe the assumptions of an integrated interpretation methodology of landscape as a contribution to the sustainable conservation and valorization of architectural heritage. Such an approach considers the human action not as an exterior causality, but as an active principle of responsibility that is part of a community.

Keywords: Architecture, Cultural Identity, Heritage, Interpretation System, Landscape, Natural Parks

1. Landscape, Heritage and Architectural Place

1.1 Landscape

The word "landscape" stems from the Latin word "pagus" which means *farmed land*. From this, came up other similar words in different languages, being the French word "paysage" the one which allows us to explain better our understanding of *landscape*: the prefix "pays" means *fatherland* and "age" means *the s□ill of planning the space to solve the human needs* (TELLES, 2002).

According to the French approach, the comprehensive nature of *landscape* concept results from an understanding of the relationship between its biophysical systems (as an ecological status) and the human appropriation process (as a cultural expression) of the space in a specific time (BARNET, 2013; INGOLD, 2011). In its turn, the *territor□* concept stems from the human action over the landscape. Likewise, we can conclude the landscape diversity depends mainly of the biophysical features, which determine not only the dynamic of its ecological status, but also the human occupation patterns of the territory.

In this sense, according to an interdisciplinary point of view, landscape can be defined as a complex and dynamic system, where ecological and cultural features are influenced by each other and which change together over the time (MAGALH□ES, 2001). However, an integrative description of landscape needs a simultaneously morphological and typological approach, related to its shape characteristics and phenomenological aspects, respectively.

1.1.1 Morphological Approach

Through a morphological approach, related to the shape of the space that takes into account several phenomena by which it appeared (LAMAS, 2010), the landscape can be perceived by a system of systems, as a result of the interrelationship between different ecological and cultural components, represented by a functional and symbolic *structure* concept. When these components are conjugated in a unique structure, MAGALH□ES (2007) calls them as a *Landscape Networ*□. In the Landscape Network the ecological systems are mainly represented by a physiographic modeling and interpreted by its influence in the diversity of the resources, which are dependent of the geology, vegetation, soil and climate features of the land. In the same Landscape Network, the cultural systems are represented by urban settlements and its main important military and religious elements, by which the evolution of the human occupation processes, as well as rural and urban systems are interpreted.

1.1.2 Typological Approach

In addition, the understanding of the landscape as a cultural construction can also have a typological approach, i.e. associated to a semiotic analysis criterion (where a symbolic substance is associated to a shape), by which the space becomes humanly significant (JORGE, 2007, GREGOTTI, 2004). This kind of approach, complementary of the morphological approach, requires a categorization of the human occupation processes according to *t□polog*□ concept: "the idea of an element that plays a role in the shape constitution – and that is constant" (ROSSI, 2001: 55). To define a typology is necessary to identify the main important components of the landscape that determine a common rule of its cultural recognition process.

1.2 Heritage

According to CHOA□ (1982), the definition of *heritage* results from a cultural recognition of a particular human action through a set of conventions, letters, directives, treaties and recommendations, depending of the entity which promotes them, to keep its collective value over time.

The patrimonial classification proceedings have been changing over the last century, namely since the mid-1970s, when were integrated the tangible and the intangible expressions from the human action that are likely to have an aesthetic, historical, scientific and/or cultural value, which must be protected and reported to the future generations (CHOA□, 2009). Since then, the definition of heritage has changed mainly to an immaterial sense, by relating the memories of the past with those of the present. The classification proceedings left from being a univocally vision (with fixed criteria) to be now a more flexible one (ICOMOS 1994 and 1996): its qualitative value may no longer be in a particular physical element, but it must be founded on the ability of a community to recognize this value, i.e. what is significant for them and upon which its own cultural identity was, is and can continue to be built.

Nowadays, heritage is the result of the identity capability that a given human action, with recognized value, has to interact with the collective memory of their communities. This is a process which is not only derived from cultural considerations, but also from ecological conditions (VECCO, 2010).

1.2.1 Landscape Identity

According to our understanding of landscape - as a result of a human action over the environment where the communities live - the memories and the different identities established are intrinsic to the cultural recognition process (BERQUE, 1994). In this way, landscape has also a figurative origin, historically built by its communities, as an asset that is inherited from past generations and transmitted to the future generations (GREGOTTI, 2004).

In this context, the first patrimonial recognition of the landscape appeared in the Environmental Policy and Protection of Nature, set out in the Convention for the Protection of the World Cultural and Natural Heritage, which resulted from the 17th General Conference Session of UNESCO - United Nations Educational, Scientific and Cultural Organization (1972) in Paris. Despite this recognition, landscape was just defined as a *place* or a *natural place* to protect. However, in 1995 landscape was finally classified within a cultural category as a *whole wor*□ *of man and nature*. In 1995, the Ministers Committee of the European Council adopted the Recommendation no. R(95)9 that stipulated the basis for the conservation of cultural landscape areas, as part of a Landscape Policy, because *the*□ *have to be e*□*perienced and en*□*o*□*ed b*□ *man*, which ensures the diversity and quality of communities' life.

Therefore, the cultural recognition of landscape often requires a cultivation of the tradition through a particular mode of construction and articulation of the past memories in the public sphere. Nevertheless, as far as the contemporary era is maintaining a vital extension of these memories, there's also a certain "artificiality" of its cultural recognition without temporal boundaries and spatial experience that we call "the place of landscape".

1.3 The Architectural Place in Landscape

From the architecture point of view, the *place* results from an identity process of the space appropriation by man in both physical and phenomenological way, according to an evolutionary pattern of cultural recognition that became into a representation of the world, where man is always present in an implicitly or explicitly way (JORGE, 2013).

In this context, the *architectural place* results from the application of the human judgment value, as an individual meaning over the architecture's collective expression (MUNTA□OLA, 1974). On one hand, man identifies himself with a given space by the ability to perceive it (in a cultural and biological mechanism of apprehension) through the experience of dwelling, i.e. with his self-consciousness in that space. The memory which results from that process allows them to create affection ties, turning them into ritual behaviors of permanence (KOSTOF, 1995). On the other hand, the architecture becomes a witness of these rituals, not only as a constituent element of the space, but also as a qualitative value of its facts, which depend on the events that originated and determine that value (SLUDGE, 2010). Even when the value of this constituent element is cultural recognized by a certain community, the architecture becomes a singular reference, though also with a collective character dependent upon the transformation of the judgment value system (ROSSI, 2001).

Thus, according to the knowledge we make of landscape, can be explained that its architectural place results from a cultural recognition of its intrinsic potential, dependent on the interaction between the spatial (function, scale, context and movement), environmental (climatic, geographic and cultural location) and human (orientation and identification) contexts. This makes that architecture be the singular expression and, at the same time, the collective result of that triple interaction.

2. Ria Formosa Natural Park

2.1 The urbanity of Coastal Areas

The study of urbanity, in an evolutionary perspective of the concept, should take into account the transformations of the territory in a social, economic, political and environmental point of view caused by urban occupation, which resulted from the human needs to install new activities and according to intrinsic characteristics of the landscape. In Portugal, since the 20th century, these transformations cycles have been restricting their ecological functional conditions, because the type of human activities and their cycle of exploitation are unsuitable for the dynamic balance of the systems. When we talk about coastal areas, these dynamic transformations are stronger than usual, due to its transition system between the land and the sea.

In this context, the Portuguese coastal areas, as a humanized territory, are a good example of how the communities understood the potential of their maritime resources, which resulted in different ways of occupation over the time (FREITAS, 2010). At first, the human settlements were confined by physiographic, climate and soil conditions to develop traditional activities associated to the exploitation of the sea resources complemented by a subsistence economy of the land resources (ARA□JO, 1987). However, in the 20th century, this integrative economic system was gradually replaced by a method of industrial production and new urban occupation models, incompatible with the natural processes of the landscape transformation (RIBEIRO, 1945).

Since then, a set of Territorial Management Tools, namely of Special Plans (PEOT) was developed, in which Natural Parks are delimited by areas with restrictive human activities to protect and to safeguard the most important natural resources of a particular territory.

2.1.1 Special Plans of Territorial Management

In Portugal, the Natural Parks are managed by the Conservation Institute of Nature and Forests (ICNF) according to the Natura 2000 Network directives (applied by Bird Protection Directive 79/409/CEE and Habitats Protection Directive 92/43/CEE). Despite of the restrictive uses and kind of occupation determined by this entity ensure the preservations of the natural resources of landscape, this isolated effort doesn't take into account the traditional human activities that contribute to its vital maintenance. In accordance to BASTIEN *et al* (2006), without a suitable human activity, a particular landscape that was intended to be protected before can become a completely different territorial situation over the time, and so there isn't any sense in protecting them in the same way.

Based on these assumptions, the success of the actions taken in territory depends on the careful management between the human needs and the knowledge of the ecological condition, as well as the capability of the resources to answer these needs. On the other hand, the definition of the Territorial Management without an integrative interpretation of the operating systems of landscape and of the cultural recognition process of its value during results in an unsuitable use and occupation of territory.

2.1.2 European Landscape Convention

To solve this problem, in 2000 was created the European Landscape Convention (ELC), legal instrument to promote the protection, management and planning of all landscapes (European Council, 2000). In fact, it is a conceptual document with theoretical and instrumental guidelines as a strategy to be adopted by each state member of the European Union, although it leaves undecided how to apply the directives in their respective legal frameworks. The document advocates that the landscape, as an object with rights, should be apply like a part of the Territorial Management Tools in order to be given a legal framework that laying down guidelines for a Policy Landscape.

In Portugal, the European Landscape Convention (ELC) was approved in 2005 (Decree-Law no. 4/2005 of 14th February), although only incorporated in the Organic-Law in 2007 by Implementing Decree no. 54/2007 of 27th April. According to the guidelines that were set out, the actions to be developed should have a local operative character and an intensive public consultation process, which has a strong multidisciplinary component and requires a prior study of the territory recognition, the kind of people who live in and the way they interact (LAMPREIA, 2012). To achieve those goals, the concerns of the National Program for Spatial Planning Policy (PNPOT) are to develop and implement a National Program for Recovery and Enhancement of Landscapes articulated with the main important Spatial Planning Policies to promote its architectural and landscape quality jointly.

Thus, according to specific goals and strategies to follow, it was created a set of categories of territorial management take into account the value of their landscapes (Article 1), namely:

- **Landscape Protection** - "(…) actions to preserve the present character and quality of a landscape, which is greatly valued on account of its distinctive natural or cultural shape.";

- **Landscape Management** – "(…) any action introduced in accordance with the principle of sustainable development, to steer the transformations result from economic, social or environmental needs [of a population] (...). Those management actions should follow a dynamic process that ensures and improves the quality of landscape according to its population's expectations."

- **Landscape Planning** - "(…) study, design and construction of new landscapes to meet the aspirations of the population who live there. It involves framing suitable planning projects, namely in landscapes most affected by the transformation and in badly damaged areas (for example suburbs, suburban and industrial areas, coastal areas)."

However, the approaches developed until now are not clear in identifying the concept of landscape in all its complexity, which is only understood in certain isolated characteristics as a basis for the protection and valorization of its natural aspects. So, without a holistic knowledge of landscape, the criteria used to manage resources, plan uses, classify patrimonial elements or choose the right authorities to do it, are always asked about their reliability by the population.

Whereas the preservation of ecological conditions of a certain landscape, namely in the coastline, depends on a suitable human action with a recognized cultural value, at the same time transformations caused by such actions can cause a breakdown in their ecological functional systems. So, the following questions arise: What are the suitable uses and human occupations of the territory to ensure the preservation of the ecological conditions of landscape How can we determine the ecological conditions of the landscape in a cultural meaning What is the right methodology to include simultaneously the ecological and cultural approach of the landscape in the territorial management process of coastal areas

Looking for these raised questions and taking into account the transdisciplinary knowledge related to the study of the architectural place, it is possible to answer that all of them depend on the understanding of the cultural recognition of coastal areas according to their ecological condition.

2.2 The Landscape of Ria Formosa

Ria Formosa, located in eastern Algarve coast in southern Portugal, is a geomorphologic situation of a stream which separates the land from the sea over about 60 km, through a dune system with 5 islands and 2 peninsulas separated by 6 bars (figure 1 on the next page). Due to its transitional character with natural ecosystems (mainly marshland vulnerable to the unsuitable human occupation), Ria Formosa has a strong dynamic of transformation, by which was classified as a Natural Reserve in 1978 and then as a Natural Park in 1987.

During its urbanity, mainly dependent on the different cycles of tides and recurrent floods, the first urban settlements on record had ephemeral character. Nowadays, it's possible to find traces of Roman salting along the coastline and there is also medieval time records on the land cultivation with fig trees (along the major freshwater reserves) and pine forest areas in the vicinities (COELHO, 2008).

Figure 1 – Cartographic delimitation of Ria Formosa Natural Park (Source: ICNF)

In fact, Ria Formosa had always natural resources that appealed to a seasonal establishment of different civilizations, particularly in the entries and exits of the stream estuary area. In the second half of the 16th century, the bars (in the entries and exits) were obligatory passage in order to access Faro's harbor (figure 2). Faro was the most important city of the region in the fishing and commerce domains, where most of the villages were dependent upon fishing and smuggling (GUERREIRO e MAGALH□ES, 1993).

Figure 2 – Chorographic map of Algarve Kingdom, 1841 (Source: Tavira's Archaeological Site)

In the 17th century, the frequent havoc of the coast by pirates and privateers contributed to a general feeling of insecurity, and therefore a set of forts were built at the ends of each bar, in order to avoid the smuggler activity (MAGALH□ES, 1993). The importance of their construction was culturally recognized by the main power authorities, mainly by the Church, as well as by the communities living there, given their protection function. However, due to the stream's nature, associated with the strong dynamics of dunes' formation and, in turn, of the different land access channels, these fortresses soon left carrying their initial function and faded over time, not only in a physical way but also in a symbolical approach. The most reliable solution for the access control of the stream was eventually the confidence placed by the Queen in local communities that lived close to the bars, which knew the smugglers and could warn the fiscal guards (CALLIXTO, 1981).

Since then, these urban settlements were consolidated due to the understanding and adaptation process to the ecological conditions of the stream and, at the same time, due to the cultural recognition of their value. To this extent, we can conclude that the social facts determined the perpetuity of a suitable urban settlement and, through them, it's possible to understand the ways and the functions of human occupation that are in accordance with the geographic conditions (KOSTOF, 1995). In this context LE GOFF (2007) states that "the essential functions of a city were the exchange, the information, the cultural life and the power." (:27).

2.2.1 Traditional Architecture in Ria Formosa

If the architecture is a singular and, at the same time, a collective expression of social facts' qualitative value (while also being considered heritage when culturally recognized), the following question arises: How is the physical expression of architecture consistent with the ecological conditions of the landscape in which it operates In the case of Ria Formosa, perpetuity of the housing architecture has been guaranteed by a constant constructive adaptation of the population needs to the environment in which they lived, applying traditional techniques and using local resources (figure 3).

Figure 3 – Evolution of the traditional architecture in Ria Formosa (Source: Olh o's Municipal Archive)

At first, the **thatched hut**, measuring about 5-6m long and 3-5m wide, had a frame with wooden sticks buried obliquely in the soil, in which cane slats were based along. All structure, including the gabled roof, was covered by reed, chargeback, clay or knotted straw with maguey or palm strings that was available in the stream surroundings. There was a low and narrow door, sometimes with a wicket. Inside, two divisions were operated as the housing for the fisherman and his family and as the storage room where they kept the fishing tools and nets. In one set, the structure and physical materialization of the house was not only adapted to the human proportions of the time, but also to the adverse weather conditions of the place in which it took root (VASCONCELOS, 2007; OLIVEIRA,1994).

Later, the thatched hut was gradually replaced by the **masonry house**, a single storey with a backyard. At the front, a rhythm of door and window predominated with a frame of simple spans. The gable cover was made of reed on lined wooden beams with cove tile, although the most important division of the house, which was called "outhouse" (living room), might have a "treasure roof" (hipped roof). The house also included a bedroom with one or two "mats" (beds) on the ground to the family sleep. At the back, a kitchen was composed by a small bench and at the corner of the kitchen there was a chimney with the "fire" (fireplace) (ROMBA, 2008).

Since the 19th century the structure and constitution of the traditional architecture was changed, due to the attainment of more wealth and consequent population growth. The plot of the land was fully occupied by the house at the patio level and an upper floor construction featured a terraced roof called "soteia", allowing its future expansion in height. The models of architectural construction and urban occupation after this age were incompatible with the natural processes of Ria Formosa's transformation and, because of that, there was a progressive loss of cultural recognition of the landscape by their local communities.

3. Integrated Interpretation Methodology

Based on what was described about Ria Formosa, in that the understanding and cultural recognition of its ecological condition has become a crucial factor to ensure the perpetuity of architecture over the time, we propose to describe a set of assumptions for the development of an integrated interpretation methodology of landscape that contributes to the conservation and sustainable exploitation of its heritage, in order to meet the multiple needs of local communities.

In order to develop a methodology, i.e. to define a set of steps and means to check a given hypothesis towards its theorization, we propose to create a landscape interpretive system for the analysis and diagnosis of its components and operating procedures. In the end, the results can be presented in both a conceptual and a cartographic representation platform.

3.1 Interpretative System

At first, a methodology is expected to have a theoretical foundation which, in this case, may be expressed as an interpretative system centered on the study of the *architectural place in the landscape,* by means of simultaneously a morphological (in respect of the shape) and a typological (the phenomenological point of view) approach.

This consists to explain the changes occurred over the time in a given space by describing the relationship between the cultural recognition processes and the ecological operating conditions of landscape. Its practical implementation involves a comparison of concepts, i.e. "representations of all lived experiences or susceptible to live in the world" (:11), of which the logical relationship establishes an interpretative system (JORGE, 2007).

In the convergence of knowledge about landscape and heritage, namely with regards to the issues of (un)embodied cultural identity in and by architecture, we will contribute to an integrated territorial vision, by which it will possible to set up a critical approach about its future sustainable management.

3.2 Analysis and Diagnosis Model

By means of the interpretative system of landscape and based on the structures and typologies concepts described before, we propose to develop an analysis and diagnosis model of its ecological and cultural systems, as well as of the impacts caused by human occupation.

First of all, according to the concept of structures, it is important to determine the Ecological Network - mainly composed by natural materials - and the Cultural Network - essentially composed by inert materials - as well as to identify the Complementary Areas with the structures of transition situations. Matching these Networks and Complementary Areas is possible to present a unique Landscape Network (MAGALH□ES, 2007) composed by the following systems:

- **Ecological Systems** - Wet System (water lines and adjacent areas), Dry System (ridge lines and slopes), Coastal System (dunes and cliffs), High Ecological Value Soils, Maximum Infiltration Areas, and Vegetation with Conservation Interest, among others of the Natura 2000 Network;

- **Cultural Systems** – urban areas composed by institutional, military and religious structures with relevant patrimonial interest, classified by the Convention for the Protection of the World Cultural and Natural Heritage of UNESCO, as well as the main road access routes.

Thus, in a morphological approach, the key elements, which characterize and ensure the dynamic balance of a given landscape, can be identified and represented as more or less homogeneous areas that we call *Landscape Units*.

Thereafter, when we interpret the landscape units taking into account the dynamics of human occupation process and the intrinsic capacity of resources available to meet in a multiple and balanced manner to the transformations caused by that occupation (i.e. their resilience), we can finally determine what we call *landscape suitabilit*□.

In the end of this step, it will be possible to propose a set of occupations and uses according to the concept of typology, that is, the idea of the role that a given landscape element plays in the formation of its shape into a type. These can work as a common rule in the study of the relationship between the built and unbuilt space (ROSSI, 2001). In practical terms, we may determine *Occupation T□pologies*, correspondent to the definition of uses or services of patrimonial, housing, agriculture, forest or pasture level among others, according to the landscape suitability.

3.3 Evolutive Interpretation Platform

When trying to identify the landscape resilience through the analysis and diagnosis model according to the interpretative system, its logical explanation should take into account the amount of energy exchanged during the interaction between different systems, the capability of each component to reorganize itself when affected by a human action, and the ability of the system to adapt itself to the new conditions after the interaction. During this process, it is important to identify the compatibility between different components of the ecological and cultural systems, understanding the behavior that each one has on the whole interaction through the study of landscape transformations.

In this context, to determine the resilience of a landscape the current methodologies use the cartographic representation. In practice, the Landscape Network and the Typologies of Occupation can be represented using a computer, where the data (ecological and cultural components) is crossed from overlapping thematic maps and where is identified the landscape suitability. For example, the Geographic Information Systems (GIS) are effective tools for this hierarchical processing and handling of data through *la□ers* with areas, lines and points (the components) of a morphological

representation. The GIS also allow a global representation (spatial or temporal nature) of all systems without invalidating any data, as well as adjusting the analysis in different scales, according to the continuing evolution of the landscape. However, this kind of representation is not entirely able to include an abstract or subjective view, namely the interpretation of the cultural recognition processes. For this reason, it will be also necessary to develop a conceptual representation model with a phenomenological approach complementary to the Cartesian view.

For this reason, we propose that the results which come from the analysis and diagnosis model be explained in a Geographic Information System (GIS) complemented by a Conceptual Representation System (CRS) platform, to present the changes occurred in a given period of time, corresponding to the main social, economic and political phenomena of the past. When crossing the data about current land use and occupation with the data about territorial intervention, including conservation and patrimonial valorization, it will be possible to identify scenarios of evolution and future stability concerning the landscape dynamics.

In the end, the conversion of scientific criteria in sociopolitical categories expressed with cartographic and conceptual representation easy to understand, will be an auxiliary instrument not only as a territorial management, but also to the social welfare, economic and public policy.

4. Conclusion

By understanding the landscape from both the morphological and typological point of view, i.e., as the result of the mutual interaction between biophysical systems (such as ecological condition) and the human appropriation processes (as a cultural expression), we can conclude that the safeguard and integrated management of their natural resources have always depended upon a multiple and suitable set of uses and human occupations.

However, its identity, that is the patrimonial recognition of its qualitative value by the communities living in, it has been losing its cultural expression, from which the time limits as well as the experience of its spatial context - which we call *place* - have been put aside.

Concerning to Ria Formosa, where the landscape presents a very strong dynamic of transformations, the consolidation of urban settlements resulted from an understanding of its ecological conditions. At the same time, its cultural recognition, resulting from the social facts expressed in a singular and collective way through architecture, has determined the perpetuity of urban occupation over time. Nevertheless, due to a progressive loss of the sense of the place, the sort of human activities developed and rhythms of exploration applied have been incompatible with the natural processes of landscape transformation and have caused the loss of biological diversity.

In this sense, we propose to create an integrated interpretation methodology of the landscape, based on an interpretative system of its architectural place, which may provide the basis for a model of analysis and diagnostic of its constituents and operating procedures. The final results can be explained in a platform with both a conceptual and cartographic representation.

Due to the fact that this methodology establishes the landscape suitability according to an integrated interpretation of its biophysical components and human appropriation processes from both a physical and phenomenological approach (mainly in regards with the cultural recognition of its value), it will be possible to develop a conservation strategy and sustainable valorization of its architectural heritage.

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Parametric analysis on first mode failure mechanisms of masonry building compounds: application to case studies

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Abstract
The current paper deals with the seismic vulnerability evaluation of masonry constructions grouped in aggregates through an "ad hoc" quick vulnerability form based on new assessment parameters considering local collapse mechanisms. First, a parametric kinematic analysis on masonry walls with different height (*h*) / thickness (*t*) ratios has been developed with the purpose of identifying the collapse load multipliers for activation of the main four first-order failure mechanisms. Subsequently, a form initially conceived for building aggregates suffering second-mode collapse mechanisms, has been expanded on the basis of the achieved results. Tre proposed quick vulnerability technique has been applied to one case study within the territory of Arsita (Teramo, Italy) and, finally, it has been also validated by the comparison of results with those deriving from application of the well-known FaMIVE procedure.

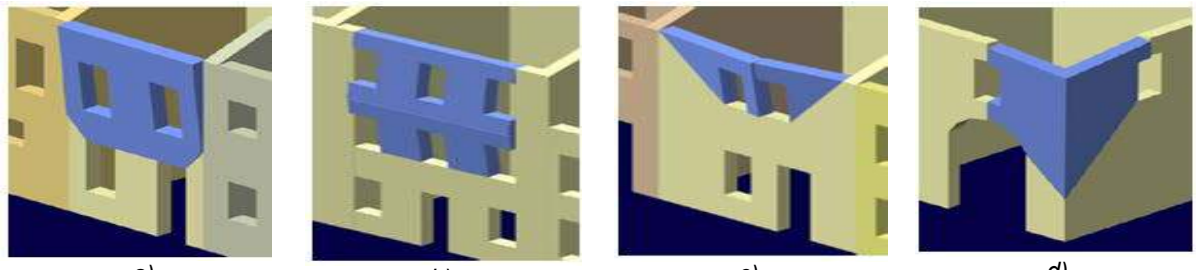
Keywords: Seismic vulnerability, masonry aggregates, out-of-plane mechanisms, kinematic analysis, quick assessment form

1. Out-of-plane collapse mechanisms
The identification of the most significant failure mechanisms for masonry buildings is primarily connected to disconnections among walls usually caused by seismic actions, which identify macro-elements susceptible at collapse for instability. The analysis of out-of-plane failure mechanisms is done on the basis of linear kinematic analysis, where the kinematic approach is based, after the identification of the collapse mechanism, on the evaluation of the horizontal action activating that mechanism. The collapse load multiplier α_0 is obtained by applying the Principle of Virtual Work by equalling the total work performed by the external forces to the work of internal forces through the following relationship:

$$\alpha_0 \left[\sum_{i=1}^{n} P_i \delta_{ix} + \sum_{j=n+1}^{n+m} P_j \delta_{jx} \right] - \sum_{i=1}^{n} P_i \delta_{iy} - \sum_{h=1}^{o} F_h \delta_h = L_{fi} \qquad (1)$$

In the case study, the above theory is applied to several masonry walls with different slenderness h/t, where *h* and *t* are the wall height and thickness, respectively, aiming at identifying the multiplier factor of the main four local collapse mechanisms (overturning, horizontal arch effect, vertical arch effect and corner overturning) (Fig. 1) detected for masonry buildings under earthquake. Therefore, the achieved results, summarised under form of design charts, have led towards new seismic parameters for a new building aggregate evaluation form, which has been applied to a case study in Arsita, a little town

damaged by the 2009 Italian earthquake. Finally, the effectiveness of the these parameters in foreseeing the building vulnerability has been proved by comparing the case study results with the ones deriving from application of the FaMIVE procedure, a very suitable calculation tool to evaluate the vulnerability and risk of in-plan and out-of-plane mechanisms of masonry walls.

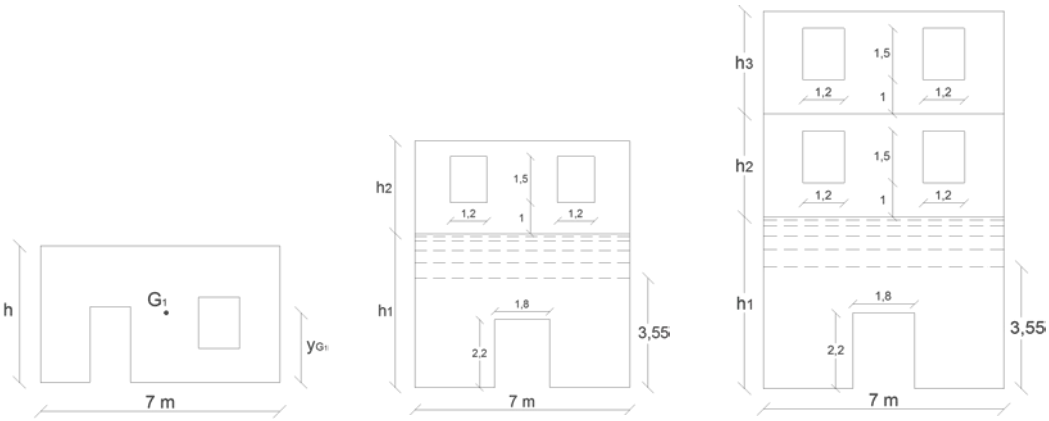


a) b) c) d)

Fig.1: The main out-of-plane mechanisms of masonry buildings: a) overturning; b) vertical arch effect; c) horizontal arch effect; d) corner overturning.

2. Parametric analysis on case studies

The examined structures have plan dimensions of 7x7 m and develop on levels variable from 1 to 3 with different heights (3, 4 and 5 m). Walls have thickness changing from 30 cm to 80 cm and openings with variable geometrical dimensions. They are made of three different masonry types (specific gravity γ of 11, 16 and 22 kN/m^3). As usually detected into existing buildings, it is hypothesised that the generic walls belonging to the case studies examined are not well constrained to other walls and floors. Barrel vaulted, as well as r.c., mixed steel-tie and timber floors, have been considered as intermediate horizontal structures. Roofs are made of the above mentioned horizontal plane structures. It is supposed that vaults and other floor beams have 25 cm and 15 cm support lengths on the walls, respectively. In particular, when vaults are of concern, the presence of steel-tie beams has been taken into account with the purpose to eliminate their thrusting actions.
In Figure 2 some representative masonry walls of the investigated buildings are depicted.



a) b) c)

Fig. 2: Geometric dimensions of some wall case studies: a) 1 level; b) 2 levels; c) 3 levels.

The design loads adopted in the parametric analysis are shown in Table 1.

Table 1: Loads deriving from different types of floors considered.

	rc floors	timber floors	steel floors	vaults
G_1 (kN/m^2)	3	1	2	5
G_2 (kN/m^2)	2	2	2	2
Q (kN/m^2)	2	2	2	2

3. Design charts

Considering the variability of the input data (mechanical properties of the masonry, wall thickness, number of floors, storey height, geometry of openings, type of floors), the collapse load multipliers α_0 related to the main local out-of-plane mechanisms mentioned in Section 2 have been evaluated. For the sake of example, in Figure 3 these multipliers related to the building with two storeys have been plotted as a function of the wall slenderness (h/t) considering the variability of the floor types.

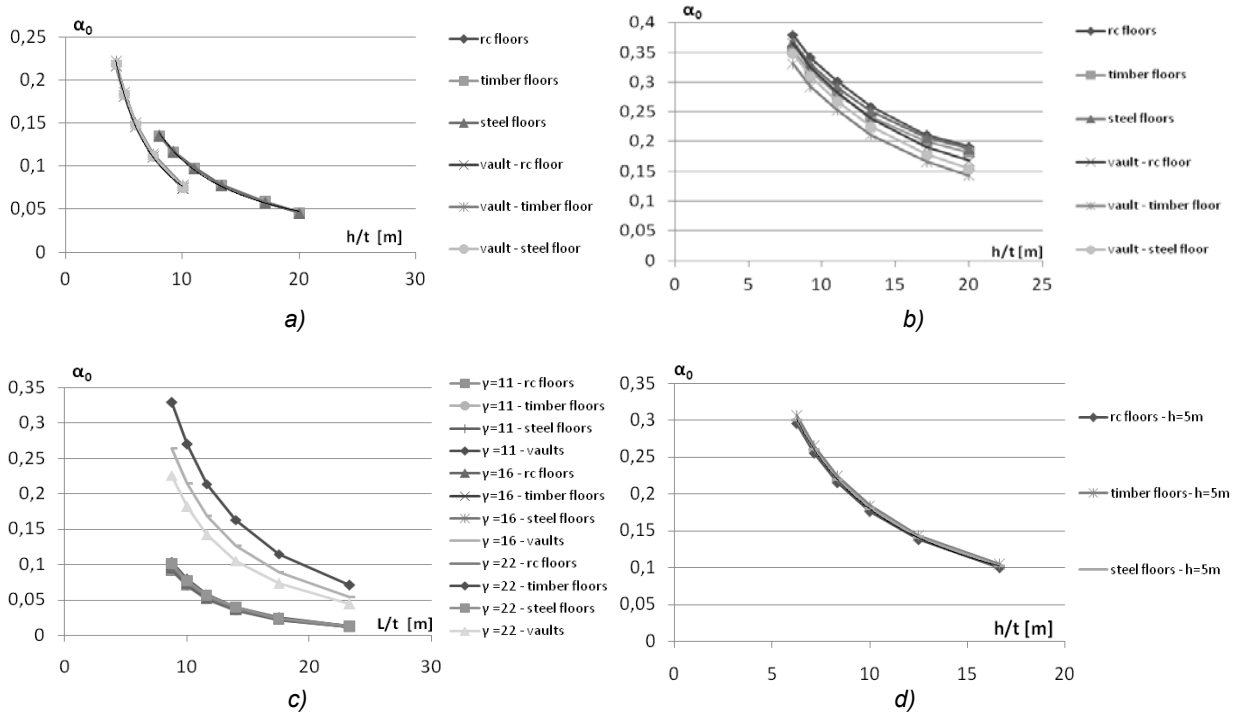


Fig. 3: Design charts: a) overturning; b) vertical arch effect; c) horizontal arch effect; d) corner overturning.

From the Figure 3 it is apparent that, for all mechanisms, the collapse load multiplier decreases as the wall slenderness augments. In the case of overturning, the α_0 factors for buildings with vaults are lesser than those detected for buildings with plane floors. The same results occur also when the vertical arch effect is of concern. In this case the maximum α_0 factors are achieved with rc floors. For the horizontal arch mechanism, the different types of horizontal floors do not modify the collapse multiplier value. The highest values of α_0 are attained with vaults: in particular, these factors increase with the reduction of the masonry specific gravity. Finally, for the corner overturning mechanism, the influence of the typologies of floors on this local mechanism is basically negligible.

4. Expansion of the vulnerability form for historical aggregates

The results achieved from the previous parametric analysis allows to add some parameters related to out-of-plane mechanisms to the quick survey form for historical aggregates implemented by the first Author [1, 2, 3] (Table 2).

This form is based on fifteen parameters taking into account the global in-plane interactions among aggregate units. The effectiveness of such a speedy seismic evaluation method has been already given by the comparison with an other trustworthy methodology [4].

To each of the new parameters related to local mechanisms, four vulnerability classes, ranging from A (the best) to D (the worst), with owns scores and a weight, the latter representative of the more or less importance of the parameter with respect to others, are assigned.

The four vulnerability classes are defined on the basis of the value assumed by the collapse load multiplier α_0, which represents an acceleration value. Therefore, this factor can be compared to the spectral accelerations related to the investigated site, to the building reference life and to the limit state considered, aiming at being framed within a given class. The conditions of belonging to the four classes are defined in Table 3.

Table 2: The vulnerability assessment form for building aggregates.

Parameter	Class score (*s*)				eight (*w*)
	A	B	C	D	
Organization of vertical structures	0	5	20	45	1.00
Nature of vertical structures	0	5	25	45	0.25
Location of the building and type of foundation	0	5	25	45	0.75
Distribution of plan resisting elements	0	5	25	45	1.50
In-plane regularity	0	5	25	45	0.50
Vertical regularity	0	5	25	45	0.50 1.00
Type of floor	0	5	15	45	0.75 1.00
Roofing	0	15	25	45	0.75
Details	0	0	25	45	0.25
Physical conditions	0	5	25	45	1.00
Adjacent buildings with different height	-20	0	15	45	1.00
Position of the building in the aggregate	-45	-25	-15	0	1.50
Number of staggered floors	0	15	25	45	0.50
Structural or typological heterogeneity among S.U.	-15	-10	0	45	1.20
Percentage difference of opening areas among adjacent facades	-20	0	25	45	1.00

Table 3: Vulnerability classes and scores for local mechanism parameters.

Vulnerability class (score)	
A (0)	$\alpha_0 > a_g$(SLV)
B (15)	a_g (SLD) < $\alpha_0 < a_g$ (SLV)
C (30)	a_g (SLO) < $\alpha_0 < a_g$ (SLD)
D (45)	$\alpha_0 < a_g$ (SLO)

Due to the dangerousness of the out-of-plane mechanisms, a weight equal to 1.5 has been assigned to each new form parameter. For each of the 19 parameters a vulnerability class among the available four is assigned by the user with a sufficient degree of objectivity. Subsequently, in order to obtain a numerical vulnerability index, the selected score of a given parameter is multiplied by the respective weight and the sum of these multiplications extended to all parameters is done. The vulnerability index is defined as the sum of the weight multiplied by the scores of each parameter.
This quick investigation method has been applied to a case study in the little municipality of Arsita, which was damaged by the 2009 L'Aquila event [4, 5] (Fig. 4).

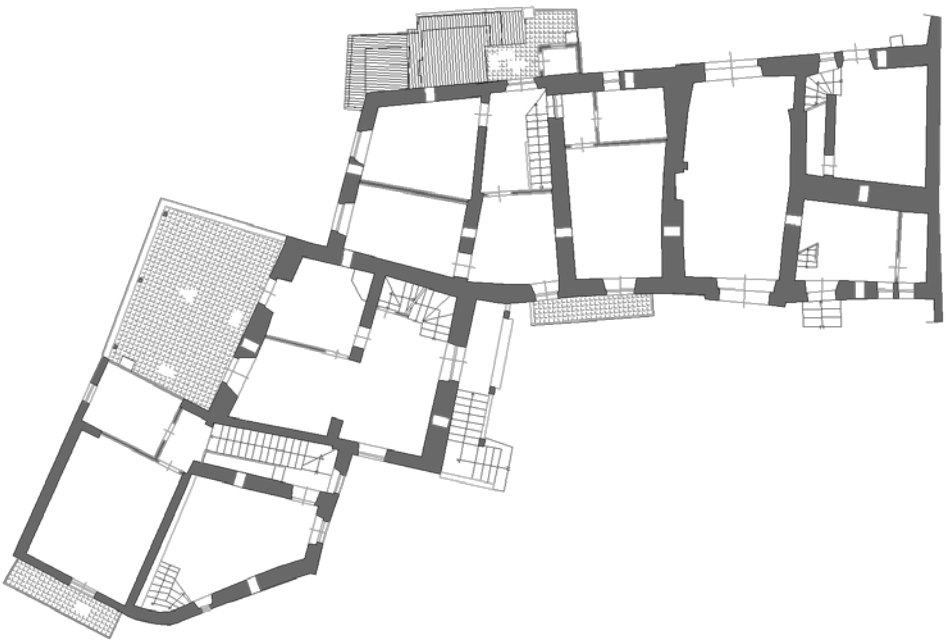


Fig. 4: First floor of the aggregate n. 7 in the municipality of Arsita (Teramo, Italy).

The case study is the aggregate of the town indicated with n.7, which is made of five different Structural Units (S.U.), developing averagely on two levels and mainly characterized by hewn stone masonry blocks and timber roofs. Thanks to the analysis of the geometric properties of the aggregate constituent masonry walls, it is possible to associate to each S.U. the value of the collapse load multiplier, which activates the main local out-of-plane mechanisms, on the basis of the wall slenderness according to the relationships reported in the previous section. Subsequently, the evaluation of the seismic vulnerability of the five S.U., by using the herein enlarged survey form, is made.
In Table 4 the minimum factors α_0 for each possible out-of-plane collapse mechanisms are reported for all the S.U. constituting the investigated aggregate.

Table 4: Out-of-plane mechanisms occurring in the aggregate n.7.

S.□.	Type of mechanism (collapse load multiplier α□)			
A	Overturning (0.114g)	Corner overturning (0.220g)		
B	Overturning (0.078g)	Corner overturning (0.220g)		
C	Overturning (0.098g)	Corner overturning (0.264g)	Vertical arch effect (1.019g)	
D	Overturning (0.046g)	Corner overturning (0.207g)	Vertical arch effect (1.076g)	
E	Overturning (0.079g)	Corner overturning (0.207g)	Vertical arch effect (0.966g)	Horizontal arch effect (0.054g)

However, after all the possible α_0 factors have been calculated for each possible mechanisms and for each S.U., they have been compared to the accelerations defined by the Italian code for the different limit states of the Arsita town, which are shown in Table 5. This allows to assign a vulnerability class to each out-of-plane collapse parameters of the form.

Table 5: Spectral accelerations of the municipality of Arsita for different limit states.

a_g (SLV)	a_g (SLD)	a_g (SLO)
0.190g	0.078g	0.062g

The compilation of the quick survey forms based on 19 parameters for all S.U. provides vulnerability indices within the range [-125 □785.25]. These indices are then transformed into vulnerability factors between zero and one, as shown in Figure 5.

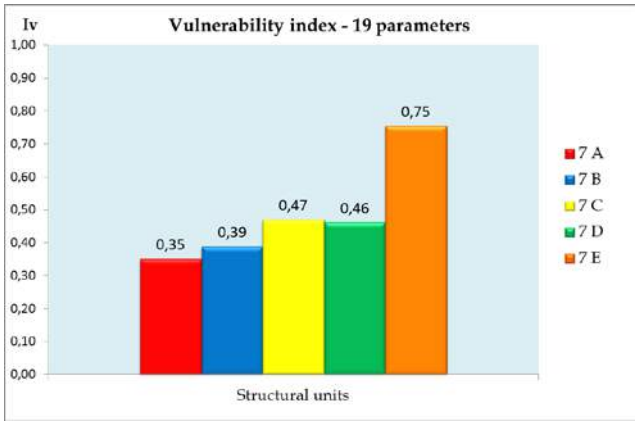


Fig. 5: Global seismic vulnerability of the aggregate n. 7.

The analysis of results shows that the most vulnerable structural unit is the 7E one, that is the unit occupying a heading position in the aggregate, with a vulnerability index I_v □0.75.
This S.U. is depicted in Figure 6, where both the location in the aggregate and some plan layouts and external photos are reported.

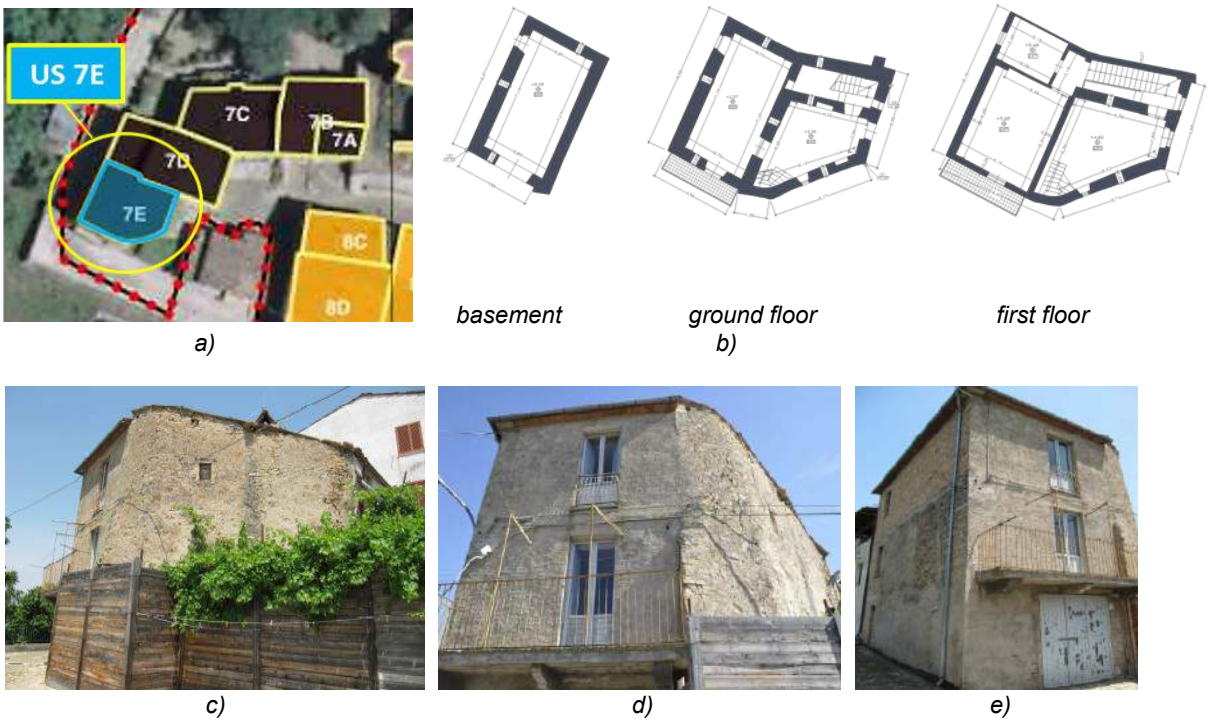


Fig. 6: The structural unit 7E: a) plan view, b) plan layouts, c) east view, d) south view and e) west view.

Furthermore, for each structural unit, the vulnerability indices related for the last four parameters of the form are calculated (Fig. 7) in order to obtain a comparison among the five buildings with reference to the most significant out-of-plane mechanisms of collapse.

STR□CT□RAL □NIT 7A						
PARAMETER	CLASS SCORE				□ EI□HT	V□LNERABILIT□ INDE□
	A	B	C	D		I_v
16. Overturning	0	15	30	45	1,5	22,5
17. Vertical arch effect	0	15	30	45	1,5	0
18. Horizontal arch effect	0	15	30	45	1,5	0
19. Corner overturning	0	15	30	45	1,5	0
Total						**22,5**

STR□CT□RAL □NIT 7B						
PARAMETER	CLASS SCORE				□ EI□HT	V□LNERABILIT□ INDE□
	A	B	C	D		I_v
16. Overturning	0	15	30	45	1,5	45
17. Vertical arch effect	0	15	30	45	1,5	0
18. Horizontal arch effect	0	15	30	45	1,5	0
19. Corner overturning	0	15	30	45	1,5	0
Total						**45**

STR□CT□RAL □NIT 7C						
PARAMETER	CLASS SCORE				□ EI□HT	V□LNERABILIT□ INDE□
	A	B	C	D		I_v
16. Overturning	0	15	30	45	1,5	45
17. Vertical arch effect	0	15	30	45	1,5	0
18. Horizontal arch effect	0	15	30	45	1,5	0
19. Corner overturning	0	15	30	45	1,5	0
Total						**45**

Fig. 7: Vulnerability indices of S.U. in terms of first mode failure mechanisms.

STR□CT□RAL □NIT 7D						
PARAMETER	CLASS SCORE				□ EI□HT	V□LNERABILIT□ INDE□
	A	B	C	D		I_v
16. Overturning	0	15	30	45	1,5	67,5
17. Vertical arch effect	0	15	30	45	1,5	0
18. Horizontal arch effect	0	15	30	45	1,5	0
19. Corner overturning	0	15	30	45	1,5	0
Total						**67,5**

STR□CT□RAL □NIT 7E						
PARAMETER	CLASS SCORE				□ EI□HT	V□LNERABILIT□ INDE□
	A	B	C	D		I_v
16. Overturning	0	15	30	45	1,5	45
17. Vertical arch effect	0	15	30	45	1,5	0
18. Horizontal arch effect	0	15	30	45	1,5	67,5
19. Corner overturning	0	15	30	45	1,5	0
Total						**112,5**

Fig. 7: Vulnerability indices of S.U. in terms of first mode failure mechanisms. (continued)

The vulnerability indices of the S.U. related only to the inspected local mechanisms are reported under form of histograms in Figure 8, where such indices are normalised in the range [0□1]. From the obtained results it appears that the vulnerability increases from the unit A to the unit E, with the latter having the highest vulnerability index I_v.
This outcome is in agreement with the FaMIVE method [7] which, applied to the whole historic centre of Arsita, provides an out-of-plane vulnerability index for S.U. n. 7E (30-45□) greater than those of other units belonging to the same aggregate (0-30□) (Fig. 9).
As a result, the reliability of the quick assessment method proposed for local failure mechanisms has been proved.

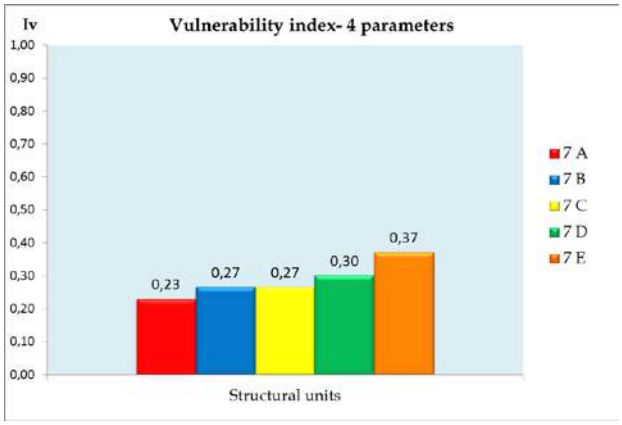


Fig. 8: Local seismic vulnerability of the aggregate n. 7.

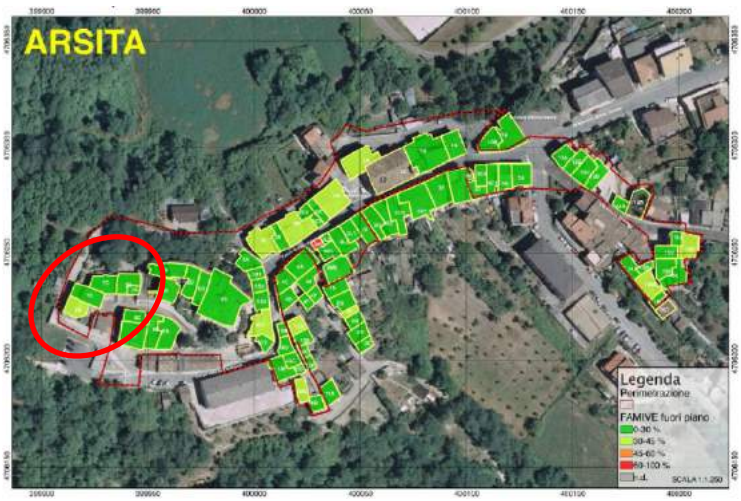


Fig. 9: Out-of-plane vulnerability indices of the aggregate n. 7 through the FaMIVE method.

Finally, the proposed quick seismic evaluation procedure can be usefully applied to investigate, other than the in-plane behaviour of masonry aggregates [8, 9], also the susceptibility at damage of masonry compounds against first order mechanisms. In conclusion, a complete analysis tool can be entrusted to structural engineers to investigate the seismic behaviour of constructions belonging to historical centres [10, 11].

5. Conclusions

The parametric study based on kinematic analysis performed on masonry buildings having different masonry types, wall slenderness and floor typologies has provided four additional parameters related to the main out-of-plane mechanisms for masonry walls able to extend a quick seismic vulnerability form already implemented for historical aggregates. The application of the methodology to a building aggregate in the historical built-up of Arsita has shown that the most vulnerable S.U. is the head one. This results is in agreement with the provision of the well known FaMIVE method which, applied to the whole historic centre of the inspected town, has confirmed the reliability of the implemented large scale speedy analysis method.

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Seismic investigation on a masonry building compound in the historical centre of Bacoli (Naples)

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Abstract
This paper has the task to investigate the seismic vulnerability of masonry building aggregates belonging to the municipality of Bacoli (Naples) through a combined theoretical-numerical analysis procedure applied to a case study. Numerical pushover analyses on the examined compound have been used to plot the capacity curves of head, angle and intermediate structural units, accounting for both the loads deriving from floors of adjacent units and the strength and stiffness of the wall portions next to the masonry structure considered. Afterwards, a theoretical study has been faced to assess the vibration periods of aggregate structural units, which have been compared to single units ones. Finally, the achieved numerical results have been compared with those deriving from a speedy analysis procedure with the purpose to find a relationship among vibration periods and quick vulnerability indices.

Keywords: seismic vulnerability, quick analysis, mechanical model, vibration periods, masonry aggregates.

1. Introduction
The historic built-up has always been not only a response to housing need over time, but also the testimony of centuries of civilization and culture and can be considered as a touristic and economic irreplaceable resource. Masonry buildings represent a large part of the Italian building heritage, often designed to withstand vertical loads and any horizontal forces without respecting seismic criteria. So, for the analysis of these structures, there is almost always the trend to examine their seismic behaviour on the basis of unclear criteria. In particular, the case of building aggregates represents the norm within roughly all Italian towns [1].
Masonry building aggregates are the distinctive emblems of Italian historical centres, which were erected in different epochs according to different design principles. The current seismic Italian code does not foresee a clear calculation method to predict their static non-linear behaviour. Nevertheless, collapses and very large damages occurred into building compounds during the last earthquakes [2, 3] and, therefore, particular attention to this topic should be paid by scientific researchers in the Structural Engineering field. For this reason, in this paper a simple methodology to forecast the masonry aggregate seismic response has been setup. Since buildings, originally built as isolated constructions, were aggregated over the years into compounds, a suitable calculation method can be developed firstly by extrapolating the single constitutive structural units and, subsequently, considering the interactions among them. The illustration of the implemented analysis method is herein done with reference to a case study within the historic centre of Bacoli (district of Naples).

2. The historical centre of Bacoli

The settlement system of the historical centre of Bacoli (Naples) (Fig.1) expanded significantly since the post-war period, reaching its maximum expansion especially in the '80s. It consists mainly of masonry buildings: the oldest ones are inserted into compounds, they being statically dependent each to other, whereas those more recently erected are arranged as isolated structures (about 60).

The study has the target to assess the behaviour of masonry building aggregates falling in the above historical centre through the analysis of a case study.

The achievement of the minimum information necessary to properly model the aggregate taken as a case study has been achieved through the CAR.TI.S survey form [4]. The seismic analysis has been performed by means of quick and numerical procedures. The first approach comes from the procedure initially proposed in 1984 by Benedetti and Petrini [5], which has been recently extended to take into account specifically the interactions among units of historical aggregates [6, 7, 8]. On the other hand, the second procedure is based on the application of the calculation program 3Muri [9], used to perform non-linear static analyses.

With the latter analysis approach, by modelling the entire aggregate, it has been possible to assess the seismic vulnerability index, as well as the vibration period, of the individual structural units (S.U.) integrated in the building complex for seismic check purpose.

Fig.1: Overview of the historic centre of Bacoli.

3. The CAR.TI.S. Form

The Italian CAR.TI.S survey form (Fig. 2), a sort of manual for the typological - structural characterization of ordinary buildings, is finalised to the detection of the prevalent building types in the context of communal or sub - municipal areas, called compartments, characterised by homogeneity of the building texture.

The compilation of the form must follow a path in which the information is acquired through interviews to one or more local technicians having an exhaustive knowledge of the examined area.

The form is divided into the following four sections:

- Section 0: identification of the municipality with focus on the study sector;
- Section 1: identification of each of the main structural types detected within the municipality;
- Section 2: identification of the general characteristics of the types individuated;
- Section 3: characterisation of structural elements.

60 of masonry structures are distributed according to an isolated configuration, whereas the remaining 40 are grouped into structure aggregates, where constructions interact each other, so to be one dependent from another.

In the current paper the study sector illustrated in Figure 3a has been investigated. The structural parameters of constructions located there are: total floors (including basements) equal to four, average floor height between 3.50 m and 6.00 m, average ground floor height between 3.50 m and 5.00 m. The average plan area of buildings is equal to 170m^2 and the erection period of buildings was before 1860. About masonry, the most common type has regular squared stones with an average thickness of 80 cm. Masonry walls have suitable cross connections (diatones), while buttresses and chains or tie-beams are absent. The floors are rigid or semi-rigid: the former under form of either precast joists or in-situ casted rc joists hollow tile (highest percentage), while the latter as mixed steel-tie horizontal structures.

The reinforced concrete structures in the sector are identified as frames placed into one direction only with infill walls and without seismic joints.

Roofs are usually made of reinforced concrete practicable terraces and masonry vaults; the percentage of openings on the surface of the facade is between 20 and 29 . At the ground floor such a percentage is lowered up to 10 . 70 of buildings appears to be regular both in plan and in elevation and the predominant type of stairs is made of knee beams with cantilever steps. Superficial foundations are provided by isolated plinths with or without connection beams.

Fig. 2: Sections of the Italian CAR.TI.S. survey form and some of the examined buildings.

a) *b)*

Fig. 3: The study sector (a) and the inspected building aggregate (b).

4. The case study of a building aggregate

The building aggregate under examination, located in the historical centre of Bacoli, is composed by structural units (S.U.) giving rise to a building stock with more or less a “in line” configuration (Fig.3b).
The macro-element model of the building aggregate, composed of six S.U., has been developed with the 3Muri software, as depicted in Figures 4 and 5a.

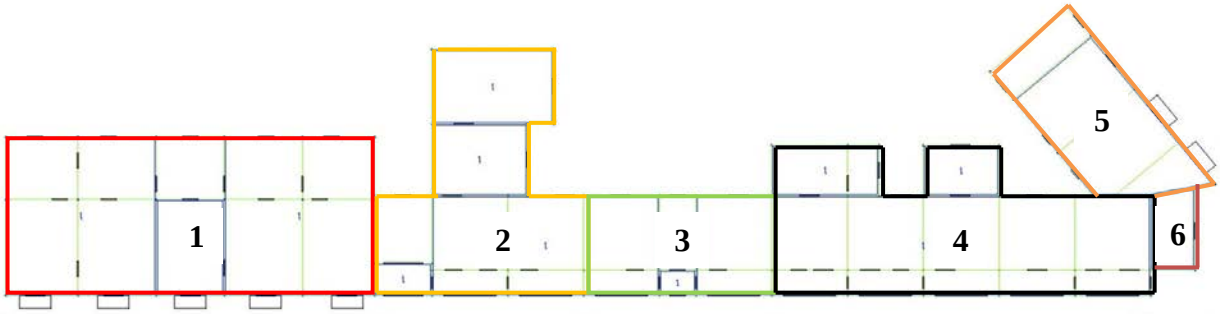

Fig. 4: The building aggregate under investigation.

- The building 1 (Fig. 5b) has a rectangular shape and develops on three floors above ground with a well dressed tuff masonry. The structure, which appears as the most impressive of the aggregate, is in excellent condition, being subjected in the past to restructuring and consolidation interventions. The floors are made of r.c structures and the flat roof is not practicable.
- The building 2 (Fig. 5c) has a polygonal shape with a substantial number of openings facing the road. The structure consists of tuff masonry in a good condition. Floors and roof are the same of the building 1.
- The building 3 (Fig. 5d) has a rectangular shape and it is perfectly inserted in the aggregate. The structure, made of tuff masonry stones in a good conservation state, has an open central staircase.
- The building 4 (Fig. 5e) has a polygonal shape and represents the structural unit of the aggregate with the most articulated plan. It has a façade with both openings that run inside and the presence of significant recesses. The masonry type is analogous to the previous loadbearing vertical structures.
- The building 5 (Fig. 5f) is positioned with an angle with respect to the aggregate horizontal alignment. It has a regular shape made of tuff stones in a good state of preservation.
- The building 6 (Fig. 5g) is the smallest S.U. occupying a corner position in the aggregate. It is different from the rest of the other units, since it develops on two levels above ground made of a masonry structure in excellent conditions.

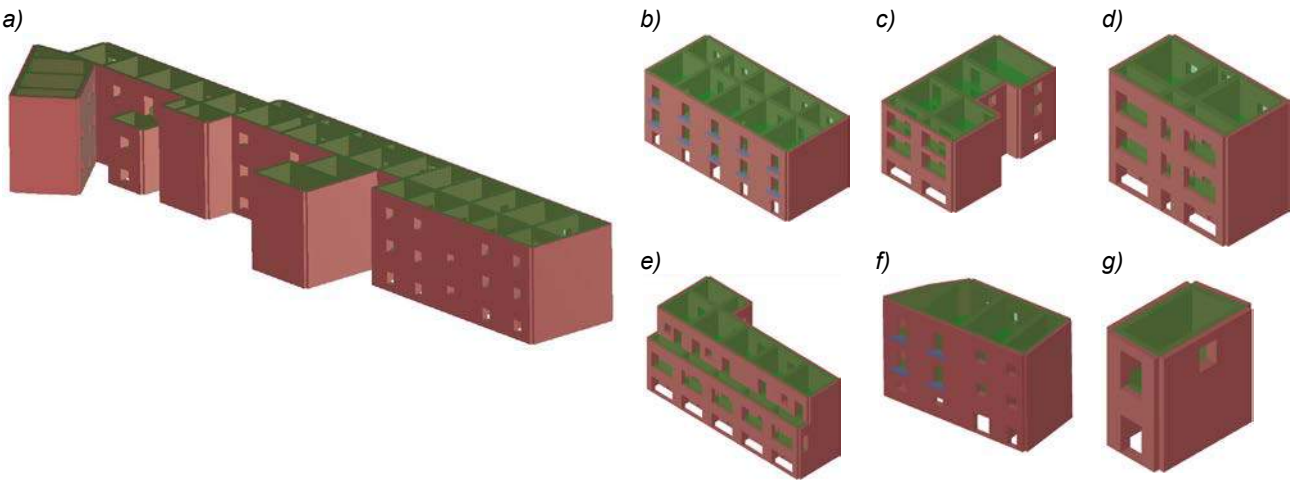

Fig. 5: 3Muri model of the building aggregate (a) and identification of the six S.U. (from b to g).

5. The quick analysis

The quick assessment procedure of the seismic vulnerability of masonry building aggregates is based on the form developed by Benedetti and Petrini. The procedure consists in attributing a score among four classes (A - B - C - D), to ten parameters representative of the geometrical and mechanical characteristics of the buildings. For each class, a score s_i is assigned and for each parameter, a weight w_i, that is the influence that the same parameter has on the overall structure vulnerability, is provided.

Moreover, in order to consider the interaction among constructions during earthquake, further five parameters have been added to the original form.

The additional parameters take into account the in plane and in elevation interactions among adjacent units, the presence and number of staggered floors among constructions, which give rise to hammering effects during earthquakes, the typological and/or structural heterogeneity among joined buildings and, finally, the difference between the percentages of openings among facades of contiguous buildings.

The extended Benedetti and Petrini's form on the basis of the above aggregate parameters is visible in Table 1. The applicability of this new form conceived for historical aggregates is shown in [10, 11, 12].

Therefore, for each S.U., the vulnerability index I_V is calculated as the sum of the scores individuated for each parameter multiplied by the respective weights. Finally, the vulnerability indices achieved for all S.U. are normalised into a scale ranging from 0 to 1, giving rise to the $I_{v,norm}$ values (see Table 2).

Table 1: Vulnerability form for historical building aggregates.

	Parameters	Class score (s)				Weight
		A	B	C	D	(w)
1	Organization of the vertical structures	0	5	20	45	1.00
2	Nature of vertical structures	0	5	25	45	0.25
3	Location of the building and type of foundation	0	5	25	45	0.75
4	Distribution of plan resisting elements	0	5	25	45	1.50
5	In-plane regularity	0	5	25	45	0.50
6	Vertical regularity	0	5	25	45	0.50□1
7	Type of floor	0	5	25	45	0.75□1
8	Roofing	0	15	25	45	0.75
9	Details	0	0	25	45	0.25
10	Physical condition	0	5	25	45	1.00
11	Presence of adjacent buildings with different height	-20	0	15	45	1.00
12	Position of the building in the aggregate	-45	-25	-15	0	1.50
13	Number of staggered floors	0	15	25	45	0.50
14	Structural or typological heterogeneity among adjacent structural units	-15	-10	0	45	1.20
15	Percentage difference of opening areas among adjacent facades	-20	0	25	45	1.00

Table 2: Normalised quick vulnerability indices of the aggregate S.U.

Building	**1**	**2**	**3**	**4**	**5**	**6**
$I_{v,norm}$	0.24	0.19	0.18	0.29	0.20	0.27

6. The macro□element numerical analyses

The seismic behaviour of the building aggregate has been studied by means of non-linear static analyses performed through the 3Muri calculation program. After assessing the seismic response of the isolated units (I.U.) along the main analysis directions, the behaviours of the units included in the aggregate (A.U.) have been evaluated, as already done in [13]. In particular, the aggregate S.U. response has been achieved step-by-step by considering as displacement the average value Δ_{medium} of the top nodes displacements δ_i:

$$\Delta_{medium} = \frac{\sum \delta_i}{N^\circ\, nodes} \tag{1}$$

On the other hand, the base shear V is considered as the sum of the piers base reactions $R_{i,j}$ of that unit in the step-by-step procedure along the two main directions:

$$V \square \Sigma_i R_{i,j} \tag{2}$$

The procedure, for the sake of representation herein applied to the building □ 3, provides the pushover curves of the A.U. shown in Figure 6, which appear to have the maximum base shears greater than those of the I.U.

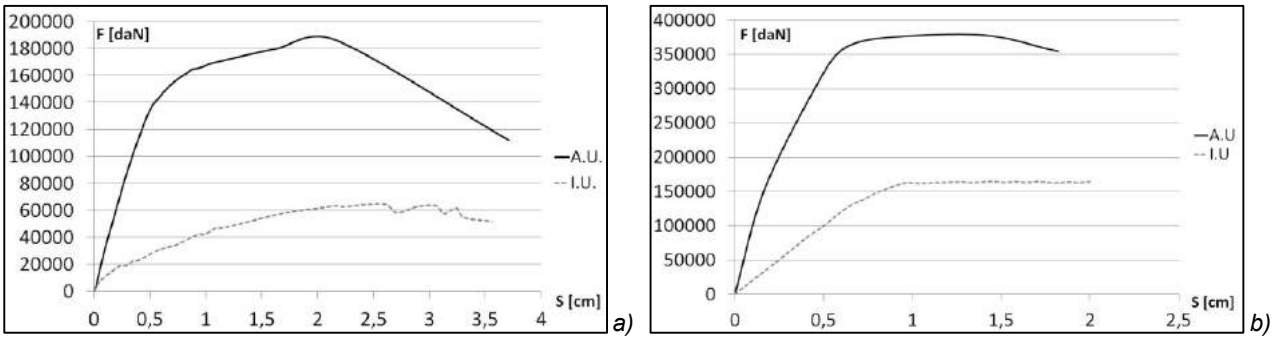

Fig. 6: Pushover curves for the intermediate S.U. in directions □ (a) and *Y* (b).

The evaluation of the vibration periods of the S.U. in the two main directions is done by inserting in the ADRS format the bilinear capacity curves (Fig. 7).

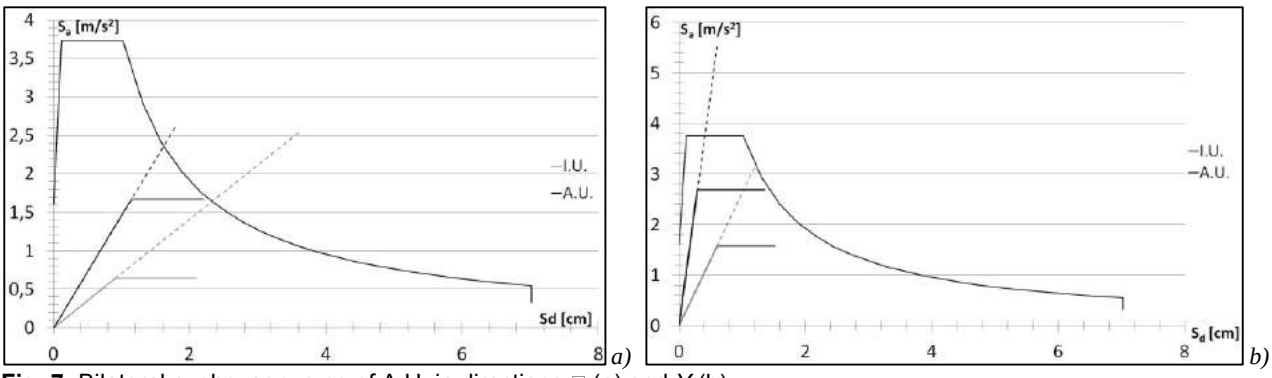

Fig. 7: Bilateral pushover curves of A.U. in directions □ (a) and *Y* (b).

Starting from the above graphical representation, once coordinates (S_a ; S_d) of the initial curve branch are known, the period *T*□of the A.U. is achieved through the following relationship:

$$T^* = \sqrt{\frac{\mathrm{Sd}}{\mathrm{Sa}} * 4\pi^2} \tag{3}$$

The calculation of vibration periods in directions □ and *Y* are reported in Table 3.

Table 3: Calculation of vibration periods of S.U. grouped into the aggregate.

S.□.	**Direction *X***			**Direction *Y***		
	S_a □m□s²□	**S_d □m□**	***T*□□s□**	**S_a □m□s²□**	**S_d □m□**	***T*□□s□**
1	3.744	0.0026	0.165	3.744	0.005	0.213
2	3.744	0.0063	0.257	3.744	0.0039	0.202
3	2.620	0.0162	0.493	3.744	0.0023	0.155
4	3.744	0.0082	0.293	3.744	0.0032	0.183
5	3.744	0.0020	0.145	3.744	0.0051	0.231
6	2.500	0.0010	0.125	3.744	0.0013	0.117

In order to compare the results in terms of vibration periods of the structural units in the isolated conditions with respect to the aggregate ones, suitable histograms in the two analysis directions have been plotted, as depicted in Figure 8.

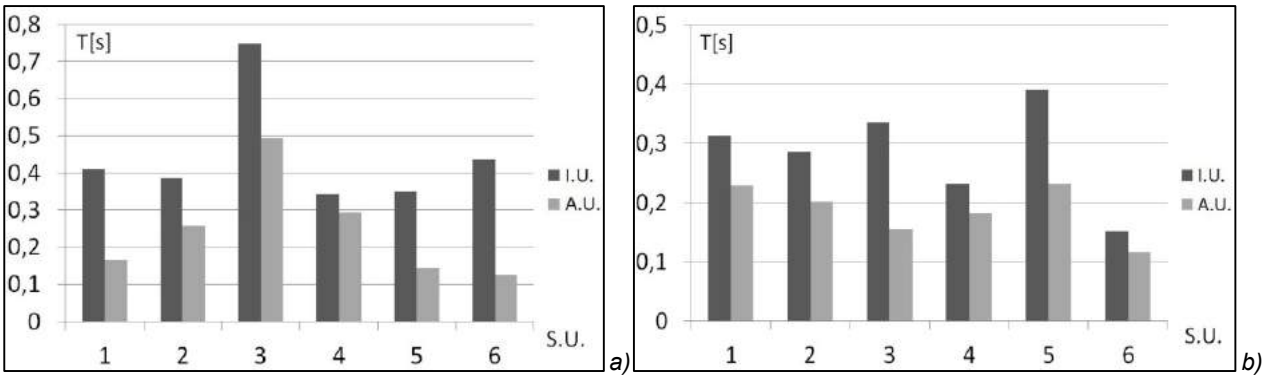

Fig. 8: Comparison of vibration periods among A.U. and I.U. in directions □ (a) and *Y* (b).

From this figure it is seen that single units have stiffness greater than that of the same structural units considered in the aggregate. Additionally, it can be deduced that in direction □ the vibration period grows for intermediate units, while in direction *Y* the period decreases for head structural units.
Finally, if vibration periods previously obtained are compared with the vulnerability indices derived from the vulnerability form for historical aggregates, it is demonstrate how the position of S.U. in the aggregate influences their vulnerability. In fact, it is noted that for the head S.U. the seismic vulnerability index tends to increase with the decrease of the vibration period, while for intermediate S.U. the vulnerability index decreases as the vibration period enlarges (Fig. 9).

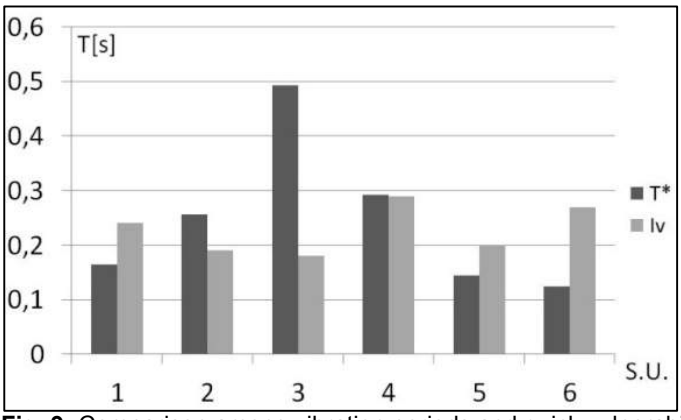

Fig. 9: Comparison among vibration periods and quick vulnerability indices for the investigated S.U.

7. Conclusions

In the current paper the seismic behaviour of I.U. and A.U. has been investigated through a combined simplified-numerical approach applied to a building compound in Bacoli.
The analysis results applied to the case study have shown that single units have stiffness greater than that of the same structural units considered in the aggregate.
Additionally, it can be deduced that in direction □ the vibration period grows for intermediate units, while in direction *Y* the period decreases for head structural units. Furthermore, in direction □ the head units have lower periods and, therefore, are subjected to seismic forces higher than intermediate ones. On the other hand, in direction *Y*, the opposite behaviour is achieved: the head S.U. (n. 1 and 5) are subjected to seismic forces lesser than those of intermediate units, so showing the beneficial effect of the aggregate condition.
Finally, the comparison between vibration periods and form vulnerability indices has shown that for head S.U. the seismic vulnerability index tends to increase with the reduction of the vibration period, whereas the opposite situation is detected for intermediate S.U.
However, the achieved results cannot be considered as exhaustive and deserve to be deepened much more. Therefore, as further development of the study, additional analyses on other building aggregates, also considering both bigger irregularity in elevation among adjacent buildings and compounds with different plan configurations, should be performed aiming at finding general rules for seismic behaviour assessment of single structural units within groups of constructions belonging to historical centres.

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To Preserve Them? Yes, but how?
An heritage and Degradation Case Study in Rio Maior, Portugal.

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Abstract
These houses are, after all, beyond what a house can offer to a hypothetical inhabitant, they turn out to be a kind of image receptacle that help build history about a particular period of chronological time and about, using the proper terminology, the "state of things"; the (vestige) house allows the various projections, as a hook on a wall can hang the most diverse things. The house is no longer (only) a home but also where it is possible to fix (our) imagination, and (our) memory; however, always a fiction.
"Both [memory and imagination] are in order of value, the union between image and remembrance. In this way, the house does not live only day-to-day in the course of a story. Our dreams, the various experiences of our lives intertwine and reflect the treasures of the old days. When, in the new house, the memories of the old dwellings return, we have been moved to the country of our childhood. We live fixations, fixations of happiness, says Bachelard in Poetics of Space.

Keywords: House, Preservation, Degradation, Architecture, Drawing.

To Preserve Them? Yes, but how?
An heritage and Degradation Case Study in Rio Maior, Portugal.

Our communication in this seminar could begin and end like this: "We live surrounded by objects, we live dependent upon them; and even our past is built through them."
One day the cathedral was white. One day the tree was seed.
The past was never like this; the past is only a projection, for lack of a better term, a *consciousness* that builds an image called time. Even if we want to live in the future, we imagine it as if it has already occurred, as a day already lived by us.
The past is *a set of vestiges*; and our notion of past, and furthermore, our notion of time is merely a relationship. What do we mean exactly by that? By a set of vestiges? By a relationship?
We inhabit the world through our body, and its interaction with other bodies and other "things": bodies that are similar to ours – the other(s); and other "things" that are not similar to our bodies - object(s), the non-objects.
The body, even unintentionally, leaves vestiges engraved in the world: our houses, texts, objects, even ideologies. Perpetuating the vestige of the body is akin to trying to perpetuate the body, which is finite and mortal: by crystallizing the-vestige-of-myself, in a way, I can tell the story of another body similar to mine, and I can, in a way, embody *other things*, making them a part of me, or at least, turning them into my own history, nature, substance or identity. Conserving a vestige, in a way, conserves his producer, and at the limit, is a way of building memory; and, through it, to model the past. From this point of view, then, the past was not, and never has been, so the past is the model which we now experience, at this present moment.
The vestiges of others are our heritage: we conserve their objects (some of them are already obsolete) – entwined with traces of others, that before us interacted with these vestiges, with the environment, despite other uses and / or other functions. We bury their dead bodies - vestiges of living

bodies which are now lifeless. (In some cultures people eat the flesh of the dead and inhale their bones when cooked, crushed and reduced into powder, in order to incorporate the dead person into the body of the living). We conserve houses and the vestiges of how the houses were inhabited. "Death [as Wittgenstein says,] is not from life". At least, in our western conceptualization of death, is implicit this physical and chemical process of the vestige´s conservation.
The vestige is "what is left" after death, a testament to the passage of another body from our world. The vestige is always an object - an object that, strictly speaking, doesn´t exist in itself; in other words, it is inert, it doesn´t feel, has no consciousness of itself, and strictly speaking, from our point of view, is not an object. It is not an object, in the same way, as the past is never as we describe it in the present. However, the residual of the object, the vestige, survives after the death of the other(s), and ends up taking the place of the other(s). The vestige is an occurrence; it is a representation, among other things, of the other(s). "Representation" in the sense that makes the other(s) become present; other(s) from the past.
Let's take for example a typical house: Salinas de Rio Maior, Portugal.

Fig. 1: “House”, Salinas de Rio Maior, Portugal.

Fig. 2: “House”, Salinas de Rio Maior, Portugal.

Fig. 3: “House”, Salinas de Rio Maior, Portugal.

Through the (vestige) house and its conservation, we can perpetuate the memory of its former inhabitants and their salt mining activities. To speak in a kind of "degree zero" of architecture: the primordial hut of Vitruvius, Filarete of Caramuel, Perrault, Laugier, Blondel, of Viollet-Leduc, Niemeyer and others; even the "Mortals" of Heidegger.

Imagine trunks of olive trees that are shafts of columns, olive branches that are chapiters, olive roots that are foundations, and little more: houses like this from eight hundred years ago. These houses, after all, turn out to be a pre-text (so we can talk about other things). These houses are, after all,

beyond what a house can offer to a hypothetical inhabitant, they turn out to be a kind of image receptacle that help build history about a particular period of chronological time and about, using the proper terminology, the "state of things"; the (vestige) house allows the various projections, as a hook on a wall can hang the most diverse things. The house is no longer (only) a home but also where it is possible to fix (our) imagination, and (our) memory; however, always a fiction.
"Both [memory and imagination] are in order of value, the union between image and remembrance. In this way, the house does not live only day-to-day in the course of a story. Our dreams, the various experiences of our lives intertwine and reflect the treasures of the old days. When, in the new house, the memories of the old dwellings return, we have been moved to the country of our childhood. We live fixations, fixations of happiness, says Bachelard in Poetics of Space.

Fig. 4: “House”, Salinas de Rio Maior, Portugal.

However, it is a fiction. Why *fiction*?
Because all that we can say / think about this house, for example, does not belong to the house, but belongs to the discourse about the house and only that; because our only way to deal with the complexity of what we call real is through representation, and paradoxical as it may seem to us, the discourse about the house ends up replacing the house; ultimately makes this house what it *means* to us.
Fiction is effectively a fiction, because there is no factual narrative of reality. We do not make this substitution only with this house, we do this with all things, we live like this and so we are like this: we represent the world.
Now we can say: "We live surrounded by objects, we live dependent on them; and even our past is built through them."

Fig. 5: “House”, Salinas de Rio Maior, Portugal.

Fig. 6: “House”, Salinas de Rio Maior, Portugal.

We built an image of the past through the objects left behind; we are - in the Western world – stuck to the physical permanent notion of objects and authenticity (for example, the temples in Japan are always kept young by small successive, ritual and cyclical reconstructions).
When buildings are the result of a design (project), then the task of building them is easy as it reflects their image: approaching the object, that we want to conserve, to the design which gave rise to it, it is guaranteed a certain originality or fidelity to its original appearance. Even when we do not own the drawings, we managed to detect the design of the building in the building itself, and the maintenance task is more or less clear regarding to the image of the building we want to keep.
However, there are cases, such as the Salinas de Rio Maior, where: there is no drawing (project) that gave origin to it, so, it is not possible to have a conservationist perspective for the *physical permanence* of the object, which puts into question our very notion of *authenticity*.

Fig. 7: “House”, Salinas de Rio Maior, Portugal.

For example, if a column of one of these houses rot or is eaten by wood decay, it will have to be replaced by another trunk of olive tree, different from the "original trunk", because and it is organic it comes from nature.
In evidence it is impossible to find, for obvious reasons, an entirely similar replica of the missing trunk, so, the object retained as a whole, it will be another over time. This house is a patrimonial object which changes: as the Japanese temples (always equal and always other).
Since 1177 this house is such as it is and it is not.
Conserving? Yes, but how?

Fig. 8: “House”, Salinas de Rio Maior, Portugal.

Fig. 9: “House”, Salinas de Rio Maior, Portugal.

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INVISIBLE NEGLECT

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Abstract
Our area boasts an immense architectural and cultural heritage enhanced, and restored, could become the first sector in which to invest, making it a source of profit. The institutions should enable good practices to raise awareness of the community for the development of strategies in the field of preventive conservation and support of studies and scientific research aimed at ensuring the best possible optimal storage conditions. The interventions will be aimed at the philological restoration and the reduction of the cultural invisibility phenomenon that affects many historic buildings. By engaging in the scenario of daily life not only the goods which are already enjoying the attention capably but also those "bound affectivity", looking both ways.

Keywords: look, immaterial, involvement, social, architecture.

1. Section
According to published reports on the future characteristics of economic and human development, it is theorised that in the next few years the process of interdependency between economy, culture and traditions will continue at a global level.
The new horizon deriving from the accumulation of immaterial capital and the challenge of human ecology oriented toward environment protection and people's dignity will be significant.
From the tale and the body of our cities it emerges that with regard to the restoration of historical protected buildings the biggest challenge, for some, is the lack of visibility. These are architectural works that represent invisible and visible heritage, real and ideal, which we should improve and pass on to future generations.
The ascertained cultural invisibility is a consequence of the isolation of the work, orphan of communication, followed by the image of neglect on the part of the institutions. In some cases it is the type of collections, exhibitions and all the operations, which do not express the most ample sign of the cultural heritage and social organisation of the place of reference.
It is the territory's duty to take into account the importance of the cultural layering and diversification representing the relevant work of the places, moreover in those routes lost in oblivion.
A dialogue between citizens and institutions has to begin in order to overcome the lack of sensitivity on this issue and to win over the anonymity. Inspiring interest and involving the users to overcome theoretical statements through precise actions, meeting places, multidimensional data and typologies, aimed at the place's understanding, for the enjoyment of the work.
Nowadays, in front of an ensemble of in progress knowledges, courageous intercultural information have to be triggered in order to restore the dignity and sustainability of the environment. Almost a watchword in the daily working to revive the world of images.
Creating platforms with a strong innovative character open to languages and in touch with the people to stimulate and broadcast the values and meaning of the work. This is the real ground on which to work.
Motivating and opening a door to the knowledge because the identity of a city can also be measured up by the works that overtime have characterised the place and that have made up the sense of belonging and of citizenship.
A strategic approach to the educational dimension enables to capture relational and network-related hues, to narrate with the strength and the power of images. So that every human being could discover

the transforming strength of a life with a window on heart-warming beauty. It is necessary to navigate and grasp at this entanglement pregnant with beauty and education in order to make civility and culture bloom.
A cultural heritage suffering from “splendid isolation” stands in my town, Nichelino, in the outskirts of Turin is the epitome, destined to be used as a countryside patrician residence, together with an Italian style garden, a park and an outside chapel. Situated in the centre of the Old Town, already residence of the Count Occelli, it was re-built at the end of the XVIII century, following the French occupation. A scarcely known place, but hiding exquisite decorated vaults.
It is a significant work in the town’s cultural heritage, finding consistency in the auspicated requalification project born at the end of the XVII century.
The building is U shaped, with the annexed cylindrical tower remembering the old structure of the castle. It articulates in three distinguishable and sober buildings, with the central block, two stories above ground, used as a residence and the lateral blocks used for services.
The face, essential in its figure, has an external yellow covering and it is enlivened by the cut of rectangular windows surrounded by columns, marking the disposition of the rooms inside. Contrasting the outside sobriety, the interior’s decorative fittings are very festive.
We can discover the artistic programme of the paintings, dating back to the time of the construction of the building and is inspired by classic mythology.
The Atrium, on the ground floor, is embellished by an agricultural scene, marked by the natural behaviours of Artemis and the Nymphs, while Actaeon spies on them and is already partially transformed in a deer.
The Chinese room is adorned by a vault sprinkled by stars and surrounded by canopies with oriental inspired scenes.
The tromp l’oeil of Diana’s room, representing the goddess whom, riding the chariot, leads Achilles in front of the gods, is surrounded by medallions with flowers and libations.
The sotto in s technique, used in the night scene of Love and Psyche, enclosed in the ovate is completed by weaving garlands of flowers contouring it.
The Galleria, a formal and celebrations room, reminds of the “Galerie des Glaces” in Versailles for its branches. In the vault and on the walls the iconographic variety opens out. The happy and serene scene depicting the countryside, with flowered mirrors, ends in the central frame, where feminine figures talk and enhance the bucolic celebration they take part into, Flora and the nymphs together with angels, fruits and flower symbolising abundancy.
The emotional journey continues on the first floor.
The rooms of the Vedute del Castello, show clear signs of degradation. At the base of the vault the deteriorated geometric design with medallions represent the possessions of the family.
The Mappamondo room, the vault wrapped by the geometric decoration that recalls the planisphere, is embraced by quadrature and pendants with landscapes views.
In the Cigni e l’Edera room, the figures play with the geometry to polygons that mark the movement. Here the iconological narrative of the cycle dedicated to the Diana myth is resumed: the swan is the 'symbolic representation of feminine grace and the ivy the emblem of immortality, which together symbolize eternal love. The painting shows signs of detachment in certain points.
The narrative of the Arti room presents the border adorned with flowers in which four pendants are inserted that branch out from a corolla formed by four garlands to which the medallions depicting the characteristics of the arts are hung.
In the Primavera room, the decorative repertoire continues the narrative of the myth of Flora goddess of spring flowers and flowering, The frieze that winds at the base of the vault is a floral pergola open to the sky and concluded with multicolored flowers that form a diamond figure. Nature, with its colours, its beauty.
It 'a distinguished and cultured home with great sensitivity for art confirmed by the use of secure caliber artists who worked in the nearby Royal hunting lodge of Stupinigi, masterful work of Filippo Juvarra.
The whole collection is in need of maintenance and restoration works, in particular the conservation of the paintings that decorate the vaults.
Now the time elapsed due to the inertia encountered by the actors must be recovered. Begin the restoration of the building and the consolidation of the wall paintings. As well as start the re-use process that breaks the isolation from the community, through a loving glance, to be fully immersed in the contemporary.
Sometimes preserving cultural property, placing it under protection, is not enough to ensure its continuation. A special scenario, that draws from all educational and social service aspects in view of the recognition and environmental visibility to the different scales, must always be activated simultaneously. Invigorate the collective identity to become a reference point and atmosphere for urban cultural life and punctuate the sense of belonging to the community.

The underlying question is to recreate the atmosphere of humanism and to make the contribution and the testimony of citizenship testable in the process of recovery of historical and artistic work.

Fig. 1: View of the compendium. Castle Count Occelli. Nickel.

Fig. 2: The main facade. Castle Count Occelli. Nickel.

Fig. 3: The Italian garden. Castle Count Occelli. Nickel.

Fig. 4: In front of the park and the medieval recall. Castle Count Occelli. Nickel.

Fig. 5: The myth of Actaeon. Lobby. Castle Count Occelli. Nickel.

Fig. 6: Chinese room. Sky. Castle Count Occelli. Nickel.

Fig. 7: Flora and bucolic feast. Castle Count Occelli. Nickel.

Fig. 8: Geometric wall painting. Castle Count Occelli. Nickel.

Soucers

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Capri's Charterhouse: an unforgettable site

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Abstract
Capri is an island full of wonders, one of the best is La Certosa di San Giacomo, a fourteenth century monastery, which has been transformed and neglected several times in the past centuries. This historical structure will be able to gain a new identity thanks to a project based on the consolidation and the valorisation of the areas fallen into ruins.
In accordance to the participatory planning, a survey among the islanders has been carried out to understand what should be the preferred choice for the future of the area. From this poll two major suggestions for the future use were outlined: the monastery as a meeting point for the islanders or as a tourist attraction with museum and exhibition area.
In order to solve the issues related to seismic safety, different software packages have been used to estimate the local and global failure modes that could take place, or are partially already in action.
An ordinary and extraordinary maintenance programme has been developed to be implemented in the following years, in order to make an optimization of the limited financial resources which are difficult to achieve during this period.
The approach used in this thesis, based on the definition of a plan of interventions over a period of time, could be adopted for many other cases, aiming to the conservation and the revitalisation of the historical and artistic heritage available all over Italy.

Keywords: Cultural Heritage, Sustainability, Structural Analyses, Renovation Project, Feasibility.

1. Introduction

The interest in historical monument is getting more and more frequent nowadays. This interest leads to projects to restore, recover and elaborate new functions for the buildings, in order to encourage the use of them and, as a consequence, the maintenance during the years. A company named Arcus S.p.A. for the development of art and culture was established on Mibac's initiative to this purpose in 2004. It started with the ambitious scope of works of providing financial and organizational support to important projects regard cultural heritage and activities.
The destructive earthquake in Abruzzo during 2011 highlighted how much Italy is highly seismic zone and how much the many historical buildings in the country are in danger. In order to take action against this problem Arcus focused their attention on the museums and all their valuable possessions implementing a project for their conservation and safety. The project was called "Verifica della sicurezza sismica dei Musei Statali" and it indented a list of the 46 museums in the most critical areas. These situations deserve a closer examination and diagnosis and monitoring techniques in order to prevent the loss of historical and architectural sites.
"Università degli Studi di Genova" took part in this major project with the seismic assessment and the risk evaluation of "Certosa di San Giacomo" in Capri. The site visit highlighted the status of serious degradation in all the building, even though it is in the list of the 46 museums chosen by Arcus to be part of the historical building to be examined. Indeed, a lot of areas are forbidden to the public access for security reasons.

Moreover, the public administration was not able to raise funds neither for the ordinary maintenance already identified and planned nor for the preventive extraordinary maintenance. This is due also to the fact that the monastery occupies a very large compound and therefore requires a very complex management.
In Italy, several historical monuments are in a status of progressive degradation that could cause the irreversible loss of significant parts of the national heritage. The main reason of this situation is the lack of funds to support many restoration projects. In addition to this there is a general unawareness and lack of interest of the people for many historical sites which leads the a not sufficient interest in taking care of these problems.
How is it possible to restore a cultural identity to the historical heritage? How can a restoration and conservation project for a historical building forge bonds between citizens and monuments to regenerate them?
The case study of the "Certosa di San Giacomo" is setting up as a model able to answer these questions. This approach could be adopted for many other architectural structures in Italy which show similar issues.
The first stage of the study was an investigation to learn about the monastery in many respects in order to understand the different constructive phases and the transformations: the architectural and historical point of view. In order to design a smart project that could be functional to the location where the building is situated, an important step was to understand the link that exists between the inhabitants and the area. Secondly, structural analysis were studied to guarantee the safety condition and to understand the feasibility of the project. In the end, a conservation and valorisation plan was carried out considering the results achieved from the previous phases.

2. "Certosa di San Giacomo"

"Certosa di San Giacomo" was built in the 14th century by Giacomo Arcucci, to honor a vow he had made. Some historical sources support that the monastery was built on an Ancient Roman ruins, but there aren't any evidences about it.
This building follows the Carthusian architectural rules, that reflects the main monk's precepts: balance between eremitism and coenobitism.
In accord with the order, the monastery must be isolated, that's why it was built on a sheer cliff facing the sea.
The Carthusian order is divided in two separate figures: the Fathers, who lead a solitary lifestyle, and the monks. This distinction can be visible in the architecture. In fact, the building is divided in two parts to allow the coexistence of both: "Casa Alta", composed by the church, the refectory, two cloisters and the Father's Cells; and "Casa Bassa", in which are located the monk's dormitory and all the other premises that are destined to guarantee the life inside the monastery.

Fig. 1: View of San Giacomo Charterhouse

During the centuries, this monastery and the Carthusian monks had a leading role in the story of the island of Capri. Several donations and privileges made possible two main constructive phases: the 14th century phase and the Renaissance phase. The first one saw the construction of the main parts: Father's cells, the church, the refectory and the cloisters. In the second phase, the Prior's Apartment and the Large Cloister as it can be seen today were built.

In the 16th century Capri was occupied several times by the Ottoman empire, that caused many damages to the island and to the monastery, forcing the monks to temporary abandoned it. They burnt the church and all the documents kept in the archive, inducing the loss of important historical testimonies. In order to restore the damage parts the monastery was rebuilt according to the second phase of construction, as state above. The Charterhouse became relevant once again, until the 19th century.
During the war between French and English, Capri was occupied by the French army who won the final battle. As a consequence in the 1808, the monks were sent away from the monastery because of the approval of the Napoleonic laws. The building fell into a state of progressive neglect.
After losing its original purpose, the Charterhouse has been transformed and some parts destroyed. The monastery became a military camp, then a home for invalid, at last a prison. These permutations compromised the original system, and today it's difficult to understand and recognize the Carthusian settings.

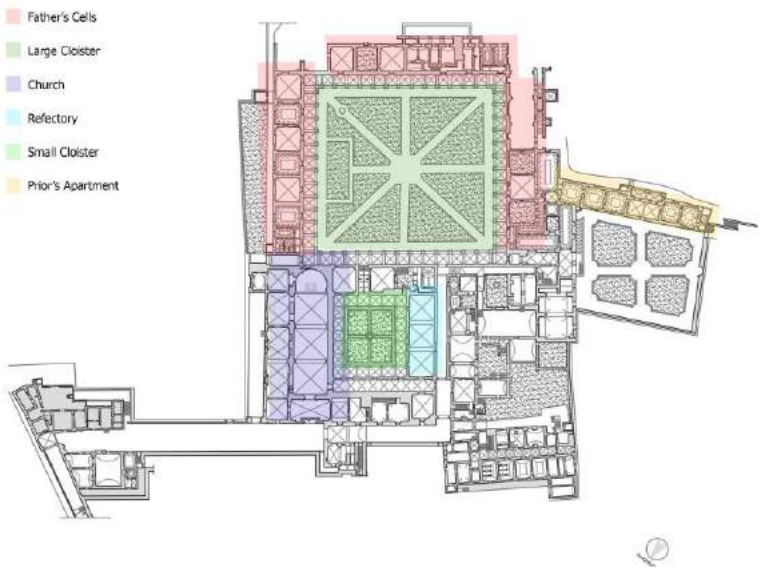

Fig. 2: Planimetry of San Giacomo Charterhouse

2.1 The 20th century's renovations

After changing many intended uses, the charterhouse became a national and historical monument in 1903. Since then, many restorations took place in the 20th century.
In 1927 the government decided to fund Gino Chierici's project, which included the removal of the sloping roofs of the church and the refectory and the elimination of the square pillars built around the slim columns during the centuries.
In 1970 Ministry for the Cultural Heritage wanted to transform this site in a museum complex. In this context, Roberto Di Stefano developed a big project, that involved all the Charterhouse. The project was soon abandoned and only a part of Di Stefano's plan was completed.
Today a new renovation is taking place in the areas occupied by the school, since 1930.

2.2 Present-day situation

In the present-day situation, the Charterhouse contains the Diefenbach's museum in the refectory and some temporary exhibitions in the other open rooms.
It's possible to visit some parts of the building, as the Prior's Apartment and Garden, the Large Cloister, the Small Cloister and the Church.
All the other areas are closed to the public and in state of decay, including the Cells around the Large Cloister in state of ruin, aim of the study.
The monastery's heart was the succession of the Cells and their gardens. In fact, in origin the Large Cloister was surrounded by 13 Cells, where the Father used to live. Each one was divided in different parts according to their use. At the ground floor, there were two rooms: Ave Maria, which was the prayer place, and Cubiculum, where the Father lived. On the first floor there was an area designated as work-room and as a storeroom. Each Cells had its own garden, where the Father could raise crops.

Today this succession doesn't exist anymore and most of the cells had been modified or destroyed. More specifically the west wing has been partially lost, while the east side has been converted in a school and the gardens have been covered by cloister vaults.
The area in state of ruin has been in part overbuilt, causing the total loss of the original Cells and gardens. Only one Cell of the 13 maintains the original aspect, whereas its garden has been completely reconstructed.

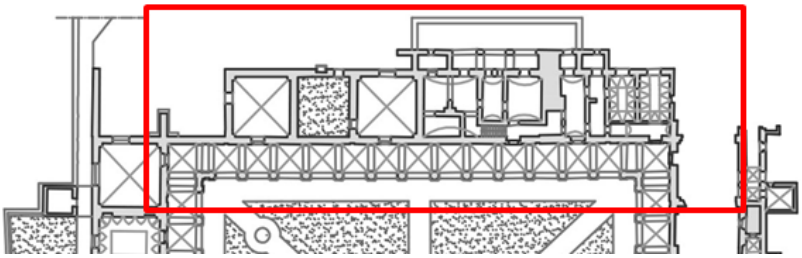

Fig. 3: The area in state of ruins, aim of study

The area of study has a strategical importance, due to its position. In fact, it is the first thing you see when you enter the Large Cloister and in addition it connects the monastery to the public garden, that faces the sea and the Faraglioni. For these reasons, this area was chosen for our project.
A recovery and revitalization project has been developed, starting by structural analysis.

3. The conservation and valorisation project

A renovation project of an historical heritage aims to protect and preserve a monument. However, it is necessary to assign a new intended use to the building, in order to avoid a new state of degradation which is not acceptable nowadays. In fact, today it is very difficult to obtain a project financing due to the economic crisis of the last years and a project without a well-defined objective is not acceptable and it would be considered a waste of money. The research of a sustainable use of the building is mandatory, to guarantee a new identity to all the historical building subject of the studies.
In this context, the sustainable intended use concept has a dual meaning. On one hand, the new destination of use shall be such that could be managed by the Administration. In other words, it means that this concept is bond to an availability of financial resources. On the other hand, it is necessary that this function is structurally sustainable and it is compatible with the historical construction. The renovation project does not have to alter the structural behaviour, but it has to allow the development of different uses from which it has been designed for.
In conclusion, a new intended use must be supported by a structural feasibility. A dual process of back analysis is implemented. In fact, both the intended use and the structural feasibility have to be validated to make the result suitable and realistic.
These observations have been the starting point for the development of this project. The design is focused on the areas of the Charterhouse fallen into ruins. This zone was chosen because of its central position; it is between a park overlooking the sea and the Large Cloister.
A potential network of architectural and cultural attractions, such as Villa Lysis, Villa Jovis, Casa Malaparte and Certosa di San Giacomo, exists on the island. Capri is famous for its natural sceneries, that is why it is a sought-after tourist destination. For this reason the island should focus its attention on this architectural network in order to increase tourism. This could be possible if the administration creates a shared management for these historical buildings, optimizing the resources and promoting growth of tourism (Guerritore and Totaro, 2015). This goal would bring tourist even in winter. In fact, it is known that Capri is very crowded in summer, but it is almost deserted during the cold seasons. This network wants to create a tourist attraction that could take place during the whole year. Furthermore, a better knowledge of the history and the architectural qualities of the buildings would guarantee a better consciousness for the maintenance of them. This could insure an interest from the government as well and, eventually, an European development fund.
An essential component for the promotion, the conservation and the valorisation of the site is the involvement of the local people. This can be seen by the citizens as an awareness of the cultural heritage. Besides this, the knowledge of this historical inheritance induces to the participation in activities which could extend the common sensitivity in protecting cultural assets. For this reason, a survey among the islanders has been carried out to understand what should be the preferred choice

for the future of the area. In fact, if the new destination purse would be not useful, the building would fall in a state of decay again.
This participatory planning underlined some important issues that helped to find out what really people know about the monastery and what they would like it to be today. In particular, the majority of the participants have been in the Charterhouse but they have no knowledge of the architectural rules and historical events of the monument. On the other hand, they are interested in a more specific touristic guided visit to learn more about the building and its history during the past centuries. Furthermore, in order to have a wider view of the monastery, they believe that it would be right to reopen the remote areas to the public.
All these thoughts suggested the two main destination for the building: the monastery as a touristic attraction with museum and exhibition area and the monastery as a meeting point for the islanders. This poll was carried out through internet in several social networks. A Facebook page was created to promote the survey.
The survey underlined that the Charterhouse's history and architecture is not known by most of the commoners, but they showed an interest in learning more about it. In fact, today the monastery is known only as Diefenbach's museum and the venue of temporary events. Today a visit to the site is not finalized to know more about the monastery and the it is proven to be confused and dispersive.
A tour with a touristic guide and the availability of information panels would allow the visitors to appreciate the building as a Carthusian monastery and not only as an art museum. To make this possible some rooms will be reserved to provide general information about the history of the building and its architectural rules. Interactive audio-visual devices could be used in order to make the visit much more attractive and interesting. Touch screens, audio guides and multimedia totems could be used to reach this aim. The creation of a database of all the areas and of the artworks will help the tourists and the academics to acquire the information (Nicolette Mandarano, 2009).
In addition, in order to create a concept similar to the period of the monks' occupation and to provide the environment of how the Fathers used to live, one Cell could be converted into its original setting. This idea took place from the results of the poll, which underlined the fact that the original configuration of the Cell around the Large Cloister is not available anymore to the public. The nucleus Cell-Garden was the main pattern of the Carthusian monastery but because of the many reworking it is almost impossible to find it.

Fig. 4 5: Render of the exhibition room and the tourist area in the Large Cloister

The site where the building is located is very large and it is very close to a public park. This suggests that other activities could be organized besides the museum. The survey highlighted a tight bond between the commoners and the Charterhouse. This is due to the fact that, for almost 100 years, part of the building was occupied by Capri's high school before the school was transferred to another building because of security issues therefore new generations do not have any more this possibility. The risk that this site could be completely abandoned could be overcome by the use of the building with new functions that would bring the monastery again in the islander's everyday life, it would be important to create a meeting-place for adults and children.
The lack of entertainment for young people is a big problem for the island. In fact, a lot of them move to other cities and the those remaining usually go to Naples looking for entertainment. For these reasons the rest of the building could be converted in recreational areas for any age but especially for teenagers and children.

In the past few years in many cities worldwide an adventure game called Escape Room became very popular. This game is based on a Japanese online game and it consists in a real-life room escape game which requires players to work together to solve hidden puzzles to escape a locked themed room before the time runs out. Groups consist of 2 to 6 people and participants have 60 minutes to solve the enigmas. This new concept gives the players the opportunity to use their intuition, teamwork skills and intelligence to accomplish a unique and challenging task. This game is for people of all age and skill sets. In fact no special knowledge is needed. It is possible to participate several times thanks to the many themes that can be used in the game. The monastery could be used for this game and the interesting theme could be the "Abandoned Monastery". The game is quite popular in Asia, the US and several European countries.
To create a project that took care of all ages, a few rooms would be addressed to welcome the children. It could be a space were parents would be able to leave their kids during the museum tour, during the adventure game or simply when they need someone to look after them. This place would give an opportunity to families, even from different parts of the world, to meet and get to know each other in a light-hearted way. These rooms would become reading and drawing areas and to recall the monks' lifestyle botanic workshops would be organised in the gardens. The arboretum would be recultivated with the different aromatic and medicinal herbs and information about their property would be given during the workshops. The public garden would be renovated so that it could be used as a relaxing place.

Fig 6 7: Project of the kids' room and public garden

At present in the building there is no refreshment area where visitors can buy food or drinks. A small food court would be necessary to make the place a more pleasant and friendly place for tourists and local people which would use this as meeting point.

4. The structural feasibility

A conservation and valorisation project of a historical site requires a structural analysis to be a viable plan. According to the legislative decree 42/04 art.6, enhancement consists in those activities that intend to promote the knowledge of the cultural heritage and to insure the best condition for its use and all those activities that guarantee a good management and a correct maintenance. To reach this goal the Italian law applies structural studies with ordinary loads and seismic forces.
There is a very large number of historical architecture built in masonry. These constructions are characterized by a very complicated mechanical behaviour. This is due to the fact that masonry is a composite building material made buy bricks or stones and mortar. It has a brittle response in tension with a tensile strength considered almost null and it is anisotropy (Roca, Cervera, Gariup, Pelà, 2010).
The stage of knowledge was essential. In fact, the research of the different constructional phases revealed several building materials. The investigations and the diagnosis analysed the buildings features. These together with the observations of the state of damage have been the starting point of the analysis.
For what concerns Capri's Charterhouse three analysis were developed: a local and a global seismic analysis and a static analysis. The results were achieved with the support of two software based on the Italian regulations: "Norme tecniche per le costruzioni 2008" and the 2011 decree "Linee guida per la valutazione e la riduzione del rischio sismico del patrimonio culturale con riferimento alle Norme Tecniche per le costruzioni di cui al decreto del Ministro delle Infrastrutture e dei Trasporti del 14 gennaio 2008".

4.1 Seismic Analysis

The observation of the behaviour of the large population of historical masonry building showed that rarely they have a global response during earthquakes. They usually have a local failure due to the loss of structural equilibrium of different parts that is visible in shifting and rotation movements. It is very common that the historical heritage has gone through many transformations during the centuries and as a consequence they have experienced several damages. These two elements often are the reason of these local losses of equilibrium.

There are two different collapse mechanisms according to the plane in which they response:

In-plane: the failure is due to the achievement of a define resistance value;

Out-plane: collapse is due to the loss of equilibrium.

The buildings response to seismic loads is related to the capacity of the walls and to the connection and how the load transfer effects due to the floor and roof diaphragms. If the connections between orthogonal walls and between walls and floors are not in good conditions or do not exist anymore, it is not possible to prevent the activation of local failure modes (Lagomarsino, Penna, Galasco, Cattari, 2013).

The Italian regulation requires both local and global analysis in order to guarantee the safety of a building.

To accomplish the local analysis, the monastery has been divided in macroscopic structural elements, based on the observation of damages and cracks in the walls, of the development of the different part of buildings and based on the comparison with similar buildings.

The local mechanism analysis is approached by equilibrium limit analysis. This method is based on the idea that single structural portions can develop independent seismic behaviours. This methodology allows the estimation of a static horizontal load multiplier that causes the activation of each mechanism (kinematic chain). The minimum of them shows the building vulnerability to local collapse modes (Magenes and Penna, 2011).

These have been studied using the software MC4LOC, of the MC4software.

In order to guarantee the correct functioning of the software, a 3d model was created with Autocad 3D. The reliability of the model is important because it ensures the correct results of the analysis. The software requires the input of some parameters, such as the location, the ground's features and the building's peculiarities. The method, used for all the macroscopic structural elements, is based on the identification of the performance in case of:

- simple rotation,
- simple rotation with a proper wall-to-wall connection,
- simple rotation with link metal chains,
- simple rotation with retreated kinematic chain.

The results of these analyses were all satisfied. This statement shows a good local behaviour that makes possible to focus on the analysis of the global response.

As mentioned above, the global seismic response is strictly related to the intrinsic capacity of the wall. This is why it is necessary to study these phenomena with a proper 3D model, which considers the interaction between the structural parts.

The Italian code (NTC 2008) uses two hypotheses:

1. Infinitely stiff diaphragm
2. Use of the equivalent frame model to idealize the masonry walls.

The regulations give both the possibility of linear and nonlinear analysis, but the nonlinear static analysis is the standard one. According to this method the structural response is described by the pushover analysis. This curve is then converted in a capacity curve, which is the comparison between displacement capacity of the structure and the displacement demand. Both this parameters depend on the building's structure and the earthquake characteristics (Lagomarsino, Penna, Galasco, Cattari, 2013).

Different failure mode can occur:

- rocking-crushing, due to a flexural behaviour;
- diagonal cracking, due to a shear behaviour;
- bed joint sliding and diagonal cracking through joint, due to a shear behaviour.

Examining the masonry buildings after an earthquake it was noticed that the damages were all concentrated in limited parts in proximity of windows and passages.

These studies brought to the conclusion that it is possible to schematize the walls with macro-elements and adequate modelling strategies.

The model used by the software 3MURI, by S.T.A. Data, is the equivalent frame model. The global analysis was carried out thanks to a 3D model created accurately by the programme. This modelling strategy idealizes the wall in frames, in which deformable elements are connected to rigid nodes. The structural components are identified in piers and spandrels. The piers are the main vertical resistant element and the spandrels are secondary horizontal elements between two vertically aligned openings.

After creating the 3D model 3MURI generates a mesh, following the “equivalent frame model”, which runs the analysis. The output shows a response at 24 combinations of load, which are all verified.
The results of final analysis are obtained comparing the drift required by the code and the maximum drift that the structure can offer. The codes follow three different levels of analyses:

- Lifesaving Limit State (SLV);
- Damage prevention Limit State (SLD);
- Operational Limit State (SLO).

4.2 Static Analysis

The static analysis has been executed with 3MURI software. The 3D model, created to study the global response, can be used also for this analysis.
In accordance with the Italian code, the program carries out three different tests:

- the slenderness of each pier,
- the eccentricity of the acting loads,
- the resistance to vertical loads.

In the study case only one of the results was not satisfied, due to the eccentricity of the acting loads on the wall. There are two possible solutions to solve this problem. On one hand the thickness of the wall could be increased, but this operation would cause an increment of the stiffness of the entire complex. This would compromise the seismic analysis, reducing some parameters. So this action is not suggestible. On the other hand, it is possible to reduce with metal chains the acting loads of the barrel vault that weighs down on the wall.

5. Conclusions

As a first consequence the environment in which the historical monument is located, has to be considered, as the studies done and of the study case show. In spite of the national relevance that the building could have, it’s important that the choice of the new sustainable intended use must be determinate in accordance with the local people.
The plan of educational activities, knowledge and conservation of the cultural heritage would let the citizens make full use of the building. These ideas will make possible the creation of a bond between the historical monument and the locals and the development of a sensitivity of maintenance.
Secondly assigning a sustainable intended use means to implement structural analyses to find possible causes of degradation.
In the study case, the results highlight the fact that the state of damage is not a consequence of insufficient resistance but it is related to years of desertion and negligence.
The methodology proposed is one of the many approaches that can be followed for historical and cultural heritage. The difficulty to maintain this type of historical structures shall not be an obstacle to make full use of them.
A good planning and an accurate study of the potential intended uses would allow a better handling of the financial resources. These actions might stimulate the placement of new financial support by the administrations.

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Design for Furnishing to Enhance the Routes in the Spina Verde Park in Como

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Abstract
Spina Verde Park extends across the hills to the north-west of Como, brushing alongside the Swiss Canton of Ticino. Starting from the valley that is home to the walled city of Como, it rises up to Monte Caprino, its southern spur provided by the fortified walls of the medieval Baradello Castle, while the archaeological remains of the pre-Roman settlement are nestled in the western slopes. In addition to the historical and archaeological wonders, a vast wooded natural area rich in flora and fauna typical of the Alpine foothills can be found just near the city. Despite having long been the focus of great interest and planning by the administrations, the park is currently suffering difficulties concerning its use and communication. The deterioration that has affected its signage, the equipment in the parking areas and the furniture elements, and the general problem with the management and recognisability of the park's visual identity poses a challenge for the designers. This text presents some of the experiences that emerged from the project carried out within the context of researches and educational courses in Furniture Design at the Politecnico di Milano. The different product types (signage, rest areas, items of furniture such as benches, tables, fountains, panoramic deck, walkways), were developed within the context of the development and enhancement of the natural, archaeological, scenic and panoramic trails, aiming for a wider, more attractive experiential and sensory enjoyment of the park in order to attract a larger number of visitors.

Keywords: Product design, Cultural heritage, Historical routes. Furniture design, Brand of territorial systems

Fig. 1: A panoramic view of the city of Como from the top of the Spina Verde Park, from Sant'Eutichio Cross.

A contribution to the enhancement of the territorial systems brand

Spina Verde Regional Park, established by the Lombardy Region in 1993, is located on the border of the pedestrian route known as "Via Regina" that twists and turns from Como, skirting the Lario up to the Splügen Pass. The park extends across the hills to the north-west of Como, brushing alongside t he Swiss Canton of Ticino. Starting from the valley that is home to the walled city of Como, it rises up to Monte Caprino, its southern spur provided by the tower and fortified walls of the medieval Castello Baradello, while the archaeological remains of the pre-Roman Golasecchiano settlement in Pianvalle are nestled in the western slopes. In addition to the historical and archaeological wonders, a vast wooded natural area rich in flora and fauna typical of the Alpine foothills can be found just minutes from the city. Furthermore, the geomorphological and hydrological structure of glacial and alluvial origin (typical of the sedimentary outcrops of Gonfolite) confers on it a special geological interest. The park is dotted with lodges, farmsteads and viewpoints connected by trails that run along ridges or cross over crests, each one providing a captivating way to engage with the peculiarities and the natural, historical, social-archaeological, sporting and cultural aspects of the sites.
Despite having long been the focus of great interest and planning by the administrations sharing it (the Municipalities of Como, San Fermo della Battaglia, Cavallasca, Parè and Drezzo), the park is currently suffering difficulties concerning its use and communication. The deterioration that has affected its signage, the equipment in the parking areas, and the elements of street furniture, and the general problem with the management and recognisability of the park's visual identity poses a challenge for the designers. This text presents some of the experiences that emerged from the project carried out within the context of researches and educational courses in Furnishing Design at the Politecnico di Milano, Polo Territoriale di Como. The different product types (signage, rest areas, items of furniture such as benches, tables, fountains, panoramic deck, walkways), were developed within the context of the development and enhancement of the natural, archaeological, scenic and panoramic trails, aiming for a wider, more attractive experiential and sensory enjoyment of the park in order to attract a larger number of visitors. The design thus becomes a flexible and effective instrument for enhancing itineraries and the communication of cultural and environmental heritage, as well as for the regeneration and recovery of areas marked by high quality but nevertheless requiring re-enforcement, re-development and re-launch in terms of their mode of use.

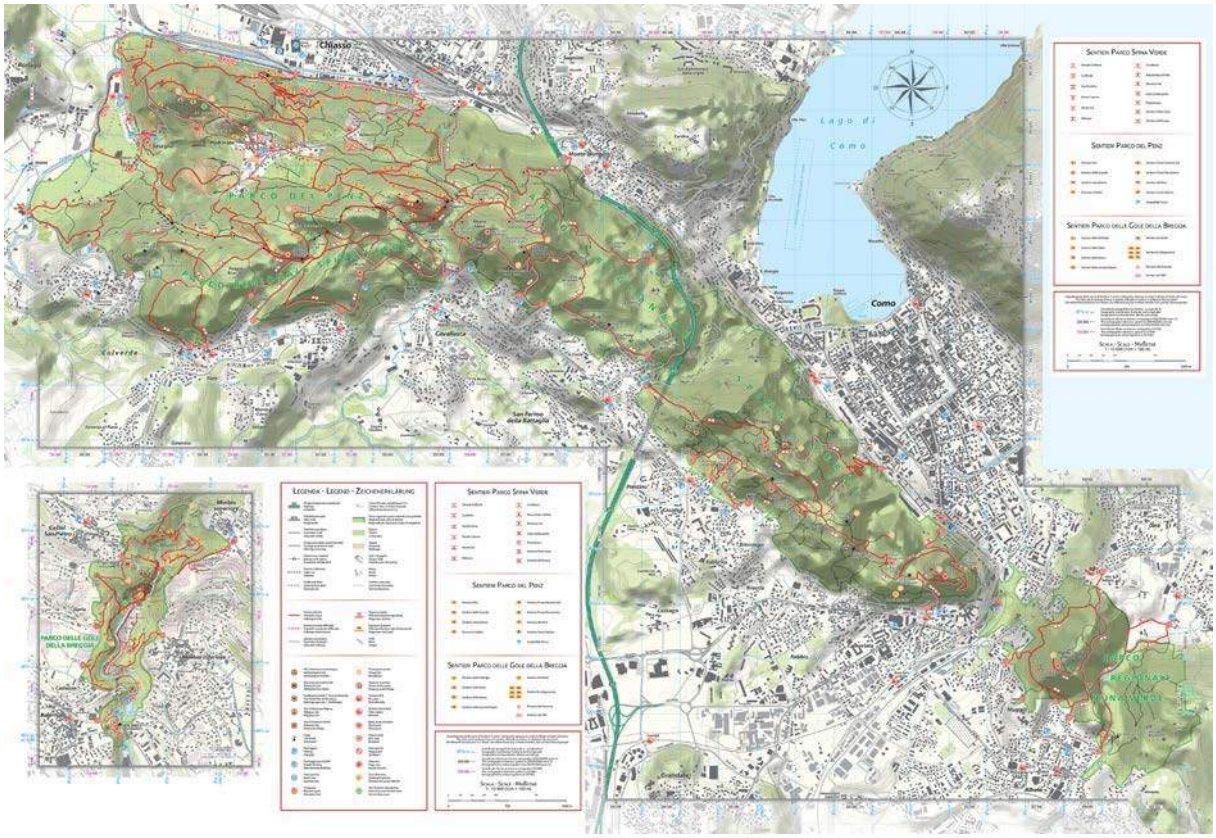

Fig. 2: The Spina Verde Park Map updated to 2016 indicating the itineraries, points of interest, paths and routes, with the ability to export enlargements of portions of the map and each one of the 13 tracks.
Source: http://www.spinaverde.it

The assumption that it has set itself is supported by the theoretical general background questions: how to build the identity of a territory? how you communicate the whole of its offer? as they represent the values that define the uniqueness of a region? The territory cannot be considered only from a geographical point of view, we are now in a mature phase to develop new ideas and professionalism aimed at the enhancement of territorial wealth.
It is now increasingly evident as the new competitive dynamics affecting the territories are increasing the weight and importance of the territorial offer strategic communication processes and their implementation. The attraction of investments and resources, as well as the management of expected cash flows (tourists, hikers, industrial and commercial operators, citizens) requires communication policies that:

- enhance the identity and specificities of the different territories;
- leverage the territorial capital, understood as a complex of tangible and intangible elements that make up the local supply system;
- tell the distinctive character and identity through brand unified policy and coordinated actions. The territorial fragmentation into different components and actors, also poses forcefully the issue of management and organization of the entire communication and marketing process.

In this context, the university integrated research with the experimental teaching can provide useful insights to administrations and managing bodies of the territorial areas to strengthen the identity of the places and the assets contained therein.
The areas examined and included in the Spina Verde Como Park require an integrated set of measures to promote the use on the local and supra, making the attractive park with respect to a broader pool of users, those categories of users with specific references and varied interests.
The research development phases have been divided into three steps:

- Analysis phase, data gathering and fact-finding information. Of each leg of the route they were carried out surveying in the field trips with operations, photographic documentation, research in public and local entities, acquiring information about the history, the forest agronomic characteristics and the elements that characterize the cultural landscape and the natural beauty that denote different paths.
- Definition phase of the brief and concept generation. They were identified case studies and best practices related and similar to the characteristics of the analysed sites and guidelines defined for the generation of identity and product concept system to enhance the tourist itineraries.
- Product Development phase system. In the planning phase have met the determinations of matter, formal, typological, production of the product-system in the various joints of the artefacts (visual communication artefacts, industrial products, fittings architectures read, rest areas furniture, supports the signs, etc.).

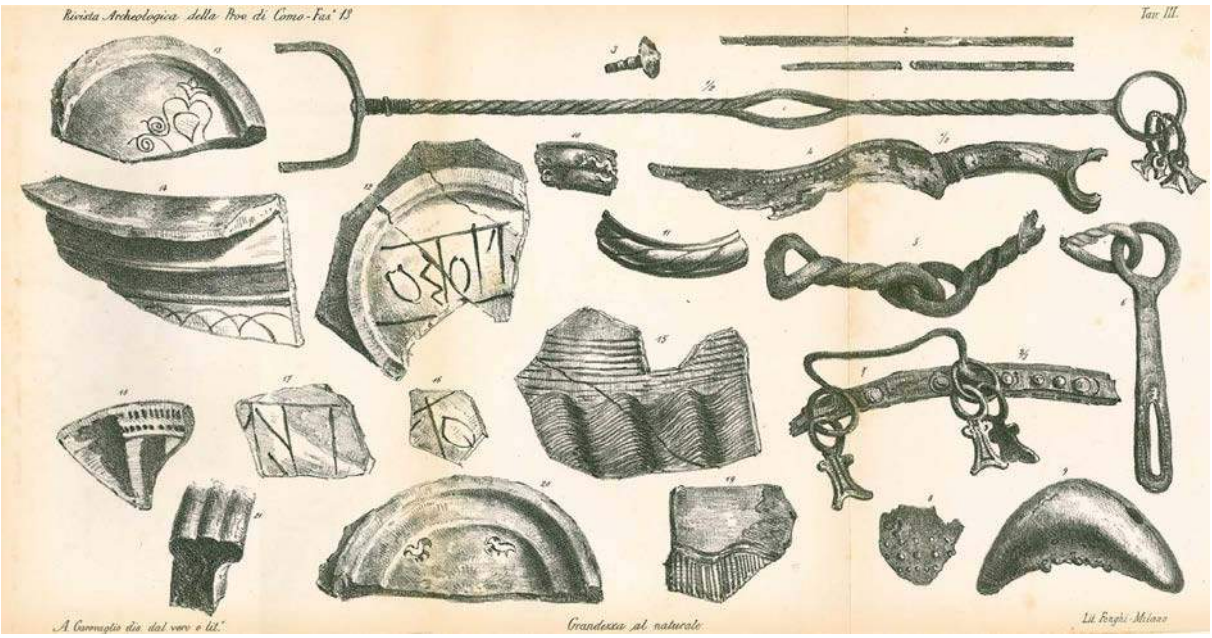

Fig. 3: Table attached to the "Archaeology Magazine of the Province of Como" File 13th, July 1878, documenting the new discoveries in the Rondineto farm (Breccia) from July 1877 onwards. They portray bronze objects, tools, utensils, pendants, cyst, shards, and fragments of vessels.

The purpose of this essay is not so much to illustrate the broader issue that Spina Verde has come to acquire in the imagination of Como's citizens, as it is to consider to which extent and with which strategies the design may perform a role of retrieval and enhancement of a state of deterioration and abandonment of such a significant area for the urban fabric (it is a land area of about 1000 hectares, with a perimeter of approximately 30 kilometres in close contact with the city of Como and neighbouring Municipalities). On this topic, there is an extensive documentation, starting from the archaeological discoveries made since 1877 of the pre-Roman settlements and necropolises in the proto-historical built-up area of Comum Oppidum, the Roman conquest under M. Claudio Marcello in 196 BC, the early medieval fortified system that led Federico Barbarossa to build the Baradello Castle in 1158 on Byzantine structures from the sixth century, the settlements and agricultural crops that from the year 1000 until the seventeenth century revolved around scattered rural settlements (the farms of Respa□, the Elisa, Pianvalle, and Monte Croce huts), around the monasteries of San Carpoforo and the Abbey of Sant'Abbondio, the development, in the sixteenth century, of Villa Odescalchi in Monte Caprino and the imposing Villa Giovio in Breccia, the era between the two wars that saw the creation of a carriageway up to the Baradello tower and the realization of Parco delle Rimembranze in 1934 within the scope of landscape protection requirements for the area manifested by the new General Town Plan, where it was stated for the first time that the hilly area sloping down to the lake may be subjected to close surveillance and entirely subtracted from edification; all the way down to the present day in which, since the sixties under the impulse of urban studies and the onset of critical awareness about the issues of safeguard and protection of the environment and the urban landscape, Como has been one of the first Italian cities to equip itself with planning tools and tools for protecting the old town. (Exemplary in that regard is the bulky contribution on the historical-typological survey of the Walled City conducted by Matteo Gianoncelli and Gianfranco Caniggia, a research promoted by the Municipal Administration in 1968, 1969 and 1970, under the guidance of the Mayor Antonio Spallino). This period saw the creation of a competition for Como's tourist centre and surrounding areas that earned broad international resonance. It saw on the expansion along the slopes of Brunate and Spina Verde a potential for developing the old town, and claimed a political role for urban architecture in order to define new scenarios and strategies to develop the vocation, not just productive, of Como after World War II (which based its economic wealth on the production cycle and the finishing cycle of silk and silk fabrics), although, during an era that saw inroads by the pressing phenomenon of spare time it based itself, in defining a possible future for Como, on tourist and conference reception and on the attractiveness of a catchment idea, not merely local and regional, but relating to Central and Northern Europe, along the trajectory of which Como is historically situated (we may think of the great thoroughfare of Roman penetration of Via Regina that, going through the city of Novum Comun, and crossing over the Alps by Pass Spluga, reached Coira for it to then advance into Gaul); besides the city, the foothill area gravitating around the lake.

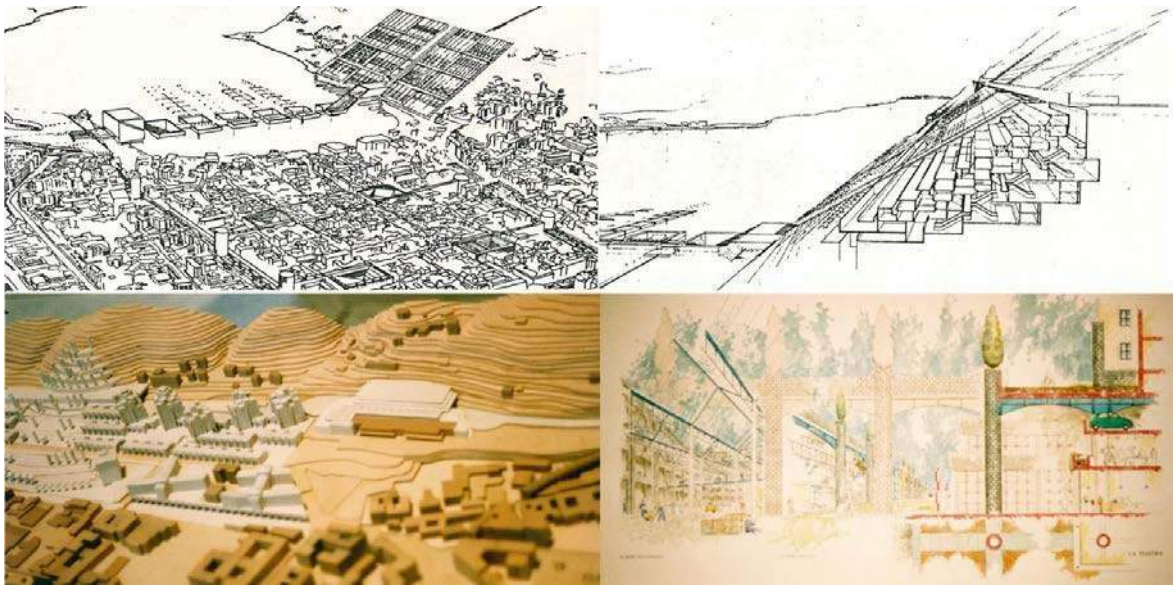

Fig. 4: *Above:* Competition for the tourist centre of Como, a project by Emilio Battisti, Salvatore Bisogni, Giampiero Calza, Sergio Crotti, Mara De Benedetti, Giuliano Della Pergola, Gigi Lanza, Lorenzo Spagnoli and Giacomo Vaciago, 1970. *Below:* Municipality of Como, the Urban Redesign of the "San Rocco-San Rocchetto- Freight yard of State Railway", a project by Roberto Gabetti, Aimaro Isola, 1993.

Fig. 5: Photographic documentation of some of the ongoing degradation: abandoned waste, loose signs, barriers remains, piles of rubble, tires, soiled panels, discoloured newsstands, unrecognizable figures, narrowing the path not removed due to a landslide, disconnection of funds, weeds and bushes, make the trails incapable of being treaded.

The design competition was an opportunity to test different approaches to the urban architecture plan, concerning which debate was at that time raging (emblematic in that sense the projects submitted by the Belgian group, by the Soviets and by the Italian group made up of Emilio Battisti, Sergio Crotti, and Franco Purini, projects in which, despite the diversity of linguistic proposals, we could discern a common approach to the development of the city by involving the hilly slopes, crossing the lake with floating containers or megastructure proposals with a metabolic flavour aimed at creating an interference between urban fabric and the surrounding green and, simultaneously, a decongestion of the walled city).
1976 saw the publication of a bulky study commissioned by the city of Como to a group of town planning architects, economists, landscape architects, geologists, botanists, archaeologists, highway engineers and transport experts, which amounts to the first systematic contribution to knowledge of the ridge and an impulse towards the recognition, institutionally as well, of the territorial park, within the responsible bodies.

Fig. 6: Photographic documentation of acceptable yet confused situations, that could be improved upon: uncoordinated signs, heterogeneity of signage aids for materials and graphics, not attributable to unified concepts of visual identity, media sometimes without other illustrative panels, furniture, structures and equipment o f uncoordinated shape, materials and finishes, failure to comply with the need to emphasize the "inputs" to the Park, inadequate appreciation of the sequence of the "Park of Remembrance".

The area is studied under different landscape, environmental, landscape painting, agricultural, forest, crops and vegetation, geomorphological, natural, historical, archaeological, typological, hydrogeological and highway engineering determinations, without neglecting to put forward a range of proposals that obviously affect the surrounding city as well, the creation of service and information centres, the formulation of routes and the reorganization of spaces and new designs down to the management procedures.
Sensitivity to the use of the architectural competition tools resurfaced in the nineties, that saw the launch of a competition on invitation attended by Luigi Snozzi, Roberto Gabetti and Aimaro Isola, Guido Canella, Enrico Mantero, in order to plan the urban redesigning of the San Rocco section and the freight area. This area, located tangentially on the sidelines of the Cosia stream, next to the railway and near Spina Verde represented and still represents, given that, after more than two decades, the redevelopment of the area is yet to be defined from scratch a testing ground for ideas of city that, through a dialogue on dialectics, nature and artifice, between mutually clashing fragmentary models of cities, and forms of paleogenetic dualism between old town and workplaces (along the banks of the Cosia stream we could find a concentration of factory works, textile mills, dyeing plants for yarns and fabric print houses), aim at bringing about a “stitching” of the city with the green of hills, letting nature descend to the bottom, into the folds of the urban fabric, then letting the Roman city climb back until it meet the less man-made section of the city, postulating a fusion between the two different systems, the urban system and the agronomic one integrated into the architecture (Gabetti-Isola project).
After a thirty-year long gestation, in 1993 a regional law finally established the “Regional park of metropolitan belt called Spina Verde”.
Since that data, notwithstanding the far-reaching debate that took place, and the consolidation of the park management structures, the ancient heritage of the primacy of protection and preservation needs that exclude throughout the area or strongly limit the new design interventions and the abandonment of the more enlightened designing choices of a systemic reconfiguration towards a re-appropriation a vehicular, albeit controlled, one of the restricted area (currently the vehicular access is prohibited throughout the area, subject only to a few exceptions that nevertheless strongly limit its use) lend to Spina Verde a nearly abandoned character, with a low degree of awareness and use on the citizens’ part and, generally, a sense of non-recognisability of the identifying values and value-based communication of what is contained therein. Within this context, highly dense due to the many layers of meaning and sense, the research we are presenting focuses on clearly pinpointing what might be the role of design in channelling these values, making them perceptible and tracing them back to a unifying logic of enhancement and communication even more than mere preservation, as the latter aspect is deemed thoroughly investigated.

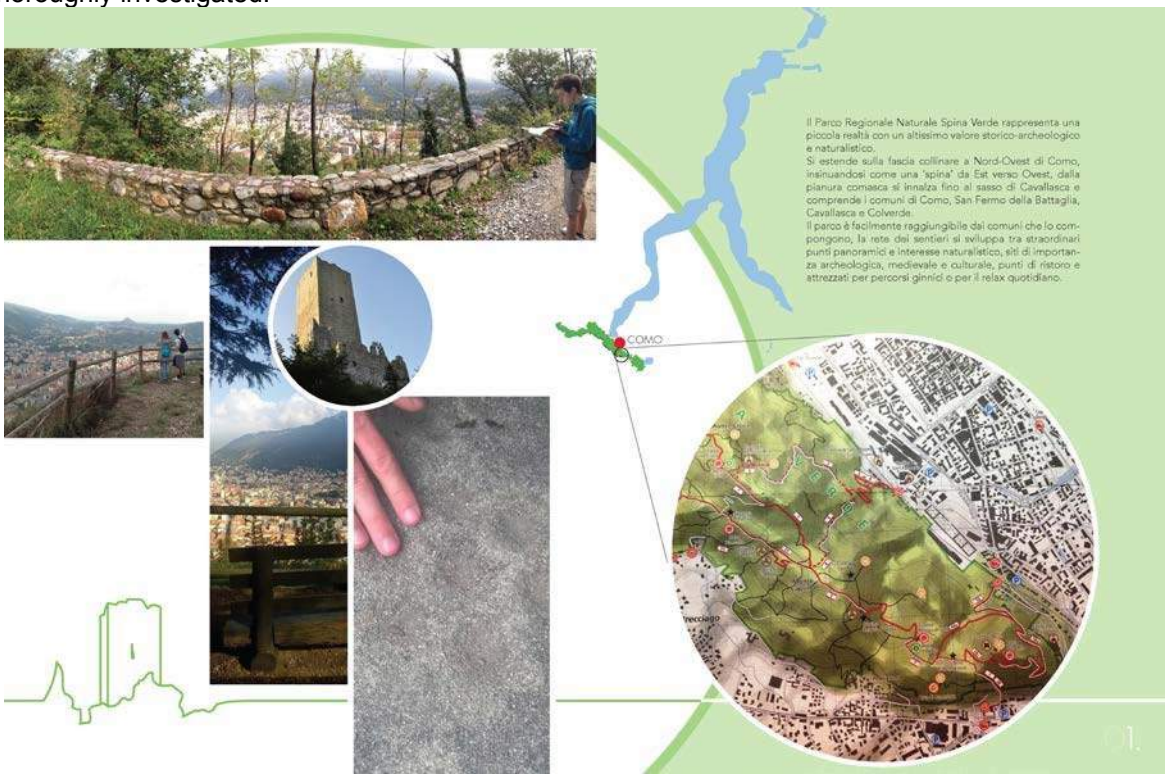

Fig. 7: The phase of analysis and perception of the environment in situ: cartographic analysis, reliefs of pre-existing environmental, historical documentation, problems and issues encountered during the visits and inspections.

Currently, the Park Authority boasts a consolidated institutional structure situated in Cavallasca (CO), is equipped with a Statute, a Plan or Regulation of use, and has endowed itself with territorial planning tools that envisage enabling rules divided per specific sectors: villas with gardens, agricultural, tourist, archaeological, fauna-related, geological and fire prevention areas. It can count on corps of volunteer eco guards, organizes events and demonstrations and, recently, has embarked on a redesigning of the official website. The park is structured along 13 itineraries, each of them with its own individuality and peculiarity: Dorsale Collinare, Confinale, Sant'Eutichio, Monte Caprino, Monte Goj, Valbasca, Cavallasca, Naturalistico di Parè, Percorso vita, Colle del Baradello, Protostorico, Porta Sasso, and Sentiero dell'Acqua.

Besides the consolidated institutional approaches, our approach to the issue was to first of all investigate onsite the legibility of the values the park should convey to the community, identifying, once strengths and weaknesses have been gathered, which tools and methods design, as project discipline, might offer to combat scenarios of degradation, eventually arriving, despite the limited resources and university research scopes, at the formulation of proposals on the reconversion of phenomena underway .

We accordingly began with an inductive analysis of the factual state, carrying out site reconnaissance, interviews, researches at bodies and institutions, and especially testing through in loco inspections the conditions that in some instances proved to be striking. They may be synthetically described as follows:

- Heterogeneity of signage aids (totems, tables, materials, writings, fonts, colours, direction indicators, etc.) and information panels;
- Lack of uniformity in the design of equipment for rest and recreation (benches and tables, fences, etc.);
- Scant presence or absence of waste containers along routes or rest areas;
- Poor maintenance of pedestrian paths and roads, detours hardly indicated;
- Inadequate planning of rest areas and scenic spots and their delimitation;
- Potentially hazardous conditions on the roadsides overlooking cliffs or precipices, insufficiently indicated or needing to be secured;
- Lack of night lighting of pedestrian paths or lack of field of view at least in the critical spots;
- Eclecticism and "spontaneity" in construction choices and the factual condition of the existing tourist operators and hospitality buildings, not subject to periodical checks on the quality of building maintenance interventions or any possible superfetations (unlike the new interventions that are, by contrast, subjected to a strict and thorough control of building quality, such as the recovery and restoration intervention on Cascine Respa□di sotto (below) used as guesthouse and catering service for school classes and hikers, and Respa□di sopra (above) currently used as Lodge for Associazione Alpini);
- Scant incentives for the construction retrieval and enhancement of real estates that the municipal and supra-municipal territorial planning has subjected to a duty;
- Insufficient emphasis of accesses to the park □gaps or entry "gates" □and contact points with the urban road network (nodal interchange points).

What we are presenting are the partial results of the researches underway, integrated within an educational process, that have been preceded in recent years by a wide-ranging and in-depth research across a broader and trans-border territorial scope undertaken as part of the INTERREG program called "I Cammini della Regina. Percorsi transfrontalieri legati alla via Regina", of which Parco Spina Verde, being crossed by and located tangentially to the route, is a not negligible part and, in some ways, a departure point for those wishing to pursue this route starting from Como.

Fig. 8: Brianza project for food and wine appreciation: installation of a stand for the tasting of local products that recalls the typological characteristics and the materials used in the construction of rural farmsteads (wicker, terracotta, cobblestone, brick diaphragms for ventilation of the barns, rustic plaster, oxidized iron, hay bales). Project by Samuele Dell'Oro, Mattia Ferraro, and Jason Furlan.

Fig. 9: Project of gastronomic valorisation of Montevecchia. Design of the furniture to be placed along the route to relaxation and enhancement of scenic spots (signage totems, seat elements, temporary seating). Project by Chiara Bianchi, Gioele Dassi, and Fabiola Laccisaglia.

Among the various proposals put forward in the Final Synthesis Laboratory coordinated by professor Roberto de Paolis with Luca Dellera and Emanuele Lupidi, the project group made up of Stefano Alberti, Luca Nodari, Andrea Pusineri and Marco Tosoni is emblematic of the methodological complexity where multiple design ideas have arisen. They mainly concern the construction of equipment and park furniture designed to promote the use of the routes and the enhancement of existing structures. The furnishings are of recognizable design, the uniformity of the choices of the materials and the compositional logic of the formal elements built a strong and recognizable visual identity while participating harmoniously in the natural environment. The project is focused on a few points of privileged interest inputs, road signs, parking area equipment (tables, benches, litter bins, fountains), the equipment of sights (panoramic sun), the pathways and installing " Sheet ", the facilities for the enhancement of the archaeological areas of the town of Pianvalle, rock Prestino, big room, (walkways, guided tours, information panels).
We extract from the report of the designers a few highlights of the project description.
The area of the park we considered starts at route 10 in the South East of the park. This path culminates in the Baradello tower and the homonymous hut, through the Cross of St. Carpoforo, and is connected to the first path that intersects Respa□ hut and Monte Croce hut, along the axis of the ridge throughout the area examined by us. At the summit of Mount Caprino, from one winding path on the south-west path 11, which leads to paleo-historical sites, and on the north-east paths 3 and 4, leading the city through historical religious stages, as the Sant'Eutichio cross. The choice of materials is not random: the selected woods growing inside the park, such as oak, chestnut and black locust, juxtaposed to metals, in particular core-ten steel. The result is a perceived chromatic harmony, non-invasive, provided by texture feature Cor-Ten steel coupled with the warm colours of wood, but also a contrast in materials lent by the artificial coldness of the metal in relation to the natural component of wood.

Fig. 1□: Project of natural pedestrian route of Via Regina, where the traveller can acquire, before departure, a reading of the territory, a kit (carnet for sketches, map, bag for the collection of gourmet products offered alongthe way), through the path identified by coordinated signage and rest areas. Project by Marco Alfano, Jole Belgiorno, Simone Bonanomi.

Fig. 11: Strategic design for the enhancement of the Spina Verde Park. Corporate identity, study of inputs, signage, benches, tables and chairs, baskets, fountains, sound installations (percussion and wind harp), panoramic deck, guided paths and walkways for visiting the archaeological area. Project by Stefano Alberti, Luca Nodari, Andrea Pusineri, and Marco Tosoni.

The furniture collection is offered in perfect harmony with its surroundings, the warm tones of the core-ten and wood are combined effectively with the natural environment. The bending and the bending of steel plates allow the creation of original shapes by the lowest number of pieces possible. Through an appealing yet sober style, we are going to "redecorate" and retool the park giving a good reason for any visitor to stay a few more minutes.
The entrance is designed to enhance the now abandoned access and is topped by a roof that integrates a map of the park. The property is closed in on itself, but its cross does not preclude the view of the woods thanks to the cut in the slab window.

Along the chosen route of Spina Verde, different types of signs are encountered. In particular, we have distinguished two different types of signals to indicate the different paths that the visitor will come across: primary paths, secondary and educational-cultural interest. The bench designed for the collection of furniture is part, together with the basket, of the basic stop inside the park, so it is placed along much of the dialogue and stands out for the entire route. Its strength lies in its ability to be combined with a mate and give birth to a rest area consisting of a table and two benches and the collection of furniture design of the basket and the standpipe. The area is in fact rich with water springs (for example the Mojenca source) that can be easily channelled up to the taps. As regards the sights, we studied the most comfortable seats, which can be exploited for a longer stop to enjoy the view. The overhanging roof shelters those who rest from sun or rain, thus providing the dual function of stop and shelter area. Walks along the historical and cultural places of interest and main footpaths are accompanied by a 'hearing experience that blends with the natural sounds of the forest' and also increase the possibility of interaction with the surrounding nature. Due to the materiality of "musical instruments" they are wedded to the colours of the forest appearing as non-invasive equipment, but thanks to the sounds they emit due to human or natural elements such as participation in the wind and rain, the amplify the sensory experience inside the Park and actively involve the visitor who is allowed to participate in a multi-sensory experience. The pivot points and bifurcations of the trails are marked with interactive sound objects. Among these, the wind harp is a stringed instrument that takes advantage of the movement created by the wind to vibrate the strings and generate sounds that are amplified through a sound box. The instrument is designed to be attached to trees and accordingly be more exposed to the wind. The resort of Pianvalle is located halfway up the eastern slopes of Mount Caprino, hosting the ruins of part of a large proto-urban settlement that has developed along the southern slopes of Spina Verde from the tenth to the second century. BC. The heyday is related to the intensification of trade relations between continental Europe and the Mediterranean, particularly with the Etruscans. During the fourth century BC, the village was progressively abandoned: upon victory by the Romans, a coalition of Insubri and Comensi, begins the slow process of Romanization that will lead to the foundation of Novum Comum in the convalle lake (59 BC).
The Prestino rock has several sandstone sediments, perhaps part of a single rock partially covered by vegetation. This is divided transversely into two by an ancient road recognizable by deep traces, traditionally called 'cart tracks', but most likely left by cargo sleds considering the short distance between the two parallel grooves. Signs are also found in other areas of the Spina Verde and relate to ancient links between the various settlements dating back to the late Iron Age. At the same site, you can see engravings dated between the late Neolithic and the Early Bronze Age.
The "rock rooms" are the oldest remains of dwellings found in Spina Verde, dating from around the first millennium BC. Study of the still visible remains, comparison with similar structures in the Alpine and similarities with ancient types of local construction, the 'Masun', strongly suggest hypothetical reconstructions. Rooms are quadrangular, with two or three parts carved directly into the rock; the others were probably builtwith stone or wood. The preserved part is on a lower floor used for such purposes as barn or storage, above which there was a second floor that served as a dwelling. For the exploitation of these findings, we have predicted guided paths, walkways for reaching less accessible points and explanatory tables.

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Building materials and "spontaneous" building methods. The seismic response of the technical elements in L'Aquila city centre

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Abstract
In the study of the protection of architectural heritage from seismic risk, an important issue is the good knowledge of the formal, functional, constructive and structural elements characterizing the historical architectures.
The earthquake, which hit L'Aquila city center and the surrounding towns in 2009, permitted our understanding of anti-seismic building methods and related technologies adopted in Abruzzo in the past. All of them testify to a building knowledge that we can describe as "spontaneous", based on observations and rules handed down by means of oral tradition.
Considering the importance of the regional features and of the local building traditions in the creation and the application of building strategies, the paper aims to analyze the techniques and the constructive components linked with town-planning, as well as the material and the structural elements characterizing the city of L'Aquila.
Tie- beams, rue, *radiciamenti*, bolted trusses, different types of archways and wooden elements are only some examples of the systems analyzed in this paper, emphasizing the skilled workers' ability in the research of requirements linked to the geometry of masses theories, material ductility, the wall connections and the reduction in weight.
Finally, this analysis relates the different technical elements mentioned above with the attainment of the Ultimate Limit State in the seismic scenery, highlighting both strengths and weaknesses.

Keywords: knowledge, preservation, historical centers, seismic risk, spontaneous construction techniques.

1. Knowledge of the seismic history
This paper seeks to analyze urban, materials and structural elements characterizing the city of L'Aquila, relating to the geographical context and the seismic history of the place, not omitting the last event that struck the city in 2009.
In fact, regarding security and preservation of architectural heritage against seismic risk [1] an important issue is sound knowledge of the formal, functional, constructive and structural elements characterizing historical architectures. A detailed dossier of notes and information on the composition of the object of interest, the building type and the aggregation logic, the construction systems, the quality of materials used and the differences between them, the structural types, the building health conditions and the stability is achieved through analytical and historical-critical operations.
These analytical procedures and data from them are essential in understanding buildings. They are a solid basis, not only for conservation actions and possible redevelopment of the historic areas but, also, for the evaluation of the asset's health status and to understand how environmental risks act and condition layered construction in the architectural typology construction.
The current legislation [2] recommends an adequate knowledge of structure for the evaluation of seismic safety and upgrading projects. These data may be obtained by recognizing the rule of art and by reconstructing history in relation to seismic events, as well as through the phases of relief and mechanical characterization of the constituent materials.

More attention should be given to the analysis of construction techniques, considering ways of building typical of a specific territory and identifying the geometrical and material characteristics of the individual components as well as their assembly. The historic buildings, in fact, were not built using the modern scientific principles of mechanics of materials, but using intuition and an observation-based approach. Using the equilibrium of a rigid-body and experiencing the behavior of ancient buildings, proportions criteria in geometry and execution, configurable as the “rule of art” were gradually honed. Although this approach is not scientifically rigorous and can be considered reliable only if used within the limits of validity, recognizing the rules of art in a construction can be an initial assessment of the building's safety. These construction systems, defined as “spontaneous”, show a territorial specificity that depends on progressive refinement in the use of locally available materials, and on reliability dictated by the “testing” of history, of which the very existence of the construction provides testimony.
The analysis of historical earthquakes, which hit an area, constitutes a strong interest indicator providing information on conditioning of the event on local building techniques (for example with the enactment of building codes with anti-seismic value). Such an investigation is, therefore, an essential reference to understand certain features of the built environment. Although, in some cases, the destruction is so great as to form a starting point for new reconstruction (such as the disastrous earthquake of Messina in 1908), in other cases the occurrence of events determines several consolidation interventions and, more in general, the development of structures aimed at improving the seismic response, depending on the seismic consciousness. The knowledge of the historical phases of the built heritage, therefore, grows through: the identification of the ancient work of post-earthquake consolidation, their location and the structural elements involved, the construction period and the verification of their effectiveness over time. Thus it can be highlighted that on seismic constructive culture, in a specific geographical area, economic factors weigh, but mainly the level of land-based hazard and the recurrence of earthquakes. In high seismicity areas, characterized by a quite frequent recurrence of violent and significant earthquakes, the experience has brought about the development of effective manufacturing solutions for the reduction of vulnerability, which successively become an integral part of building rules.
By relating the buildings' story with seismic events, we could analyze and verify the possible collapse mechanisms [3]: identifying, in fact, the most significant and traumatic happenings and the corresponding effects, supported by verifiable documents, it is possible to extract information necessary to determine the status of damage that occurred in the past and that could probably occur in the future. Exemplary is the comparison between some historical images of the earthquake that struck L'Aquila in 1915 (better known as the Marsica earthquake) and photos after the earthquake of 2009: the mechanisms and visible damages are mutually comparable and almost identical.
A first step in cultural heritage knowledge, then, refers to the research of historical documents showing earthquakes through the centuries and the damage that it caused to the constructions, in a particular area. Frequently, in fact, from documentary sources we may extract an abundant information on the seismic effects on edifices, on the consolidation techniques in place, on materials, as well as exclusively historiographical notes. It could therefore be profitable to link data from the INGV historical catalogs [4], in which we read temporal and geographical locations of the most important seismic events, with historiography, archival and bibliographical news reporting details about the damage, the materials and techniques.
From an exegetical reading of catalogs and historical sources, it emerges how much L'Aquila has been, over the centuries, shocked and devastated by destructive earthquakes. In addition to that of 1315, estimated magnitude 6.0 with epicenter in Sulmona, and that of 1349, probably consisting of a seismic sequence of events with various epicenters in the regions of Lazio, Abruzzo and Molise, other earthquakes have struck the city of L'Aquila, with extensive damage, in 1456, in 1461, in 1703 and in 1915, prior to that of 2009. These seismic historical sequences have greatly influenced construction techniques, allowing the development of a mature seismic culture and later reinforced on the different episodes; probably only towards the end of the last century.

2. “Spontaneous” building methods in L’Aquila

The earthquake, which hit L'Aquila city center and the surrounding towns in 2009, allowed our understanding of the anti-seismic building methods and the related technologies adopted in Abruzzo in the past. All of them testify a building knowledge that can be described as “spontaneous”, based on observations and rules handed down by means of an oral tradition.
Considering the importance of the regional features and of the local building traditions in the creation and the application of building strategies, the paper aims to analyze the techniques and the constructive components linked with town-planning, as well as the material and structural elements characterizing the city of L'Aquila, emphasizing the skilled workers’ ability in the research of requirements linked to the geometry of masses theories, material ductility, wall connections and the reduction in weight.

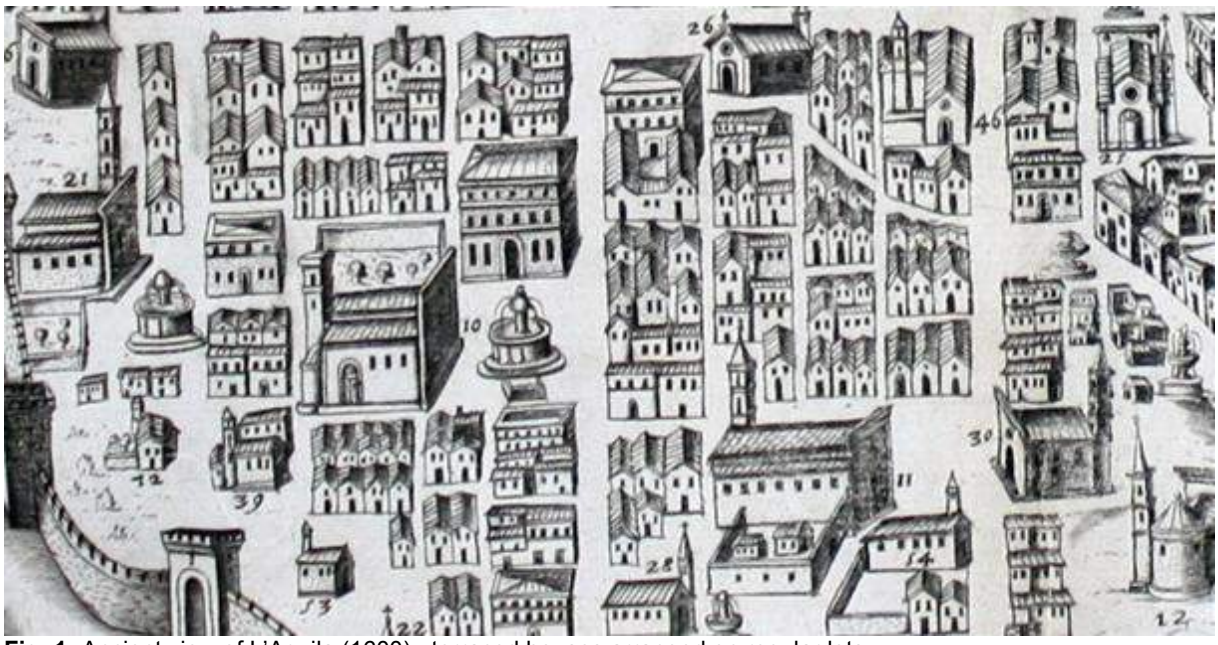

Fig. 1: Ancient view of L'Aquila (1600) : terraced houses arranged on regular lots.

A first analysis should be performed in the urban plant in L'Aquila by referencing, not only to what is still visible and what emerged after the last earthquake, but, also, by comparing the present configuration with ancient views representing the medieval city; this to highlight the composition of the city at that time and the following transformations. L'Aquila, in fact, despite its Renaissance style and its many majestic buildings that belong to the *palazziale* type, boasts a medieval foundation [5] (or rather a second reconstruction) set to a regular and orthogonal grid according to two main axes, *cardo* and *decumano*, recognized as "*maglia angioina*". This axiality could be read mostly in historical depictions of the city [6], where sporadic buildings stand out and stand on a base fabric mostly composed of terraced houses arranged on regular lots, designed by road. The *rue* or *rughe* are recognizable in the poor building fabric: mainly used to remove rainwater from the roofs, and served, even in static functions, as technical separation joints between adjoining buildings. The recast of several elements and the thickening of the urban fabric that occurred over the centuries, most since the earthquake of 1703, led to the almost total disappearance of *rue*. So, today these elements are clearly visible only in sporadic cases, but many are brought to light in the post-quake reconstruction sites.

Fig. 2: Examples of *rue*.

It can, therefore, emphasize the importance of an anti-seismic urban plant; goal pursued also by paying attention to the relationship between the heights of buildings and streets, to the presence of many empty urban spaces and to isolated building lots. Over-road arched or *supportici* employed in the past had the same purpose, namely to eliminate the forces between the opposing fronts of

buildings. That expedient, surely spread in the ancient L'Aquila, as evidenced by the historical pictures, is hardly present and visible in the building fabric as it is today.
The workers of the past tried to pursue narrow and strict rules in the definition of building-urban relationship, but on the other hand had developed structural techniques, relative to the geographical context and the available raw materials and, as highlighted previously, increased by experience corroborated by past earthquakes.
In L'Aquila, cultural reasons and, especially, economic ones resulted in the almost exclusive use of stone masonry a rather than brick or mixed masonry: the houses were to be built «*de bonis lapidibus, clace et arena*» [7].
The basin of L'Aquila, characterized by limestone outcrops, and its numerous quarries [8] have provided, over the centuries, the primary elements for the buildings and the decorations of the city and neighboring areas. This is the reason why, the most widespread type in the city, consists of hewn stone [9] placed regular, more or less, up to the tidy declination with joints staggered of *apparecchio a□uilano*, characterized by small square elements of limestone, used since the Angevin reconstruction, until the fourteenth century with exposed finish.
Lime mortar was also used: as evidenced by the Statutes, from the fourteenth century, there were 38 quarries in the cities, one of these was found in September 2002, out of the basilica of Collemaggio, north of the apse area [10].
Scarp walls are extremely widespread in the city of L'Aquila, and are reinforced with bricks or stones; they are built mostly such as repair interventions after the earthquake of 1703. The realization of these elements, like the buttresses used in churches, prevent the rotation of the fronts and correcting misalignment; while in the case of buildings on a slope, were mostly used to avoid the base's slip [11].
The strengthening interventions on the walls, made by liner bricks, are also dated after the XVIII century earthquake. This measure, made as a "second skin", even to remedy evident out of plumb constructions, demonstrates the skilled workers' ability: they had realized the importance of masses in the static and seismic response of a building and, therefore, they intervened on the thickness of the ground floor wall.

Fig. 3: Stone masonries: (from the left) *apparecchio a□uilano*□liner bricks; scarp wall.

Squared limestone blocks, then, were used in the corners, were strong and mighty to fulfill the bearing function of stiffening and allow for a greater connection between orthogonal walls. For this reason, the stone elements are often willingly staggered especially in cases of connection between the church's fronts "*all'a□uilana*" and perpendicular nave's walls. The corners which are strong and well clamped can be considered as an anti-seismic construction technique that has been well refined and tested in time. In addition, there was the habit of decreasing the walls' thicknesses with the building height (offsets), in order to diminish masses and seismic weights, and the use of arches above openings, weaker elements of the continuous wall. Large relieving arches were used, also, as static structure of the entire wall. This can be seen in the case of the Convent of Annunziata in whose side wall there are three large arched structures which run through the entire height, visible following the fall of parget.

Fig. 4: Large arched structures which run through the entire height of the Convent of Annunziata.

The previously conducted analysis, has focused on the walls and perimeter structure techniques which are the most widespread in the buildings in the historic center of L'Aquila.
The analysis of the internal horizontal elements, which have demonstrated a wide variety of types, is also interesting. Pointing out, at first, how in the old center of L'Aquila the vaulted structures are more used than the horizontal wooden ones, probably because of the availability of the material, the presence of structural and nonstructural arches should be noted. The first ones, used mostly with bricks vertically placed, show a refined technique in disposition of the bricks in a herringbone pattern in the crown: making the connection between the parties firmer and responding better to earthquake stress.
The nonstructural arches, instead, were especially used for upper floors on the first floor and there were approximately two different types, in the analyzed context. A first type is the wattle technique (*incannucciato*), already known by the Etruscans and much used in southern Italy definitely up to the mid nineteenth century. Derived from the *Opus craticium*, a self-supporting structure with frames buffered with different materials depending on the available resources, presents a closing with a mixture of raw clay with defatted straw lying on a frame of twisted canes. The second type of slight arch, then, is realized in bricks placed horizontally, a technique probably introduced after the earthquake XVIII century, to lighten seismic weights.

Fig. 5: Different types of vaulted structures.

Another feature that emphasize the skillful workers' ability and the sophistication of local seismic culture is the use, since ancient times, of wood as a reinforcing element in buildings: *radiciamenti*, tie-beams, truss bolted are largely disseminated in the context of L'Aquila [12]. Already used after the destructive earthquakes that hit the city in the fifteenth century (1456- 1461), they were restored and reused even after that of 1703, adding new iron technology. The use of wood to connect walls as an increase of the box- like behavior, such as clamp in corners, tie- rods in the domes, as bond between floors or trusses and walls to prevent them slipping, anticipates, in L'Aquila, the doctrine of timber-framed houses (*baraccata* house) of which, moreover, one case in the city of Abruzzo has been found. The technique of *radiciamenti* (wooden beams placed, on different floors, longitudinally in the wall's thickness, in order to create a durable and box-like structure as a curb) looks very old: there was already testimony in the treaties of Eug□ne Emmanuel Viollet-le-Duc and it was developed in the Middle Ages in the Merovingian and Carolingian era. The earthquake of 2009 highlighted the widespread presence of this technique within the old buildings in the town: most of these beams have been found in masonry and they show the connections made with nails or iron clamps.
A different technique, instead, consisted of frames formed by wooden horizontal and vertical beams, inside of which there was masonry infill. Identified as timber-framed houses, this type of construction had maximum development after the Calabrian earthquake of 1783, following which it was used in rebuilding, recommended by the *Istruzioni per gli Ingegneri Commissionati per la Calabria Ulteriore* enacted by the Bourbons. This seismic regulation, which had major application in the areas most affected by the telluric event (near Reggio Calabria) [13], addresses urban aspects of the reconstruction by prescribing the dimensions and geometry in plant of buildings, the mutual distances, the size of the roads and the construction technique to use as seismic remedy. A timber-framed floor was discovered after 2009 in the old town L'Aquila.

Fig. 6: Wooden seismic techniques: *radiciamenti* and timber-framed floor.

We may include among the wooden seismic techniques, finally, the tie- rods as that discovered in the drums of the domes of the churches: in the Church of St. Bernardino [14] as well as in that of the Anime Sante. In both cases, the collapse of 2009 and the subsequent restoration have revealed the presence of three rows of wooden tie- beams placed at different height and inserted in walls faced with cut stone and rubble masonry fill.
Furthermore, wooden tie rods and more modern iron ones were employed in buildings to fulfill the function of connecting the parallel walls. As in many Italian towns, these structures were widespread and privileged as a traditional seismic technique in the reconstruction and structural security; even today it continues to be so. In addition to metal ones, with characteristic shape of lily, whose dating should be referred to more recent times (although according to some sources dated back already to the fifteenth century), numerous wooden tie- beams dating from the fifteenth century stand out on the walls of the historical center.

Fig. 7: Different types of tie- rods: wooden one and iron one.

Fig. 8: Particular of a bolted trusses.

Similar to the wooden tie- rods are, finally, the bolted trusses (*capriate impalettate* o *inchiavardate*), used as a static solution instead of pushing roofs. The top chord's thrusts that, very often, cause cracking simply in operating conditions, were cancelled using trusses whose bottom chord was anchored to the wall using wooden or metal clamps. The roof structure, thus realized, allowed the truss to not slide by connecting the parallel walls and making the oscillation of the two masonry piers synchronous: that technique has increased the static nature of the reticular truss using the bottom chord as a tie- beam.

3. The seismic response

This paper, even synthetic, highlights the variety of technologies applied through centuries of history and of reconstructions. Finally, this analysis aims to put in relation the different technical elements mentioned above with the attainment of the Ultimate Limit State in the seismic scenery, highlighting strengths and weaknesses.

The analyses conducted below are, for the most part, obtained from direct qualitative and quantitative observations, relating to a mapping on the historic center and on what is visible as a result of the collapses.

Stressing that, of course, the feedback may have some exceptions, because of mergers and of buildings' recasts and of subsequent reconstructions, below some widespread behaviors are analyzed.

It is difficult to describe the response of urban anti- seismic methods, because, as mentioned, few examples of *rue* and arches over the road are still evident in the old town; conversely some comments can be expressed on the masonry techniques. The collapses that affected most of the buildings, especially the “poor” ones, underlined the fragility of disordered walls, surely influenced by degradation and depletion of mortar. The load-bearing walls do not result monolithic, due to the installation and the manufacture of stone elements, to the recasting of medieval buildings in heterogeneous bodies and to continuous historical phases of destruction and reconstruction.

Not-homogeneous walls have crumbled struck by the earthquake's action while a better resistance was opposed by those built with the technique of the *apparecchio a□uilano*: preferential stress directions, evidently, were suggested by regularity and order, avoiding slippage of the elements from the plane. Regarding the walls reinforced with brick linings, they were not very resistant to shock of April 6th because of a lack of transverse connecting elements between the two skins.

Instead, corners, buttresses and scarp walls have given good seismic response especially in those cases of geometric construction and of well-done art rule; as well as links between fronts and ecclesial walls: despite being, in some cases, triggered by the rotation mechanism, it has been partial, not arriving to collapse of the macro element.

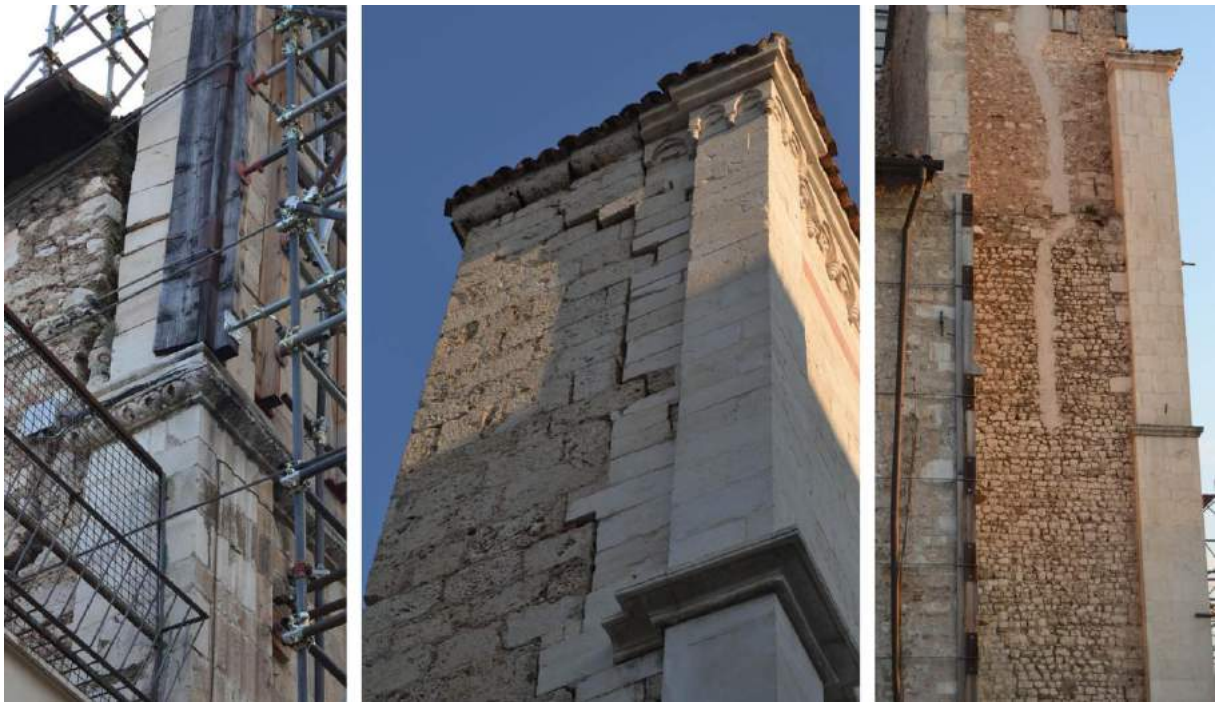

Fig. 9: Rotation mechanism of ecclesial front: (from the left) S. Pietro di Sassa; S. Giusta; S. Domenico.

Qualitative assessments can be expressed, then, regarding the archways: if structural ones have proved particularly resistant by remaining mostly intact, the lighter ones, too thin and weak, have almost always collapsed disastrously, confirming their absolutely not structural function. The weaving in a herringbone pattern has been resistant: the arrangement of bricks along the directions at 45 degrees, probably best meets shear stresses, the same characteristics that cause injury as the St. Andrew's cross.

Fig. 10: Seismic response of lighter archways.

In addition, significant was the contribution of the wooden elements placed in structures, such as radiciamenti, bolted trusses and tie- beams. Importantly, in case of wood, the conservation status is essential and, probably, its contribution would have been greater if the seismic awareness had not waned over the centuries. In many cases, poor maintenance led to the breakup of the material and to the reduction of the resistant section until the total decay of the structures as, for example, in the

mentioned wooden tie- rods of the dome of St. Bernardino. Nevertheless, these elements, handed down orally for centuries and kept alive by replacing and reinforcing after the historical earthquakes, prevented the trigger of bigger collapse mechanisms and the slipping of trusses and floor slabs, in the 2009 earthquake. Maurizio D'Antonio says «It should be pointed out that failure to generalize reversal on the roads of the historic buildings' fronts in the historic center of L'Aquila, which instead occurred regularly in other previous earthquakes, such as that of Messina, is due to the presence, in the masonry structure, of tie- beams and radiciamenti»[15].
Fundamental then, were the steel tie- rods, which have remained unchanged over the centuries. For example, the metal rods affixed, following the earthquake of 1703, by Contini in the dome of St. Bernardino dissipated a lot of energy up to breaking, preventing further damage and collapse.
As the object of the following analysis is a stratified historical center, also the interventions put in place over the centuries and, especially, the modern ones have importance, in order to conduct a complete assessment of the structure. The intrinsic limited resistance of construction techniques in L'Aquila is not, in fact, the only and main cause of damage after the earthquake of April 2009.
The partial or total collapse of numerous brickwork buildings is related to a whole combination of vulnerability factors consequent to the continuous transformations of the historical and architectural heritage that have altered the geometric-proportional logics and the structural yield making the traditional anti- seismic principals ineffective. The latter have often been replaced with elements foreign to the historic buildings, during the consolidations «operated according to an technicistic and reconstructive idea, at the expense of proper and regular maintenance» [16].
Although the reinforced concrete cannot be ascribed between building techniques as “spontaneous” and traditional, the analysis of the context of L'Aquila cannot ignore how the seismic response of the buildings has been, in many cases, largely influenced and conditioned by the presence of elements not compatible with conservation purposes. Therefore, the Abruzzo earthquake has highlighted the inefficiency, the incompatibility and, in some cases, the harmfulness of using reinforced concrete elements for consolidation and replacement of structural parts.
The collapse of many buildings in the old town, in fact, has been totally or partially due to walls and heavy roofs that ruined the underlying masonry; to not closed curbs, that have operated a pounding force on the fronts, especially in the case of churches; to closed curbs that, even performing liaison duties, led to a swelling of the walls like a “barrel effect” creating an obvious out of plumb; to beams that triggered a ram head effect in perimeter walls; to staircases that have disastrously gutted portions of neighboring structures, fluctuating according to the reinforced concrete’s own ways.

Fig. 11: Interaction between reinforced concrete roof and perimeter walls.

4. Conclusions

The study presented here, that is still in progress, implies a methodological process that, through the sum and the intersection of the data extracted from different testing procedures, comes to the knowledge of stratified tissue in relation to seismic risk. These procedures are indispensable for understanding and identifying the characteristics of cultural heritage.

In this case, we sought to highlight how numerous architectural and other factors specifically earthquake engineering are connected to the seismic risk assessment on consolidated buildings; they are all crucial for a qualitative evaluation.
This paper has focused on the influence of the “spontaneous” techniques, on the most usual construction systems in specific geographic areas, on the use of materials in a characteristic area; it has even highlighted the relationship between the timely analysis on the chronological reconstruction of earthquakes that have affected the site and its degree of vulnerability, or between the building types present and their aggregations and the increase of the seismic force. The town, therefore, must be studied by analyzing the processes of formation and transformation over time, in order to assess the texture and the features not neglecting the additions and the accretions that affect the risk assessment.
That data constitute a documented basis useful for predictive and preventative against environmental risks, together with the conservation and regeneration operations.

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Smart Heritage.
Technology for marking Architecture.

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Smart Heritage.
Marking as advising, gathering, qualifying
The proposed contribution intends to present the preliminary studies carried out in the field of the elaboration of the international doctoral thesis in Civil and Environmental Engineering. The dissertation is about "working places in Italy and Germany", with the aim to acquire a methodology of intervention for conservation and reconversion of industrial buildings realized after the second post-war. In particular, the research develops from a specific case: a research laboratory for studying and testing motors, attributable to the industrial buildings typology, realized in 1961 for the University of Braunschweig and bounded because of the significant and innovative technical and machinery characteristics. The building, disused and in a very poor condition, is assigned to a new use (laboratory for electronic components) and radically transformed since summer 2015 with the consequent demolition and reconstruction of whole portions. In a context like the German one, where the entity of the contemporary architecture heritage is too much extended to be systematically catalogued, the question is how to control value monuments that might be subject to an equally relevant alteration. In this sense, it is investigated the possible use of new operational tools (Internet of Everything, Building Information Modelling, Planning and Technologies) as means of management and control of the building's history and evolution, able to realize a digitize and accessible catalogue of documents.

Keywords: preservation, documentation, participation, culture network, data sharing.

1. The damaged Heritage

The theme dealt in this text, points the attention to the consistency of the architectural heritage constituted by industrial buildings, architectures of work with innovative technological characteristics or technological laboratories that are in disuse. It is about a heritage to which too much little attention is set aside, even though many associations have arisen in order to implement conservative strategies and to promote its knowledge and even though many provisions have been given in order to regulate its use, reutilization and the possible change; those architectures where once production or industrial activities and testing laboratory were, realized in the period of greater experimentation in this field (between the end of the 50s and 70s) are in great danger. In 2016 it is still possible to bump into situations in which significant interventions on a building through drastic modifications of its substantial characters, sometimes also with important demolitions, are allowed, causing the loss of a patrimony that should be only preserved. And such loss directly involves our identity, even if not directly our territory. But here the interest is directed not only to the importance that such heritage has for all of us and to the necessity of its safeguard; there is also the attempt to explore the possible options in order to control its vastness and to identify the so-called minor cases, that hardly draw attention, not being associated with a household name (linked to the designer or to the activity

that was taking place there) and that, subjected to a limited number of controls, prove to be even more at risk of a well-known work. To suggest me such issue has been the history of a building with which I'm dealing in the context of my doctorate. The specific case can not to be defined an industrial building, since this is an experimental laboratory of the Technical University in Braunschweig; but here the machine's and airplane's motors were tested. The building therefore showed all the characteristics according to the industrial typology, and above all, it had to face to a series of problems resulting from the activities required by the tests; and the resolution of these problems has been faced adopting a series of strategies that employed cutting-edge technologies at the time, particularly regarding the plant design, transforming the laboratory itself into a "machine". It is not a case that the designer, Walter Henn [1], already professor in the same University at the Institute for Industrial Buildings, was an expert knowledgeable of the industrial buildings, authors of many publications and handbooks, which have been also translated in different languages [2], and designer of a great many industrial and university buildings in Germany (from Dresden to Berlin, as well as in the same Braunschweig). Henn has employed therefore his ample knowledge of the industrial world, that was rare at the time, to try to solve the problems that the type of experimentations conducted in the laboratory would have caused, particularly relative to the acoustic, air and soil pollution. For this reason the building has been recognized of considerable importance becoming part for two years of the list of the buildings of particular interest, to be preserved. Now we have to talk about this building unfortunately in the past tense since there is very little trace of its original structure. In fact, the building has been almost completely demolished. And this is a current matter, so that the process of transformation, started in the summer of 2015, is not yet (March 2016) finished. Underlying the considerable metamorphosis, to which the building is subject, it is certainly the choice of radically changing its intended use (from an experimental laboratory for piston engines to an experimental laboratory for nanometrology) distancing itself from the ones according to which the building has been planned. To be interested to such a variation it is not only the single building, but the whole complex of which it was part, losing the entirety both at architectural level and from the constructive point of view, since the demolition of two of the constitutive buildings and their replacement with a new element is taking place. Fortunately, before everything was completely lost, the building has been subject to an architectural survey campaign, as complete as possible, that has enabled us to store its traces. Beyond the motivations that have led to these choices, the specific case turns out to be exemplifying of a more general situation: there are numerous examples of significant architectures, belonging to the typology to which reference is made, that, if disused or destined to a new use, risk to have the same destiny. And the total measure of this heritage, considering also the one not at risk, is such that it would be impossible precisely specifying, pinpointing and identifying its size. In this sense, here the question is whether, with the new instruments which are today available, it is possible to have a greater control on it. And a greater control means, also and above all, a greater protection, in order to prevent that so important losses still take place.

Fig. 1: Case study in Braunschweig. On the left in October 2015, on the right in February 2016.

2. Marking as advising

"The order of the global village is in the middle of a change of paradigm; a change based on connectivity and dialogue. To describe all of this we must talk about radical change in the way people have in interacting and socializing and this has involved almost all of the cultural fields, except the architecture. […] In what way can the new instruments, available to the architects, bring people together, not only in the sense of living together, but also of changing, increasing and finally *creating* together the surrounding environment□ "[3]

The possibility of supervising our precious heritage might be at hand since all the necessity components for an innovative management of monuments is already available. It is needed instead that all the available elements are systematized and interact to create completely new and unexplored occasions. At the base of the reasoning they're the potentialities, partly unimaginable, offered by the most recent virtual technologies, and the widest usable resource: ourselves. With virtual technologies is meant particularly the resource given by the *Internet □ orld* and by its powerful application of the phenomenon *Internet of Ever□thing* (IoE). It is about the extension of internet to the world of objects and places and it is defined as a "market constituted by complex systems composed entities, of a physical and logical nature, among which a bidirectional exchange of elementary or elaborate data via internet happens."[4] This means that Internet, that now is able virtually to connect the users worldwide, is also able to allow the connection of the objects among themselves and with people. Such application is at the base of the idea of *Smart Cit□* that, according to a wider meaning, indicates an intelligent city able to satisfy efficaciously people needs guaranteeing an elevated life quality. An *ideal cit□*, then, that conceptually derives from the Renaissance ideal city [5] and with which shares a possible answer to the need of balance that men in every age feel. In both cases, in the past and in the present, the attention is directed to the inhabitants of the city, for whom the spaces, physical or virtual, are drawn; and in the smart city it's the same inhabitant that, being connected in network with all the physical objects, has full control over them. From the technical point of view all this is possible thanks to the use of further systems, already existing and used, like for example the sensor technology, the Volunteered GIS, the LBS geolocation services, the Information Technology, etc. But it is clear the practical difficulty of such an innovation, able to involve at the same time the whole physical and virtual world. A requirement that is needed is that all the possible applications as part of IoE and all the involved elements, even if representing only a part of a unique complex system, should be to this ascribable, in order to refer to a communal idea, to a unique project. However, even in this text, only a part of the possible city is investigated, hypothesizing the IoE applicability in the field of Architecture, and particularly with regard to the protection of architectural heritage to which a smaller attention is addressed and which risks to be lost forever. The idea consists in applying these new digital tools to identify, list, manage and supervise the architectural typologies that, like the over described example, being relatively recent and potential empty spaces to be filled up, transformed and developed, can be not adequately preserved. The technology alone is not sufficient, but it is a useful instrument serving an active system which involves people in the front line, meaning not only the experts, but anybody wants directly contribute to the safeguard of his own territory and identity. In particular the attention is particularly focused on the identification of the works at risk and on the *open source* method that is described and tested by Carlo Ratti:

"The collective action has the extraordinary power to inflame the existing social and economic fabric, but is it possible using constructively these same networks, and the attitude characterized around networks□" [6]

The *open source* method has been applied for example, together with the use of internet, to the elaboration of the Linux operating system, as well as in the well-known Wikipedia virtual encyclopaedia. In this sense the huge potential offered by the use of open and updatable systems which can become virtual catalogues are to be considered and they are feasible thanks to the involvement of the individual users, who become cataloguers firsthand. The strategy proposes then to involve a large number of persons in order to identify a great number of architectures; the possibility of success is supported by the social advantages that derive from it:

"The key point is the social desirability. The human action is based on the fulfillment, both economic and interpersonal, and the collective consumerism appears to be an answer to both of these things. […] The social position of an individual within the community is a powerful not monetary fulfillment and it plays the role of necessary incentive in the alternative economies"[7]

Suffice it to think to the innumerable social networks that have invaded our lives and to the influence they have in the social behave, having originated a parallel virtual world through which it could be completely possible to live. In this sense, also pointing out an architecture can represent a social advantage, whatever the reason that moves a user to make it is (that is interesting, in great danger or considered a really disturbed). Marking a construction and sharing it in an open system are gestures of collaboration helpful for the experts, who will be able then to value all the aspects; and all this would make think to the real possibility of identifying and preserving a great number of buildings.

3. Marking as gathering

In this hypothetical model of protection of the architectural heritage, l'IoE plays a fundamental role in the phase of collection and in carrying out the virtual catalogue. Precisely the catalogue would become the connection tool among three systems: the architectures to be protected (indicated or already well-known), the users (signalmen or proposing ideas for possible interventions) and the experts (architects, engineers and the figures that works in the academic sphere). Between these systems bidirectional exchanges of elementary data (simple descriptions, photographic documentation, etc.) and elaborate data (drawings of surveys and projects, projects ideas, etc.) through internet happen. Through the well-known survey instruments (GIS, LBS systems, sensors, ICT systems) it is possible: to identify exactly the object, eventually pointed out, and to locate it geographically with exact indications about the context in which it is positioned; installing on it survey sensors of a determinate phenomenon, to observe and notice the variations and to transform them into measurable data; to archive all the information in a unique open virtual catalogue, updatable and freely accessible. In such a way the heritage to be preserved becomes accessible to everyone and anyone can co-operate in searching for the best possible solution, feeling an active part of the protection system. The experts, professionals and researchers, work in the control phase, in the examination of the data received from the users and in the real survey of the buildings. In this sense the control is carried out through the comparison of the proposed material with the available documents (particularly with those from the archive) and, above all, through the architectural survey of the monuments from which the real present situation and the history emerge.

4. Marking as qualifying

The system of the experts collaborates with the one of the users and works through supervising and verifying the available data and, above all, the deep cognitive investigation of the indicated buildings. The used tools are the traditional tools of investigation and survey, the only possible to relate to an architecture on which it will be necessary, sooner or later, intervene. The investigation happens through a deepened study of the history of the building, starting from the comparison among the archival documents, the original drawings and all the information concerning the designer. And in case of recent works, everything is easily reachable. The architectural survey is the inquiry instrument that allows to reach a complete consciousness of the building, including its evolution, distinctive characters and the possible problems. Such a study must always be combined with an attentive and exact way of representation, able to bring out the most important aspects and to make easily the comparison between the elements and the different buildings. The documents resulting from the study of each building become part of the virtual catalogue, increasing and perfecting it. The interesting aspect of sharing in network the existing data of a building, lies in the fact that everyone has the possibility of viewing the gathered material, adding yet, proposing ideas and projects, contributing to the knowledge, safeguard and requalification of the buildings themselves. The effect of such an exchange of ideas can only be productive, also and above all in case of contrasting ideas. And this is made possible by the occasion offered by internet whose power allows that all this happens with great speed and for an incredible quantity of knowledge and ideas. Gathering the potentiality of internet with the ones offered by that technologies which allow the control of the variations of the building system, the constant protection of monuments becomes really feasible.

5. Damaged Heritage□Smart Heritage

The aim of this contribution is reflecting on a possible method to face the identification, cataloguing and the control of the extended architectural heritage consisting of industrial buildings and of typologies that can be assimilated to this one, that are at risk of alteration. The integration between the open source phenomenon,

the sensor technology, the geolocation services and the Information Technology is hypothesized in order to realize, through the maximum sharing possible, a connection network between the monuments and the involved persons. The potentiality of this method is given by the possibility to have an unlimited number of contributions, which facilitate a fast exchange of ideas that is extremely productive. The procedure can be applied also to the heritage that belongs to different historical periods and in any geographical context, since all our patrimony can be at risk, also without the effective awareness. In the end this methodology is simply feasible, since all the necessary elements are yet available and applied in different experiences.

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Approaches to Evaluation of Landscape Scenery – A Conceptual Contribution

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Abstract
There are several ways to determine both landscape scenery and landscape character. Over time we came to a great variety of their interpretation and evaluation. These terms are defined (interpreted) in practical situations as well as in literature within individual professional (scientific) disciplines that are based on historical, ecological, artistic, technical or interdisciplinary approaches with a number of different terms of content. Rich amount of definitions is a proof not only of their complex nature but also a broad range of points of view on them.
The paper deals with methodology of assessment of landscape scenery and character from the perspective of landscape ecology and landscape architecture. By integrating both the natural scientific and architectural approach we establish a platform for creating methodological basis for evaluation of landscape's visual factors.
The need for such integration has recently become an increasingly urgent request. Each of the above mentioned approaches applies its own priority aspects of evaluation of landscape's visual factors but by their combination a more objective evaluation results are achieved.
Verifications of the outlined methodology on concrete typical examples will be included in this paper together with recommendations for evaluation "standards" required for planning and design in the field of landscape architecture, landscape planning and landscape management.

Keywords: landscape scenery, evaluation methodology, multidisciplinary approach, planning and design

1. Introduction

The ways of evaluation of landscape scenery are being developed for a very long time. The landscape underlies continual amounts of changes that are reflected both in the landscape physiognomy and its aesthetical quality. Evaluation processes of landscape image, landscape scenery and landscape character are important for landscape management, planning and especially for landscape design.
For the development of approaches assessing landscape scenery, the adoption and ratification of the "European Landscape Convention" (hereinafter referred to as the Convention) bears major importance. It reflects the tendencies to combine cultural heritage with natural heritage as a result of the complexity and interdependence of man and nature. As is clear from the Preamble of the Convention, the objective of the Council of Europe as the promoter is to achieve greater unity in implementing the outlined ideals and principles concerning the landscape as common European heritage. The necessity to adopt and ratify the Convention resulted from the ever accelerating adverse changes in landscape caused by the effects of agriculture, forestry, industry, mineral production, regional development and spatial planning, transport, infrastructure, tourism and recreation, as well as general changes in global economy.
The Convention aims to promote protection, management and landscape planning and to systematize European cooperation in this field. Member States also undertake to legally recognize the landscape as an essential component of environment of their inhabitants, to establish and implement landscape policies with broad public participation, local and regional authorities and, equally, to integrate the

landscape into its policies, spatial and urban planning, cultural, social, economic policy and other instruments that might directly or indirectly affect the landscape[1]. Under the Convention the signatories undertake to apply measures for the care of landscape of the whole territory, including natural, rural, urban and suburban areas, areas of land, inland waters and marine areas, i.e. not only extraordinary, but also the everyday and degraded types of landscape.
For the evaluation of landscape and especially its cultural and historical significance it is helpful to define the landscape in relation to its characteristic appearance, the definitions of "landscape concept", "target landscape quality", landscape protection and management and landscape planning . Under the Convention the nature/characteristic appearance of landscape is understood as "the result of activity and interactivity of natural and human factors". It means that landscape has been formed for years and is the result of natural and human forces. The definition suggests that landscape is formed by natural and cultural components as a whole and should be assessed as such, and not separately. The definition, on the one hand, is sufficiently wide to reflect the different understanding of landscape.
For the evaluation of landscape and especially its cultural and historical significance it is helpful to define the landscape in relation to its characteristic appearance, the definitions of "landscape concept", "target landscape quality", landscape protection.

2. Principles and approaches in landscape scenery assessment

Landscape scenery assessment is characterized by a range of possible approaches that not only reflect the diversity of understanding, perception and interpretation of landscape on the one hand. On the other hand they are the result of tradition in the protection, development and management of landscape in the world. The status is also affected by the ambiguity in defining landscape and the effects on individual landscape characteristics resulting from transnational legislation.
Nevertheless, it is possible to identify certain common features of landscape interpretation in the system of environmental impact assessment that highlight landscape as a material entity in accord with aesthetic-visual characteristics, often referred to as landscape scenery, and cultural and historical significance referred to as characteristic landscape.
Landscape together with landscape scenery and characteristic landscape appearance can be defined in several ways. Over time, a number of forms crystallized in their interpretation. In practice and in literature the terms are defined and interpreted within individual professional (academic) disciplines that are based on historical, ecological, artistic, technical, and interdisciplinary approaches with different terms of content. The amount of definitions evidences both their complex nature, and a whole range of perspectives that are largely influenced by the specialism of individual authors. Examples of the many approaches and concepts in their definition support the argument [2].
The content and terminological ambiguity of the term landscape is also reflected at an international level in the field of European and global directives, treaties and conventions. The European Landscape Convention provides a common platform for understanding landscape as "part of an area as perceived by people, whose character is the result of action and interaction of natural and/or human factors". On the one hand, the definition is broad enough to express diverse understanding of a landscape. On the other hand, however, is too limited for corresponding perception of the concept. The "character of the landscape as a result of actions and interactions" reflects the fact that landscape has evolved over years. Hence it is the result of natural forces and human activities. It also reflects the understanding of landscape as a whole, composed of natural and cultural components that ought to be considered together, and not separately. The definition highlights the fact that landscape is a result of the relationship between man and a location. et landscape is more than just physical environment. It also includes human experience and perception of all surrounding physical elements, both natural and cultural. It has been formed through the influence of a number of physical components (geology, soil, fauna and flora) and modified by human activities (historical and current land-use, including settlements). Landscape is mainly perceived by sight, but also by smell, or the silence, the sound of wind and the sea as factors of our impression of excellence of a given location. The definition does not take only account for the extraordinary landscape types. It also addresses landscape as commonplace, everyday, i.e. such that humans observe from home, work or during travels.
Landscape does not only cover rural environment: it represents an external environment both in villages, urban areas as well as in an open country. The features and textures of buildings, streets, open spaces and vegetation, and their relationship within urban environment are an equally important part of the wider landscape heritage. It forms the basis for natural resources, depository of archaeological and historical findings, natural environment of flora and fauna, and equally a significant part of quality of life.
Landscape, landscape scenery and characteristic landscape are concepts often mentioned in connection with landscape management. They are closely related when evaluating the effect on landscape. The issues of scale, content and methodology of assessment are derived from this. When

assessing both areas of change, it should be borne in mind that each new activity and strategic proposal has some impact on landscape and landscape scenery. Prediction of the effects, their recognition and consideration to the given type of landscape and landscape unit is therefore most important.

Humans value and appreciate landscape for various reasons. It provides them a place to live and also testimony of the original way of life. Landscape may also bear social and societal values that contribute to the identity of a given location. For many it means the general environment or space for recreation. Landscape thus becomes a source of living standards and experience. In broader sense it also includes health benefits. For many people, factors such as peace, comfort, wealth of fauna and flora or natural character of landscape are significant, refreshing or uplifting. Landscape can also be a source of inspiration for music, literature, visual arts, language, customs, etc.. The considerable economic value of landscape also deserves a mention, such as its attractiveness for people and visitors seeking distinctive qualities. In this context, the diversity of landscape in certain place and time should be taken into account. Its nature and typical signs have to be preserved and cultivated.

Landscape scenery is an essential and determining factor, for example, for new construction or building technical infrastructure. Yet it leads all too often to visual degradation of the landscape. Many new buildings have highly negative influence on the environment, given their scale and an absence of a positive nature and respect for the landscape features. The character or typical features of landscape are also an significant phenomenon in landscape management. Hence the importance of plans, programmes and concepts that may significantly alter the landscape by their intent.

When assessing environmental impact in a number of European countries, the most common understanding of landscape is a phenomenon that largely depends on geological and soil conditions, topography, archaeology, history of the country, its use and management, ecology, architecture, and cultural context (Fig. 1). Furthermore, hand in hand goes the assessment of a landscape as a visual phenomenon, i.e. the appearance of landscape, including the shape, texture and colours, reflecting the way in which the different components combine and create specific features (features and scenery). These factors influence the perception and evaluation of landscape.

The cultural landscape is, unlike the natural one, with forming processes mainly, contributing to its development, reshaped and strongly influenced by people. The key human activities through which the natural landscape is transformed into a cultural one, include: forestry, agricultural activities, water management activities, activities related to construction of settlements, transport systems as well as activities linked with spiritual and religious culture. A cultural landscape as a reflection of forms of land use and creative activities of people features adjustments and changes in relief, changes in representation and deployment of landscape elements, founding and cultivation of cultural vegetation, occurrence of human artefacts and elements of spiritual culture of human civilizations[3], [4], [5].

International practice in the landscape impact assessment is based on the concept of landscape protection and planning, its sustainable development and possibilities for the assessment process including all pertinent steps.

Landscape is dynamic; thus any change in landscape is inherently positive or negative. It changes by natural processes (e.g. vegetation growth, erosion, flooding), as well as by human activities. Everyone is aware of the differences in landscape, to which humans respond in different ways. It is not easy to quantify landscape: some landscape components and elements can be counted or measured, yet many can be only qualitatively expressed through evaluation of characteristic landscape and/or landscape scenery.

Impact on landscape, landscape scenery and characteristic appearance of landscape are often considered individually. Yet their assessment is closely related. Impact on landscape relates to changes in its physical composition, properties and quality. Identification and impact assessment in this context therefore focuses generally on the direct effects on landscape components and elements, landscape characteristics, its regional and local diversity, and the uniqueness and impact on significant landscape units with unique natural, cultural and historical value. Impact on landscape scenery and the characteristic landscape relates to visual and/or aesthetic, cultural and historical aspects of the changes. Environmental impact assessment ought to clarify the direct effect of the new activity or strategic intent on the view of the landscape as a result of suppression or enhancement of negative phenomena, reactions of observers who may be affected by the activity, the overall impact on the visual value of the landscape.

The effects on landscape may come from a number of activities, such as mineral extraction, deforestation and drainage; construction of residential, industrial and agricultural buildings and roads;

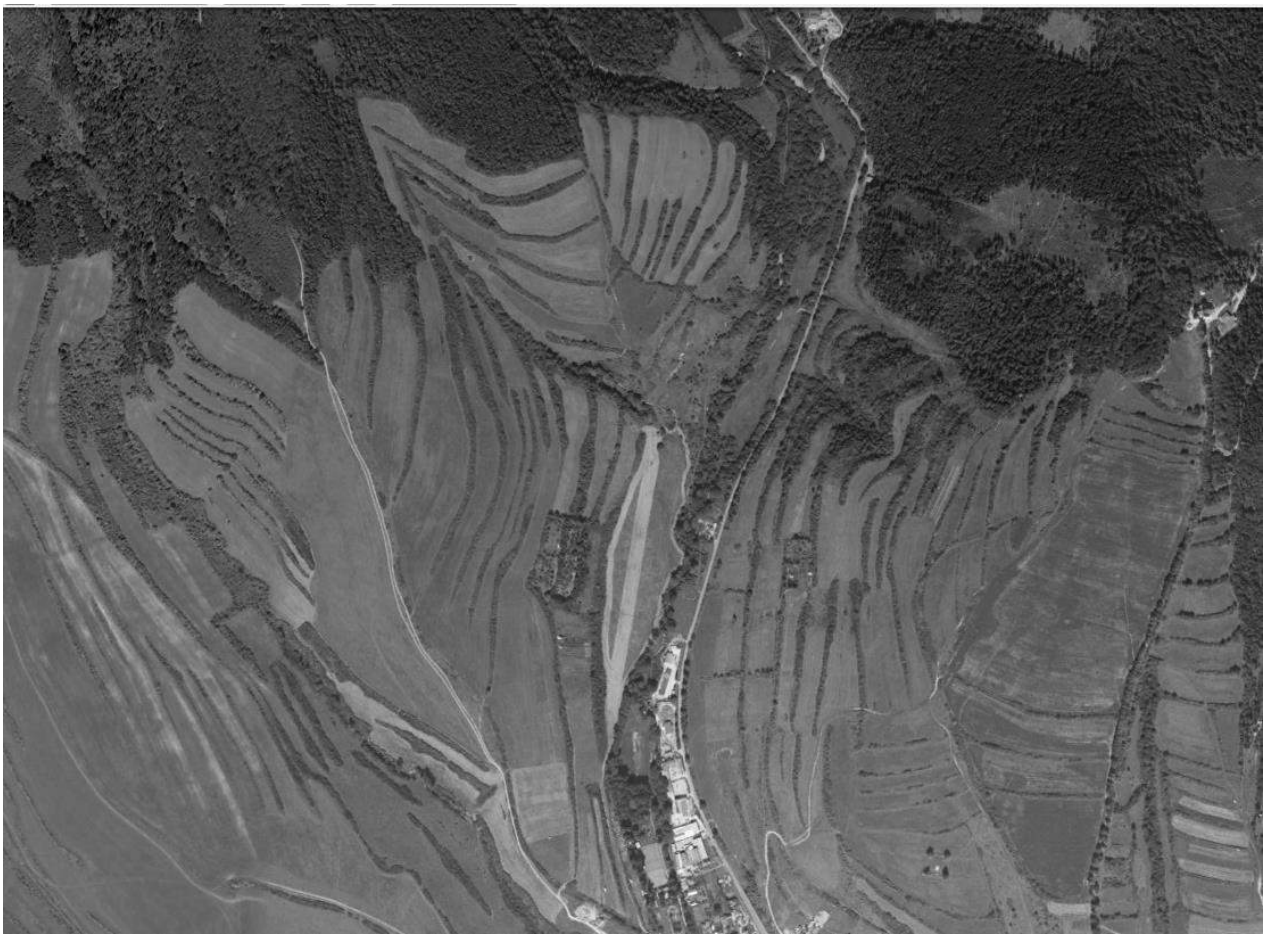

Fig. 1: Landscape mosaic of the Levoča (Slovakia) neighbourhood.

changes in the use of area. The various sources of impact can differ at each project stage (e.g. during construction, operation or reconstruction). One speaks of impact when (positive or negative) effect occurs on sources or receptors of landscape and landscape scenery that also includes landscape structure, special landscape units and group of preceptors (locals, tourists, visitors).
The aim of landscape impact assessment is to identify the degree of negative effect resulting from landscape changes, and how and where they appear. They differ from impact that might arise in any case and try to identify possible options to avoid, reduce or mitigate them, possibly to improve. Many changes occur in landscape. Plans and programmes significantly affect land use in spatial terms and consequently the changes in landscape.

3. Assessment of landscape scenery through GIS techniques and vedutas

The principle of determination of landscape scenery structures lies in the strategic and methodically appropriate processing of all available input data in the form of spatial geo-database containing attribute data from all the above described areas including archaeological data. By subsequent combinations of multilevel data selections meeting the given conditions and multiple spatial analyses the potential landscape archetypes are generated based on the outputs of geoprocessing. It is necessary to review the results, then eliminate errors and, if necessary, apply methods of statistical generalization.
Creation of digital landscape models is part of identification and research of landscape scenery elements. This covers not only standard models (from the natural-scientific point of view) taking into account altimetry and forms of land use but also archaeological predictive digital models. The models applying archaeological information can be used for taking the landscape type classification in terms of archetypes into new dimensions. Due to possibilities of obtaining data from ancient history it is recommended to prefer archaeology focused on settlements and strategies of land occupancy because the very places where nowadays artefacts of human settlements could be found can help to provide the necessary arguments, facts and information relevant for landscape type classification in order to preserve ancient elements. Climatic, geomorphological, hydrological and geographical

characteristics of the landscape are normally accumulated in creating archaeological models related to land occupancy. If such knowledge is complemented by the likelihood that communities inhabiting the given area had the same culture and religion, the probability of finding (uncovering)archetypal elements in the landscape is higher and the probability of real disclosure of landscape archetypes is increased, too.

Analysis of landscape using geographic information systems with their options of various types of spatial operations on data from historical, environmental and archaeological researches brings a new dimension to landscape perception. Virtual reconstruction of landscape can significantly help in understanding the current landscape. Moreover, nowadays new possibilities for interpretation of results are already available. In case of landscape archetypes or their perception in historical context it is possible to use 3D scanners and special modelling software working with point clouds and attribute data. This area of research provides room for applications of so called close-range digital photogrammetry, with its outputs being spatial models. The digitization of archaeological landscape artefacts by digital photogrammetry that uses digital image information transformed into numerical form and a subsequent assessment of the content of the corresponding digital image in a particular program represent along with methods for image processing and computer vision unprecedented possibilities for searching, determining and characterizing landscape scenery structures [6] .

Landscape scenery structures can be documented using various types of image materials (current and historic), for example vedutas.

Vedutas are usually being divided into the segments according to landscape elements. These objects can be evaluated in terms of: the type of land cover (P_k), originality (O) and visual compliance (S). By means these parameters and also with help the relative value of the aesthetic quality of each object (landscape element) was calculated total aesthetic quality of landscape scene (Fig.2).

The main goal of contribution was to present the vedutas like important information source about landscape (about landscape structure, landscape mosaic, heterogeneity of landscape) and at particular example to demonstrate using of vedutas in assessment of visual landscape quality [7].

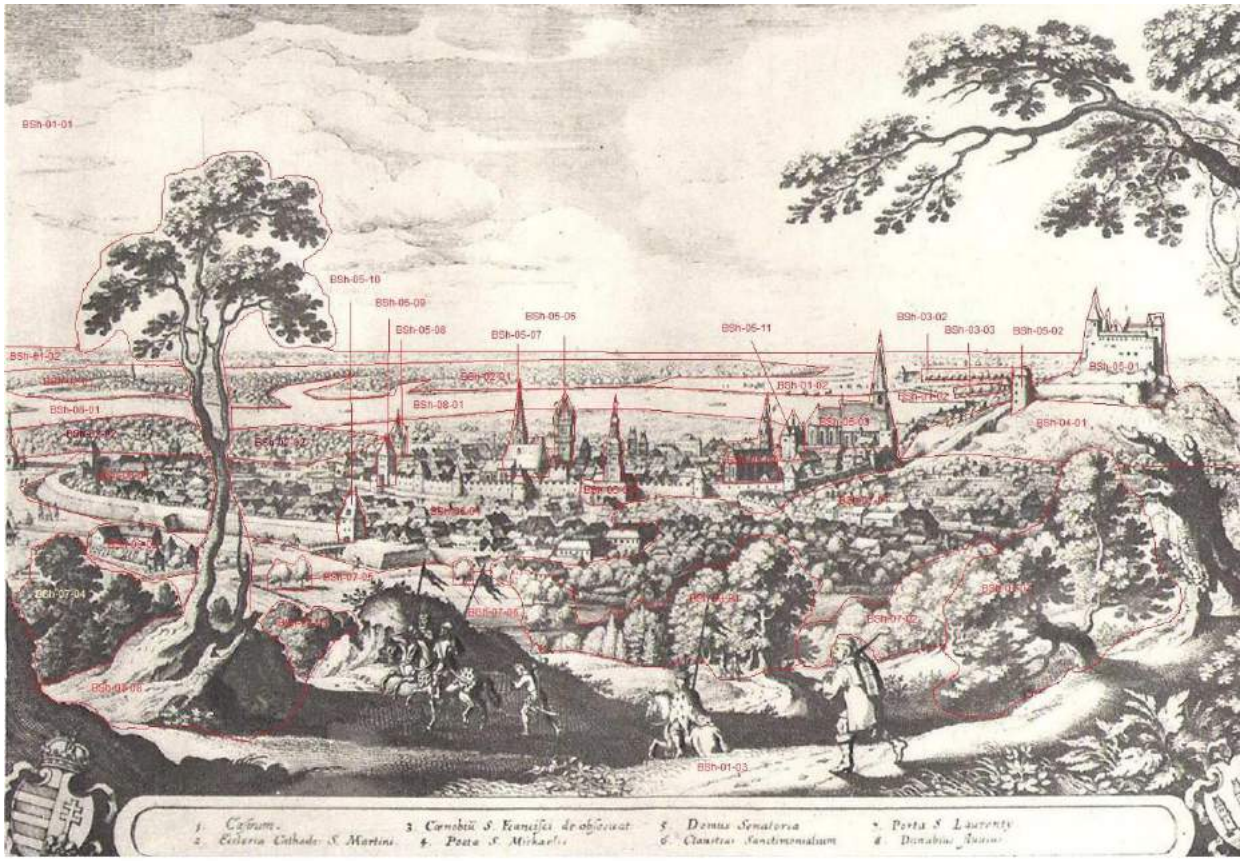

Fig. 2: Veduta of Bratislava (Matth□us Meriaan, r. 1638)

4. The importance of landscape scenery evaluation for landscape management

Determination of landscape scenery structures is based on the identification of landscape elements helping us to distinguish the basic landscape types: forest, agricultural and residential, as well as on determination of the so-called archetypal elements of landscape. The defining criteria for classification of archetypes at territorially different hierarchical levels are: the proportion of landscape elements within the spatially defined part of the landscape, types of relief (micro-relief), presence of the characteristic landscape features related to the occurrence of historical landscape structures and/or cultural-historical monuments, but also with knowledge of socio-historical development of the given area while it is necessary taking into account the intensity and method of land use. Based on these indicators it is possible to compile not only a standard image of landscape structure, but also such a mosaic of the landscape that equally accepts the indicator signalling the preservation of archetypal (ancient, original) elements that could be the foundation for classification of a landscape into particular archetypes. By abstracting the types of these patterns and their adequate generalization it is possible to create a classification of landscape scenery structures.
Identifying and creating an overview of landscape scenery structures including archetypes of a cultural landscape have an important meaning for the development of the area and in particular for the planning processes. Determination of landscape character conceals an underestimated potential useful particularly in land use planning, as well as in processes having a direct impact on modification of land use, on changes in the appearance of the landscape and affecting in long term the territorial development.

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Masseria (Manor farms), rural systems, farm houses in southern Italy. Formal typological and constructive characters of some significant types in Calabria Paper's Title

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Abstract
The paper proposes a formal typological-constructive reading of rural buildings in southern Italy, particularly in Calabria, between the XVII and XIX centuries. In the first part, the focus is on manor farms, complex structures of feudal matrix. They were residential-productive-rural structures organized around a courtyard comprising the landowner's residence (manor farm–palace and/or castle), and a group of buildings for different uses, forming a sole productive reality. The manor farm could be fortified by incorporating ancient towers and/or defensive elements, with examples found throughout southern Italy. These architectures presented a variety of building types and constructive articulation that is differentiated by the construction period, by its composition, by the materials used. The aim is to highlight the architectural-constructive panorama in which these rural complexes develop and to present significant types examining their distinctive characteristics. In Calabria there are several fortified farms, but in addition to representative types; there are rural systems and farmhouses with unique architectural features, which even though they are more modest, show elementary architectural features and at times partial, model the identity and organization of the reference type. In this second part, the focus is also on this heritage that has not yet been recorded, in order to trace the variant and invariant characters to start conservation and cultural and/or tourist regeneration actions.

Keywords: Industrial archeology, Knowledge, Conservation, Redevelopment.

The paper proposes a formal typological-constructive reading of rural buildings in southern Italy, particularly in Calabria, between the XVII and XIX centuries. In the first part, the focus is on manor farms, complex structures of a feudal matrix. These architectures had, at that time, a variety of building types and diversified compositional articulation according to the period of construction, the functional organization, the construction and materials used.
The present study, seeks to define, through the critical reading of data and documents, a historical and architectural context of the farm types present in Calabria, and the compositional-functional-construction view of such farms, presenting examples and examining the variant and invariant characters. In the second part, the essay focuses on rural systems and farm houses with unique architectural features with an elementary and modest layout, but that recall in their formal composition and organization the reference type identity. Farms, systems and rural houses are a legacy of widespread interest throughout the territory of Calabria, in a state of evident decay, which requires conservation and rehabilitation actions. The farm system, which is configured as a rural complex organism based on the transformation of agriculture and pastoralism, with significant examples in Puglia, Sicily, Basilicata, Calabria, played a decisive role in the historical development of the agricultural landscape, the productive organization and social campaigns as well as the territorial dimension of comparison between town and country [1].
The historical events that led to the consolidation of such structures, of ancient origin, in the southern territory, between the sixteenth and the eighteenth century, began the process of colonization of the feudal array of large abandoned and uncultivated areas, in conjunction with the ambitious project of

the Spanish government "Refeudalization" of the countryside entrusted by the Royal House to a new aristocracy of mercantile and financial origin [2].
The farms designed as composite and independent architectural structures, self-employment centers, in combination with residential-production-rural elements, were designed for the management and regeneration of the landed property and for the transformation of agriculture and herding, were always placed in close relationship with the agricultural lot.
These were organized around a large square courtyard, which represented the predominant typological element, meant as the space for production, for the collective relations and for relations with the outside. The courtyard served as a real square where production functions were held, together with commercial activities and entertainment, such as celebrations, rites, and feasts at the end of harvest. This character is evident and invariant in almost all farms in southern Italy, especially in Puglia, in Basilicata and in Calabria. The courtyard could also architecturally present wide, modest elements of representativeness, it could simply be clay or paved with stones composed of simple geometric designs or pebbles and equipped with a central well. Reference should be made to the inner courtyards of the farms: Torre Pinta in Rossano Calabro in Calabria made of river stones; and the court of the Spanish tower near Matera made of square stones of varying size.

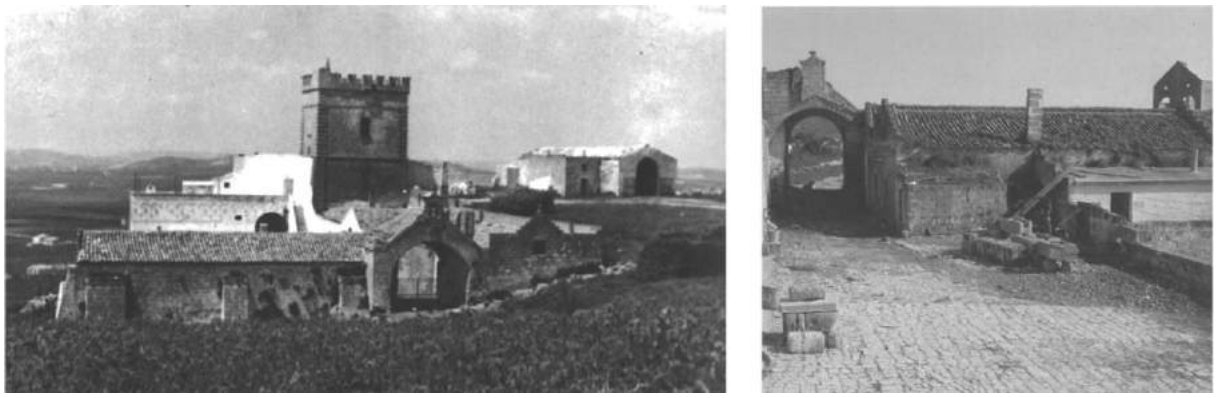

Fig. 1: Matera, masseria Torre Spagnola: general view; detail of the courtyard.

The courtyard, understood as an invariant element, was bounded by the wall to protect the structure, and emphasized the introverted character of rural architecture, closed to the outside and with the openings facing the interior open space. A large more or less representative entrance, as appropriate, gave access to the farm.
An emblematic example in Calabria is represented by the majestic tower guarding the fortified farm of San Mauro in Cantinella Corigliano Calabro, of a quadrangular shape, which marks the entrance to the rural architecture, with the imposing surrounding walls decorated with battlements and lateral bastions.

Fig. 2: Corigliano Calabro, masseria San Mauro: general view; detail of the tower.

Other representative elements can be seen in the crenellated watchtowers, in drains, in drawbridges, steeples, the heraldic crests, in wells, in the chimneys topped by proitiatory elements and anthropomorphic masks, or usually made from clay crosses. Beyond the wall, from the inside, the open-air space was delimited by various constructions, with different architectural values and different

functions which constituted a whole and in their aggregate have regular and geometric plants and are quadrangular or rectangular in shape.
The type of value characterizing the whole system was the home of the landowner, or feudal lord, farm of architectural relevance that formally recalled the mansion, and represented the entire rural system in a preeminent construction, for size and architectural features, also known as farm-palace and / or farm-castle. The house of the landowner could have block or court installation and performing in front, the stylistic elements of *palaziata* home. The outer structure was characterized by the entrance portal almost always arched and surrounded by molded stone. The prospect could be simply plastered in lime or could be marked vertically by parastades and pilasters, while horizontally there could be string courses. Pilasters and string courses articulate the space occupied by the openings, also surrounded by simple stone cornices. The landlord building was extensively equipped with a vertical connection that gave access to the first floor, directly to the apartment of the landlord, while on the ground floor there were premises used to house the service areas: deposits, stables, barns and sometimes the accommodations some farmers. The external staircase identifies another invariant character of the farm system in the south of Italy and gave the building a great architectural value. The outer staircase could be a single or a double ramp, confluent in a gallery that gave access to the portal. Such as the scale in single ramp, of singular beauty, in the San Domenico in Fasano complex and Spina Grande farm in the municipality of Monopoli with staircase access to the first floor double ramp. The master house, was often equipped with corner towers of various shapes and sizes, carrying the legacy of the castle type.

Fig. 3: Fasano, masseria San Domenico.

Fig. 4: Monopoli, masseria Spina grande.

Fig. 5: Cirò Marina, masseria Sabatini.

In the same way of the *palaziata* house that always features a private chapel adjacent to or near the farm, in the rural system there was always a modest church for the celebrations and prayers of the entire community. The rural church, was usually set according to a rectangular plan, single hall with a gabled roof with prospect on the court.
The rural complex was consisted of the dwelling of the farmer, the accommodation for the farmers, said *casalin*i or *casaleni*, places usually on the ground floor in direct contact with production environments. In some farms the dwellings for employees consisted of living units of one or two rooms, with essential dimensions of living space; these units were generally aggregated together in a terraced house with a balcony overlooking the courtyard as in the ancient village of Cannavà, but

sometimes located outside the fence of the farm, to form an external modest aggregate of feudal matrix homes linked to the life of the farm.
Inside and overlooking the courtyard there were stables for the housing of animals, stores for tools and / or foodstuffs, sheepfolds, rooms used as breeding of farm animals, coach-houses, tanks or cisterns to collect water, and traditional agricultural constructions such as crushers, mills, cellars, rooms used for wine production, rooms for the production and maturation of cheeses, ovens for bread, and sometimes, for the conservation of snow, very frequent in the farms of Basilicata. In some manor farms near Matera, more complex settings, there were also handicraft laboratories such as carpentry, blacksmiths, saddlery, and offices for the organization of work [3].
Below is an excerpt of an old notarial document which describes the Masseria Pezza della corte in Francavilla, which no longer exists, reflecting some of the functions analyzing the relationship between structure, household goods and agricultural funds.
"*Il suddetto Regio Signor Amministratore asserisce in detta nostra presenza, di avere, tenere, e possedere il Regio Fisco Allodiale in Feudo di questa Città di Francavilla una Masseria nominata la Pezza della Corte, consistente in terreni fattizzi, e macchiosi, vasi d'acqua, corti, abbitato, animali grossi, e minuti, attrezzi rurali, capitanie di vittovaglie, e tutto quanto trovasi compreso nell'attuale affitto di detta Masseria, appresso le olive dell'Antoglia, di Fallacchia, il Giardino di S. Eramo, le vigne de Grottagliesi, e li terreni di Perito, S. Barbato, e Scannato, li terreni, ed olivi di Fallacchia, le terre di S. Barbato, e le vigne de Grottagliesi da Levante, li terreni de Scannati, dell'Antoglia, vigne de Grottagliesi, e Parco di Renna, e Sciajani da Tramontana, li beni di detta Masseria dell'Antoglia da ponente, ed altri confini*" [4].
The farm system could be fortified by adding, to the walls of defense, more structures recalling military architecture: various compositional forms of defense towers to guard the agglomeration, angular towers with residences, circular and square watchtowers at the corners or at the walls of the building for vigilance, the walled area, bastion buildings, slits, moats , drawbridges, all elements that recall the typology of the castle and functional to foil frequent attacks from the outside. The introduction of fortified elements in these rural systems finds its expressive matrix, in the royal farms, ascribable to the Swabian and Angevin dominations, which were major centers of production activities, held by royal power. In Frederick's age, in fact, on the southern territory, especially in Puglia and in Sicily, there were many royal farms, defined as production centers of agro-pastoral work. These had also been established to cover the territory they occupied, could be activated directly by the king, but they could be of private property without heirs; they could be requisitioned by the rebels and in some cases in monastic institutions.
The type of Frederican rural settlements involves *domus* (residence); the *casalinum* (deposits for tools and food); and *curtis* (workplace and breeding).
At the same time, the territory of the monastic communities, to whom we owe the work of reclamation and clearing of inaccessible lands, owned large estates, with agro-pastoral character, arranged in the vicinity of monasteries already equipped with *grancie*. Emblematic examples of *grancie* in Calabria are represented by the Sant'Anna complex in Montauro and SS. Apostles in Bivongi.
Royal farms and *grancie* thus constitute a significant step of the evolutionary phases of the rural structure and will become the array references in the development of compositional characters, formal, typological of the type in question, which through time consolidate their identity by showing several examples on the entire southern territory. Illustrative examples of fortified farms in the South are: Jesce farm in Altamura, on the ancient Via Appia, probably built on a Benedictine *grancia*; the San Basilio farm-castle, near Matera, with a Norman round tower and impressive entrance with *caditoia*, coat of arms, originally built by the Basilian monastic community.
In Calabria, the farm-castle of San Mauro, at Cantinelle in the municipality of Corigliano Calabro, from the sixteenth century, was the country residence of the Sanseverino princes, probably built on the ruins of a former medieval monastery. The plant with a rectangular formal composition consisting of two open-air courtyards of which one accommodates, in axis with the arcuate access, the master building, and the other entirely porticoed with round arches destined for orange groves. The Vennari farm, of unique beauty, located in the municipality of Cariati, from the fifteenth century, refers to the compact and fortified castle type. The buildings that form it are organized around a rectangular courtyard, modest in size, and the main features are the two square towers that mark the main facade, embellished even by the large entrance portal surmounted by the coat of arms. From an examination of these emblematic types some invariant characters in all the farms of the southern Italy emerge: the setting of the ground floor arranged around a more or less large courtyard. The presence of the defense towers, the geometric rigor in the floor plan, the main building that emerges in the system, often characterized by a wide staircase leading to the entrance gate, the houses for workers, minimal in their composition with horizontal profiles with terraced aggregation, located inside or outside the fence, built of brick with stone masonry parties, differentiated by implementation. The presence of other factories in the rural system attributable to industrial archeology such as mills, the oil mill, the *conci*, sugar factories.

Besides these examples, throughout the region there are countless farms which are more rigorous and minimalist in architectural setting, showing essential compositional systems. These basic architectures, representing widespread rural architecture in Calabria, are an equally significant heritage, on which here we want to focus, in order to highlight a historical-productive legacy of great interest, but currently little known and of which a census has not been made yet. Illustrative examples of this are: the Falvo farm in the territory of the Pollino National Park in the town of Saracen which, with an eighteenth century structure displays all the prominent characters and function of the most advanced systems, with the presence of a rectangular courtyard which is overlooked the main building at one end, and on the long sides of the service rooms, stables, warehouses, the houses of the farmers with a minimal set-up and the farmer's house. The irregular courtyard in the formal composition, refers to a spontaneous geometric composition.
The Varcasia farm, near the Coscile River, in Castrovillari, currently in a state of neglect, presents a stately building of particular architectural interest equipped with arched loggia upstairs.

Fig. 6: Matera, masseria San Basilio.

Fig. 7: Castrovillari, masseria Varcasia.

Fig. 8: Saracena, masseria Falvo.

The Longo-Bombini farm, in San Lorenzo del Vallo, following the planimetric system of large farms, was built in the '700 for processing liquorice root and in the late nineteenth century was enlarged to the point of assuming significance in the town. The company was located around a large square courtyard, which houses, inside the main house with corner towers, the private chapel, the houses of the workers, services, schools and the large *concio*, characterized by a series of arches, for the production of licorice. Today, the farm with *concio* is a wine company run by the Gallo family.
The Sant'Irene farmhouse in Rossano Calabro with two different sized courtyards and four different buildings that forming it, and the access portal to the Solano farm of Montegiordano is of great importance [5]. The farms that dot the territory of Cosenza are many and significant. It is possible to note that in the 18th century, the city itself had various rural structures. Accordingly, a reading of the 1756 Land Registry shows that the activity of farmers was widespread among the resident population, and it is testified by the presence of a number of farms: the Sambiasi farm, in Panebianco, the farm D'Aquino in Campagnano, the farm belonging to the order of the Jesuits in the Portapiana village [6].
In addition to these farms, complex construction expressions intended for production and processing, are a diffused heritage in the southern territory, more simple and spontaneous, residential and rural types, craft and production, devoted to the carrying out agricultural activities.

Rural architecture, strongly present in Italy and especially in the smaller villages of the south, is the first form of protection of man, in which the dwelling instinct translates through the possibilities offered by the environment [7].

Fig. 9: San Lorenzo del Vallo, masseria Gallo: general view; detail of the conduit; detail of the Norman tower.

The rural house, in its basic configuration, consists of one floor, with a rectangular installation arranged longitudinally from the road and whose back, originally, prospected on the countryside, defined a wall of separation between the anthropized space and the countryside. The single cell, "in its simplicity of form", as well as the subsequent aggregation, is often covered by vaults or pavilions. The extrados is usually flat or slightly sloping and has no crowning or openings [8]. The specialization of the, agriculture / production and domestic use environment, can be both horizontal and vertical, resulting in an aesthetic value, which is closely linked to the function of the built units. The observation and understanding of the space shows that the composition is determined by the use of daytime temporary residence and, therefore, normally formed of a single floor, consisting of two spaces, one for the kitchen and the other intended to mainly store tools or shelter animals. The link between land and man is well expressed by the building materials and the orientation of the rooms that, by referring to simple bioclimatic archetypes linked to the Mediterranean climate, are arranged in relation to the sun's path, to the prevailing winds and to the presence of mountains and seas, strongly influencing the shape of the house and its distribution.
In general, the country houses reflect adherence and functionality to the type of production, the essentiality and the precariousness of the space in which to live. The buildings are very simple without any special decorations, with limited openings both in number and in amplitude, especially at street level. The centerpiece of the house is instead placed inside, and is identified in the hearth, a simple construction incorporated in the farm or protruding from it, placed in the living quarters, and often used as a natural ventilation system and air circulation to increase indoor comfort of the house [9].
On the external face, apart from rare cornices, vertical strips and frames around the openings, there are no modules for scanning of space. Balconies, when present, are not very jutting. The walls are made of masonry, stone and mortar, stone and sand, and in stone and lime.

Fig. 1: Santa Maria del Cedro, hearth e oven in rural houses.

Analyzing the coastal area of northern Calabria, in a landscape with strong rural traditions, there are abundant rural houses scattered along the mountain ranges towards the Tyrrhenian Sea. The houses, whose ancient presence is evidenced already in the land registers of the eighteenth century [10], is usually configured as farms made of stone, essentially rectangular in plan, about 4-5 meters each side, usually facing north-west, entrance on the short side, with two floors, with a sloping tiled roof and gutter line orthogonal to the entrance. On the door there is usually a window and the openings show wooden jambs. Characteristic of the area was to make the plaster with clay mortar or Rapillo shredded and reduced to dust, or with stone extracted from ditches or tunnels, similar to calcium carbonate, and widely used as a construction technique throughout southern Italy [11].
Examples of characterization of the type, through the material, are still present on the Calabrian coast: in Scalea (CS), in the locality of Petrosa, where was found a settlement of the VII-VI centuries A.C. on a hill, with shelters made of perishable materials reinforced at the base with rough stones and the walls and plastered with mud roof, usually associated with stone varied, reeds and shrubs.
And also in Santa Maria del Cedro (CS), where there is a small settlement with buildings made in limestone gravel and stone. Also included in the simplest architectural form realized in dry stone, where the ashlars were carefully chosen to ensure that they coincided well, decreasing the formation of interstices, possibly filled with residues of the larger pieces. The most regular ashlars were placed in the vicinity of the openings, made with wooden lintel, or to improve the attachment to the edges of the walls. The floors were often made of beaten earth.

Fig. 11: Santa Maria del Cedro, rural house.

The type specifications, however, have the same frame of reference, with the presence of compact tissue, homogeneous but isolated, which consist mainly of rural houses (two floors with external staircase), grouped together to form a real rural village. An example is in the area of Sant'Angelo in Cetraro, in the province of Cosenza.
Other types occur with the terrace house, typical of southern Italy, and easily seen in the lower valley of the Sarno, near Pompeii, it consists of two rooms on the ground floor, with external staircase to the first floor, perpendicular to the entrance and ladder to the roof terrace; or the tower houses, linked to rural housing models and farmers, with the prevailing growth in height.
Even more Intended for productive activities are the construction of mills and oil mills, which normally stood along water courses close to their habitat, preferably in places where it was possible to convey the water along pipes and lime stone arched structure, and obtain by the force required for moving gears.

Fig. 12: Tortora e Bonifati, rural houses.

The size of the buildings were very variable, and if the mills, the most widespread in Calabria, with a horizontal wheel, had an area of 20 square meters, the oil mills, often at one level, developed at least three times as much. The materials used were stone and lime for vertical walls and the vault, wood for window frames and roof, brick for the roof covering and sometimes for the paving of the mills.
Analyzing the same coastal area near Cosenza, finds of wall structures of mills are located in agricultural areas of Scalea and Bonifati, or embedded in the ground floors of homes, as in Sangineto and Cetraro.
In the same area of Cetraro, in rural districts, examples of farm houses, with outbuildings mills, oil mills and local conservation of agricultural products are evident, as already documented in the second half of the eighteenth century by a representation of the Fella Feudo today preserved in the museum and Bretii of Cetraro sea. The image shows the composition of the area, highlighting the natural elements, such as blockage caused and rivers, and reporting the rural settlements, the rural churches, the largest religious complexes, as well as craft and production buildings, which precisely mills, piggeries and towers.

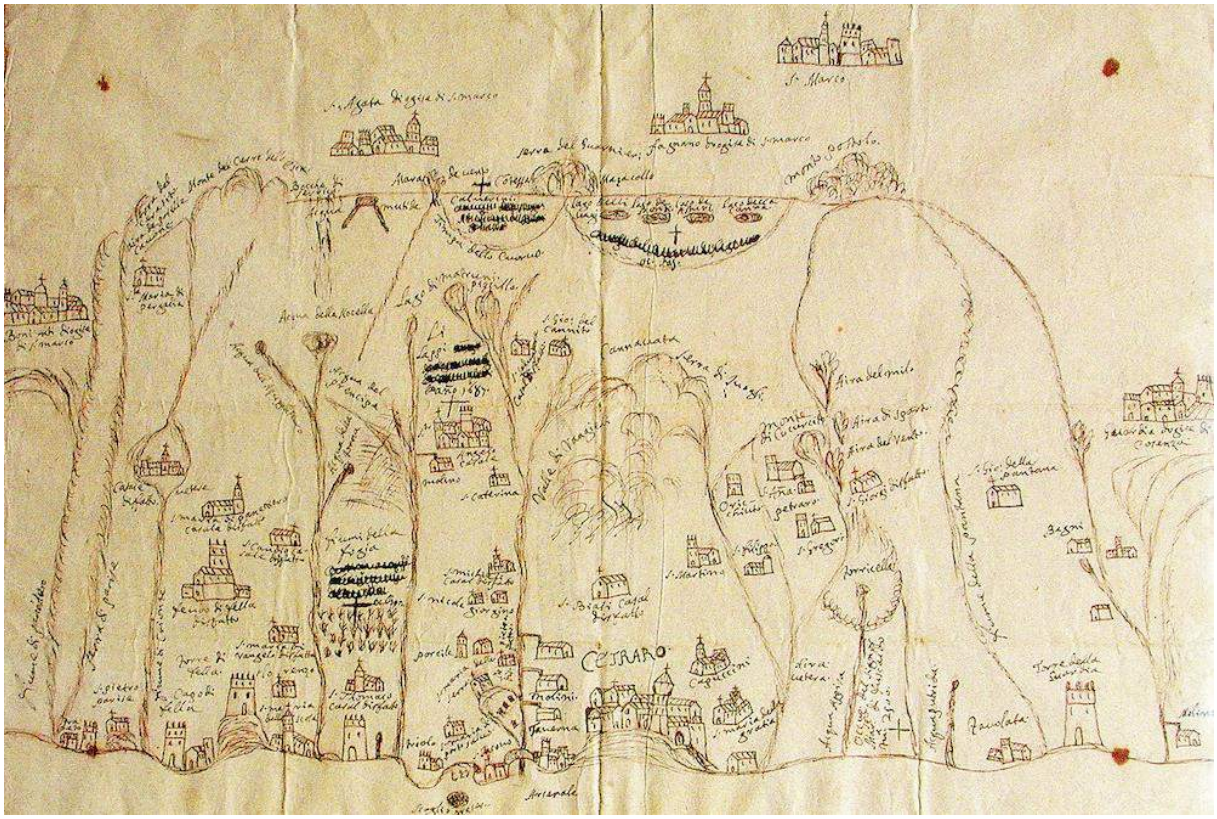

Fig. 13: Cetraro, drawing of the Feudo di Fella (XVIII century).

Finally, further specialization and articulation of rustic architecture is expressed in rural noble residences, the richest buildings and closer to the stylistic, typological and architectural expressions of the city and the most developed town centers. Disseminated within the Tyrrhenian, several examples are found in the territory of Bonifati, for example in the locality Cappone, where houses mainly on two levels, with a stone entrance portal, alternating with vast plots of agricultural land.

Fig. 14: Bonifati, rural noble residences.

The typology, close to the expression of city buildings, shows a greater attention to both form and style with a more rigorous scanning of openings and with the presence of decorative elements on the facade.
In conclusion, cataloging and recognition of this heritage of minor architecture, basic and productive with agricultural vocation, spread throughout the southern Italian territory but often little known and abandoned, it is necessary to highlight the need to preserve and redevelop anthropized contexts, the symbol and value of a heritage, both tangible and intangible, which risks losing its identity. The complexity of signs which are stratified in time, and sedimented, documenting the presence and action of man, appears today, often violated by the territorial transformations that have unbalanced the natural space, breaking the flow from nature to landscape [12].
The knowledge of rural architectures, the recognition of the variant and invariant characters, the acquisition of information on the theory and practice of building and understanding of the traditional characters can, however, be considered as a first act for the determination of regeneration systems that, by keeping alive the memory of places, may trigger innovative and sustainable processes consistent with the material-constructive addresses, with the spatial organization and with the specific formal structure of a geographical area or a building typology [13].
Reconstructing the image of the landscape and its architecture means, therefore, revealing and preserving its identity; this, in turn, means integrating organisms isolated in large-scale systems. It is necessary to respect factories and consider them as a resource for society, demonstrating compatibility between the processes of adaptation and renovation and cultural heritage values.

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Regenerating the echo monster through ephemeral and sustainable architecture: how to recover the identity of a place

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Abstract
The identity of places, generated by the interrelations between routes, edges and districts becomes a resource within the new development paradigm for the regeneration of a historic centre.
The place under examination is the ancient quarter of "Graziella" in Ortygia, an island characterized by the strong spectacular element of the seafront. The echo monster which faces the sea is actually an indoor parking, a real boundary which breaks the relation with the sea.
A re-conception of the place through a sustainable regeneration process which goes beyond the mere architectural aspects avoiding the simple and dangerous urban refurbishment could trigger a solution to regain control of the seafront, to regenerate the neighborhoods and to integrate the historic sites still present in the area.
The proposed action includes the promotion of sustainable development, involvement of residents and societal embedding in the local heritage combining rule and exception, natural and artificial, permanent and ephemeral, fixed and mobile, "temporarily" transforming the Ortygia skyline.

Keywords: Landscape, waterfront, identity, ephemeral project, commons.

1. The process of evolution for the definition of a space between design and reality. The Eastern promenade of the island of Ortygia. *(S. Gatto)*

The building of the Talete car park has been and still is the reason for an intense debate since its construction. The cementitious infrastructure to be considered as an echomonster is recognized as a mistake completely inappropriate to the territory where it is set; a seriously deteriorated area of high value from the environmental, historical and urban point of view. The examined place lies in the north-eastern coastal strip of Ortygia, corresponding to the Graziella quarter, originally inhabited by fishermen, one of the most populated and poorest quarters of the city [1] characterized by an Islamic structure and by a fragmentation of the residential areas [2] with a reduced volumetric consistency compared to the remaining fabric of the island. The only emerging marks which with their shape represent a tangible evidence in the urban configuration of the area are the palace of prisons desired by the Bourbons in 1834 and the Post Office building, designed in 1929 by architect Francesco Fichera from Catania. We can add to these the Old Market building house and the archaeological excavations of the Temple of Apollo; the remaining part is a building fabric mainly made up of ground floor houses and warehouses or by the union of two cell-buildings developing in height. The lowering of the road level brought to light part of the remains of the ancient Spanish fortifications dating back to Charles V which characterized Ortygia as a fortress town as far as 1885 and together with the S. Giovannello bastion certainly represent elements to protect and to enhance bringing back to fruition a monument of great historical and architectural value which today still, as it emerges from the documentary analysis and from the engravings of the most learned travelers, demonstrates the evocative force of the ancient city.
In some rare images of the end of the XIX century or of the beginning of the XX century, it is possible to admire the beautiful promenade which developed along the area now occupied by the car park whose walls represent the "signs" of time, a connection between architecture and the surrounding environment. The architectural object must establish a balanced dialogue with the place, citing Roberto Pane it is possible to

talk of a “choral value” «the value of what is around us and represents the stage of our daily life does not consist only in the importance of a famous church or of a famous sculpture, it is something different indeed. I am speaking of the environment which is the result of a current production which has its own civilization, which has its own qualification, aesthetic too, let’s say a piece of jargon, diffuse, “choral” is the right word, the attribute of environmental values»[3].

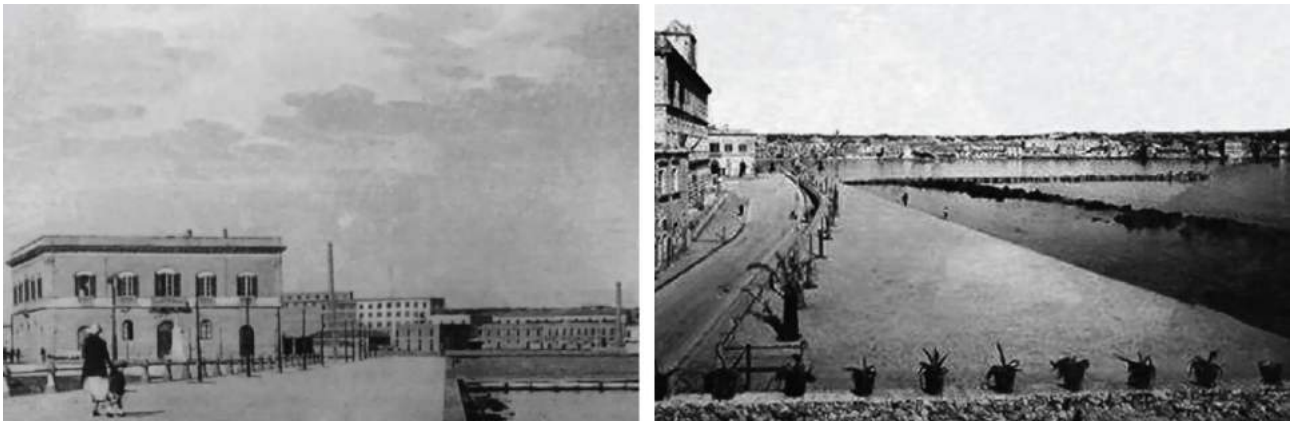

Fig. 1: Talete Promenade in the first half of the ‘900.

In the mid ‘80s, it was proposed to regenerate the area through a public call. The original project of about twenty billion, financed by the Civil Protection Department, included the execution of a subterranean driveway tunnel for the connection between Ortygia and the mainland. Dismissed the idea of the tunnel, it was planned a passage at grade and a car park implementing safety measures for the whole area. Actually, it was built a “cement monster” which is over 280 m long and 32m large, a work «disproportionate in dimension as it looks like an aircraft carrier from S. Lucia despite the painful attempt to conceal it towards the sea with a false cliff»[4].
The car park, exaggerated in shape and incoherent in solution, disfigures the territory with its cementitious mass, it denies the relation with the sea and interrupts the dialogue with the remaining quarter. Partly used, since the beginning of its execution, as it is not in conformity with safety regulations and because of an inadequate roof to allow car traffic; it was thought to use the upper area for pedestrianisation, proposing a sort of “walk” in a totally aseptic place where nothing invites people for a rest, for reflection and for enjoying the landscape with a view on the overlooking Small Harbour.
Some regeneration projects of the area have followed this phase.
The Town Council announces a public competition for the refurbishing and fruition of the Talete Promenade. Among the five competing proposals the winner is that of Architect Carlo Truppi who, drawing inspiration from Federico Fellini’s film Amarcord, projects a tensile structure 50m high made of steel and wood, similar to a big sailing ship, just like the impressive Rex in Fellini’s film, with at its base a compass rose and which uses the sails as a cover from the sun, cloth benches for rest and baskets with the form of little ships; everything designed with the idea of transforming the big terrace into a second promenade along the sea equal to the marina as it was at its origins.
The year 2004 sees the beginning of modernization works and of urban refurbishment. The project envisaged the division of the area into three zones, the external ones to be used for sports and cultural events and the central one to be used as kiosks for resting activities; it was also planned the execution of a cycle lane along the whole perimeter, stairs and elevators to guarantee vertical connections between the car park and the upper area. Of what has been said only a very limited part has been achieved, resulting in another unfinished work.
Other requalification proposals followed, among them that of architect Vincenzo Latina who, together with architect Silvia Sgariglia, suggests some reversible interventions with a low environmental impact with the purpose of intervening on different project scales: urban and architectural. A great plan with an inclined position was designed in order to contain and hide the volume of the car park maintaining the traffic in the basement so granting a continuity between the sea front and the surrounding context, including the remains of the fortifications.
Other proposals aim, on the contrary, at the demolition of the echo monster for the construction of a car park at road level, maintaining the same number of parking places. This provoked a lively debate. As for the demolition, architect Vincenzo Latina says «we run the risk to create a new “esplanade” with some trees, a modest promenade on the sea separated from the city by a series of roads and by a multitude of parked cars»[5].

The demolition which is supported by the majority would be in conformity to the Ortygia Detailed Plan which takes it into consideration among the interventions; meant as a complex of interventions for the removing of building superstructures and of the congestion of urban fabric. Architect and urban theorist Giuseppe Dato was in favour of this idea «this cementitious mass which does not take into account the existing context is not a work of architecture, it deserves the name of echo monster and should be demolished making a great gesture of urban restoration as it was courageously made in Naples and on the Amalfi coast»[4]. The long debate has resulted in numerous attempts to regenerate the place. Among them those relating to an ephemeral project articulated around the environmental sustainability in an active dialogue between the historical heritage and the sense of the message, with the purpose of being an autonomous generator and also a commercial driver for the city, animating the place through an "intelligent rebirth" of urban deterioration.
Talete Promenade represents one of the most troubled historical and urban questions of the Ortygia area, a permanent scar in a charming place also full of memory; its "care" would be a resource within a reformed model of progress for the regeneration of the entire historic centre recovering and discovering the soul of the place characterized by a strong spectacular element of the sea front. Maybe this is still a possible dream, after all, in James Hillman's opinion, psychologist and philosopher, «dreams are made by elves' work at night, blacksmiths of the underworld who forge labyrints, artisans who never stop creating forms»[6].

2. The landscape through the waterfront perception: the "Talete Promenade" *(E. Paternò)*

Architecture operates, more than ever, as a mediator between different morphological contexts, woven spaces interacting with the articulated structure of the ancient city and the contemporary territory. In this context the blank and/or suburban areas, once conceived as gaps of the urban fabric, become areas structuring the new urban form where the landscape assumes the role of a main factor in the creative process.

Fig. 2: Landscape and perception: the Eastern waterfront of the island of Ortygia.

The reading of a territory «has a double significance: one refers to the evaluation of cultural contents which are expressed through the existing architecture, the other refers to the perception of the historic urban

space»[7]. To start a perceptive analysis of the landscape and its identity, as fascinating as complex subjects of study in strict relation, is a relevant operation for the real knowledge of the place. To observe, to perceive, to analyze, to represent “impressions” are fundamental operations for a re-interpretation of the space which «from the use of pencil which has permitted to stop, to think and to choose the drawing of basic shapes, of the vertical lines and semi ellipses in order to construct over them the image of the place»[8] relies on digital elements.
The concept of landscape not only allows to overcome the ancient dualism between natural and artificial which has always characterized the relation between nature and human being and, in turn, feeds and defines the relation between nature and architecture, also allowing to connect two different realities often separately considered and evaluated: the historical one which refers to the action of time and the geographical one which regards to the dimension and character of space.
The studied place is the Eastern waterfront of the island of Ortygia. From a perceptive analysis of the place the remains of the Spanish fortifications emerge, ancient urban limit on the sea, two building volumes, the one of the ex prison and the Post Office building, which for their huge shapes surface directly on the remaining fabric; to these precious features we can add, almost totally, the huge cementitious mass of the Talete car park which denies the relation with the sea. The visual perception of the sea is denied also by the spatial fragmentation and by its designated use. The scenographic element of the sea is extremely important to highlight the identity and the original characters. All this brings to mind Eugenio Turri’s idea of «landscape as a theatre»[9] a reading key which invites to a “new education of seeing” where society wants to raise awareness considering it a manifestation of itself and of its own culture nourishing the sense of belonging to the place and reinforcing at the same time the links with the community living in the place.
The current proposal becomes an important occasion in order to trigger a process of re-appropriation of the sea front, of requalification of the background fabric and of integration with the important historical and archaeological remains still present in the place.
The occasion of an “ephemeral project” is converted into a “modality of communication” temporarily redefining a new perception of the Eastern skyline. The project of an ephemeral space takes the characters of a real project where the main feature is “mutability” based on the dialectic relation between form and time. The resulting perception is temporary, linked to the scenic layout of the space; when the latter fails, perception changes, re-turning to that which existed exactly before its becoming. A new quality of space is reached, even if temporarily, obtained with light elements; in the present case, with ropes, cloths, nets, elements which relate with the place they have been thought for.

Fig. 3: Ephemeral project.

It is not easy to combine the aesthetic and formal needs with the construction techniques; the employed materials must stimulate behavior and life styles in a compatible and sustainable way, in the conviction that improving the quality of landscape means a better quality of life. Confirming this “metamorphosis” of the territory which is told by the landscape as a «guardian of time»[10], is not only conceptual but also a duty for a community which decides to invest and to bet on the cultural growth of those who live on its territory.
«The project takes the form of a new tale, woven on the basis of the plot and of the events of the past, " a not yet told story" able to regenerate the historical identity or to give life to a new identity not in contradiction with the "long lasting one"»[11].
As for the examined place, the purpose is to carry out a reinterpretation moving from the “urban waterfront”, or from the recovery of the historical memory which passes through the conservation of ancient structures, the introduction of new functions and the maintaining of the traditional harbor activities, becoming an instrument for the requalification and development of the whole city.

3. Visible perceptions of ephemeral signs in the existing space. *(R. Valenti)*

«Today for architecture space is no more a pre-established element; rather, it essentially identifies its task in the creation and in the structuring of spaces and of spatial experiences»[12], this concept is based on the assumption that a pre-established place can determine different spatialities according to the type of perception and experience it is submitted to. Beyond the concept of *topos* and *spatium* there is the modality space is thought upon, articulated and filled with contents giving consistency to the place and consequently determining the potential of lived experience.

As a matter of fact, "common goods" or *commons* are recognized as such exactly when the community takes possession and starts using them, including them into its activities and showing a sense of belonging. In the specific case, the studied place is an open space, on a raised level in comparison to the urban fabric, far from characterizing itself as a connection between the parts of the city, used as an underground car park.

In order to contrast the phenomenon of decline and impoverishment of this "marginal" place, in its double consideration of limit of the island of Ortygia and of abandoned and almost forgotten place which, however, presents considerable potentialities for the privilege of being part of an area in the centre of the Mediterranean, destination for a multitude of visitors, it is extremely important to think of it in terms of sustainability, in an experiential and *low-tech* logic.

Pending the cultural debate about the destiny of this architectural artifact, considered an echo monster, and waiting for common solutions, the pursued objective is that of giving life to a space of big dimensions, regenerating it, starting from the visible signs and hoping that all stakeholders (firms, politicians, citizens) could look at the complexity of the theme reconsidering it from a different perspective.

The Eastern promenade seems to suffer an adverse fate: towards the end of the XIX century the system of walls and fortifications were demolished with the aim of relieving the island of its status of fortified and circumscribed place. The relation with the sea has been interrupted and denied again with the construction of the Talete car park, an invasive concrete structure on the *waterfront*, whose perception from the mainland recreates a caesura with the natural limit, actually becoming an artificial limit.

From the opposite point of view, from the sea or from the S. Lucia quarter, nothing of the echo monster can be perceived. From there, it is possible to glimpse a mega terrace screened by artificial breakwaters. The re-interpretation of this space, even if in a temporary and ephemeral way, wants to establish a relation of consequentiality with the visible and invisible signs, with the system of warps and wefts, configuring the real geometrical space identity.

Fig. 4: The eastern waterfront perceived from the sea.

The material survey of its physicality and of its inherent potential vocations and the discernment, through drawing, of the traces which time has settled, are the first necessary steps to find out the relation between the logic intentions suggested by the reading of the place and the primordial idea, shaped by the mind and transferred on paper.

The project model starts from the discretization of all the signs encountered on the “place”, considering it a combination of physical and conceptual space, i.e. a space where it is possible to find evidence of a stratification of customs, appropriate or not, weak or strong, which overlapping and interacting between them have given a certain identity and specificity to the place itself in the course of time. The re-interpretation, carried out with the instruments of drawing, analyses the phenomenon of the material sedimentation in its semantic aspects and addresses its contribution to the identification of new layers and new forms which can, even if temporarily, have visual and relational identity with the surroundings. The interaction between the drawing of the perceived structure and the design of the paths, represent the tool for the discovery of the geometric rule and modular coordination between the different parts of the morphological structure.

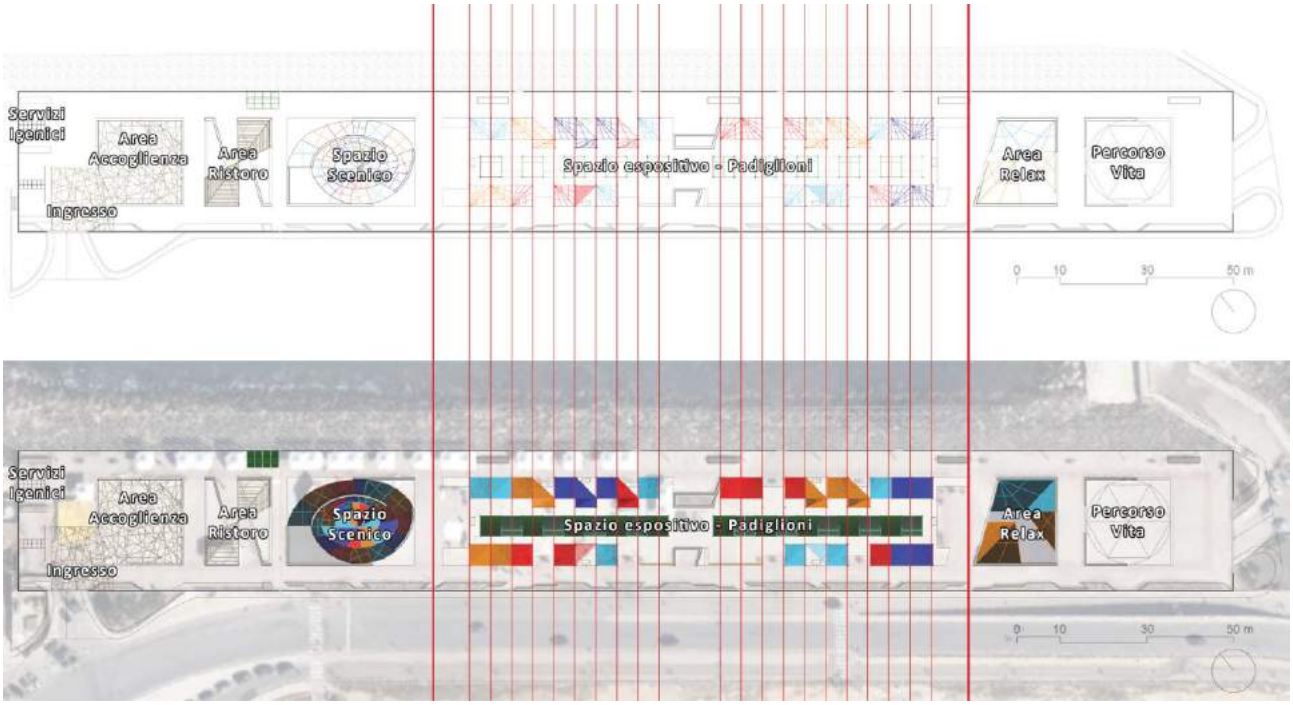

Fig. 5: The discovery of the geometric rule and modular coordination between the different parts of the morphological structure.

Having questioned the field of research and on the basis of the obtained information it was possible to detect three areas with strong unitary features which can provide a vital system of temporary relations. Through sketches and graphics, the place has been sewn back in a single open system, ready to receive and give birth to the different sectors putting them in relation through physical and perceptible paths. The philosophy of intervention requires the demolition of the visual barriers which block the view of the sea so to perceive the space in its absolute entirety with the natural limit. The purpose is to develop through formal language a structure perceptible as a whole with the natural context.
The resulting landscape is revealed through an articulated organization of the space which, through the interaction of simple elements, variable in range and in aggregation mode, and through the sequence of thematic colors identifying the conceptual paths, establishes a complex web on the anonymous surface structured around cyclical evolutionary patterns, in an almost fractal dimension, based on the concept of auto similarity.
The aim is to create a place which can display, within its functions, a sense of dynamic freedom, albeit in a modular regularity, of physical and mental well-being, favored by the visual, auditory and olfactory contact with the sea in the re-appropriation of its own identity.
The virtual simulations of the phenomenal reality designed in correlation with geometry of places and the digital models are the instruments of control and constant monitoring of the morphological definition for the objective verification, in respect of all values.
The methodological approach documents the morphological evolutionary process and allows the constant verification of the choices made from the perceptible point of view and from the place modulation point of view, in line with Peter Zumthor’s formulation according to which «in architecture there would be two basic ways to arrange spaces: on the one hand the delimitation of space in the architectural body; on the other hand the enclosure of a spatial sector, correlated with the infinite space through an open body»[12], the latter is directed towards the experience of space itself and its surroundings; in our case the infinity the viewer is

projecting himself into is the sea which, despite all the interventions from its own limit, keeps on shaping matter.

Fig. 6: The virtual simulations of the phenomenal reality designed.

4. A Wellness Fair as a meeting place between urban regeneration and social innovation *(A. Casciaro)*

As ever, Individual health is in close interdependence with the collective. That which in contemporary societies has mutated however, is our ability to intervene under conditions of risk. The thin line that demarcates nature from the artificial is ever more subtle. The moment in which we build, plan or design, we are implicitly intervening in the order of nature. Such interventions, inevitably carry risks. Much of what we do is directed at the reduction of such risks; cities are the prototype of such a pattern of behaviour.

In the historic centre of Syracuse, a mega-parking lot situated along a traditional waterfront has become a place which symbolises man's inconsiderate intervention on the beauty of the landscape. To this we add the inability to use the enormous ground space (10,000 square meters) in an appropriate way. So, try to imagine and reinvent a beautiful landscape which shoots from an idea of well being, harmony and balance, not only from a bio-psychological but also social and urban. An exhibition project in the pipeline: “The Grande Armonia” is a fair dedicated to wellness in a broad and global sense.

With this project we want to rediscover (by translating) the ancient ideal of human and urban wellbeing from which one is orientated from the complex in which it is inserted. Health is intended as a harmonious relationship between different components. Therefore, holding a Wellness Fair that will not only create an opportunity of meeting people, companies and institutions, but also urban opportunities to propose an idea of social space and landscaping. Health is thus proposed as the capacity of entering into resonance with the environment. WHO defines health as "a state of physical, mental and social wellbeing and not merely the absence of disease or infirmity" (1948); such an explanation constitutes a historic turning point that allows for the abandonment of the medical interpretation of well being. Well-being (feeling good/being well) is a state that involves all aspects of human beings and characterises the quality of life of every single living person.

The risk created by the construction of this car parking lot is that one gets used to a mortifying landscape, to trivial usage of ground space, and a disfigured image of the city. The event is therefore intended to give substance to a spurt of imaginative and proactive momentum, urban regeneration of an area otherwise used

without taking into consideration the importance that the artificial can be reinvented only by another artifice, but, however, of nature sustainable design devoted to beauty.

Fig. 7: Talete Parking: the mortifying landscape and the banal use of ground space.

When the European region of WHO launched the program "Health 21" (21 targets for the 21st century health) -suggesting target 13 as “people in the Region should have greater. opportunities to live in healthy physical and social environments, at home, at school, at the workplace and in the local community" and target 20 as "the health sector should be involved in active health promotion encouraging other sectors to unite in multi-sectors and share goals and resources"- indicating a road that must be travelled so that application can be given to multidisciplinary, systemic and collectively specified strategies and interventions. A multidisciplinary approach -with a socialising network- creates new organizational forms where the same reticular relations become instruments to be mobilized in social, economic and cultural activities. In other words: social innovation.

If it is true, as indicated by the Ottawa Charter (1986), that the promotion of health is the process which enables the individual to increase control over one's health and to better it; to reach a state of complete physical, mental and social wellness, an individual or a group must be able to identify and to realize their own aspirations, to satisfy their own needs, to change the environment or deal with it. The urban environment then, with our project-fair, will be reinterpreted for the purpose of a different and innovative use of the idea of regeneration that can be informative, not only for promoting trade relations, but shall in itself put into practice leisure and free time activities, the appreciation of the East Coast of Sicily, all put into play within the field of cultural activities.

In practice the Fair will offer the public all there is to do and know about being well or feeling better. Natural products, holistic disciplines, free classes, experiential workshops, meetings and free treatments for a better quality of life in relation to lifestyle, to correct sedimented daily bad habits which may hamper our 'wellness'. There will be on offer a range of proposals for well-being with a review of biological products for the nourishment of the body and well-being of the mind, leisure time, the environment and much more (from

massages, to cosmetics, herbs, herbal teas, bio-natural disciplines, to alternative therapies, yoga, tai chi chuan, spirituality). It will be a trade fair of harmony and serenity, with the presence of numerous stands, workshops and conferences.
The exhibitors will be both commercial and cultural. For the first category there will be selected companies that manufacture and/or market quality products/services in the field of food, cosmetics, clothing, furnishings, bio-construction, fitness, organic, and well-being in general. For the second category, ample space will be given to public and private organizations that deal with art, culture and research. Those who come up with ideas will then be put in touch with those who can translate them into products and services benefitting the end user. It promises to be an interactive and engaging way to broaden our horizons of knowledge, through which you can try, know, and experience all those disciplines and products for the integration of mind and body with a view to understanding and meeting the North, South, East and Western corners of the globe.
The space will therefore be designed following a common thread that can help the visitor to make the most of intimate, public and private spaces.
The event will offer three main sections: 'Expo', 'Experience' and 'Culture' focusing on Natural Beauty and on an exhibition area designed and specifically built, installing pavilions and stands. The first two sections will be dedicated to displays and exhibitions and the opportunity of on-the-spot experimentation of all matters relating to: Food (foods that aid our daily well-being based on a correct diet, consisting of conscious choices and balanced elements); Nature (harmony between mind and body but also harmony with our surrounding environment, the selection of courses, products and training opportunities and useful ways of investigating and attaining complete serenity in symphony with an increasingly frenetic world); Wellness (wellness centres, holiday resorts, spas and villages characterized by peace and beauty); Care (therapies, ancient and modern methods that can help in preserving both health and balance of the mind, body and spirit); Fitness (workouts, fun, well-being and integrated keep fit programs of gymnastics, natural cosmetics and dietetics).
The culture section, which includes conferences, round tables and theatrical stages will instead be dedicated to project sharing with exhibitors participating in activities in line with the proposal of ideas for sustainable prosperity for all. Moments of reflection and ways of gathering together in a collective dimension of health. Visitors will be guided through the stands, meeting not only exhibiting companies and qualified industry experts who will present products and courses, but also ideas and projects to be implemented for shared bio psychosocial for interpersonal wellbeing.
The aim, therefore is to propose a type of Fair that can help with reflection on the entire range of interest within which it is located and at the same time, stimulate bottom-up initiatives that can act as engines of urban regeneration. The physical space to be regenerated will be the "trigger" to these experiences of self-organization, forms of social enterprise and design skills.
The network of enterprises with organizations that produce ideas will be the social infrastructure that stimulates the proposition of social innovation models and therefore new organisational practices which may encompass not only interactions between bottom-up initiatives and institutions but also between decision makers/operators and designers.
In this sense, the Fair would like to propose new ways of relating, and organizing projects in order that self-organised productive communities and developers of new social practices aimed at health promotion can be stimulated: A cultural model of quality of life in line with the continuous evolution of our complex society and, therefore, demanding a multidisciplinary approach to social design and the organization of urban regeneration initiatives. An approach directed at the reduction of risks produced by man himself.

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The choice of the intervention on post-war housing.

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Abstract
The growing awareness of the importance to limit the soil sealing process has prompted a shift of building activity towards modification of the existent stock rather than construction of non-urbanized soils. Approximately a third of the European housing stock was built during the thirty years after WW-II and a huge part of it presents different kinds of obsolescence. This declining performance process makes it necessary to take action in order to meet today's requirements. A decision must be made in order to choose the preferable intervention in a sustainable and lifespan conscious perspective. This paper focuses on multi-storey apartment buildings, which do not present historical or testimonial quality, and seeks to inform the choice between reconstruction or renovation. Focusing on physical conditions and recurrent obsolescence process, this paper highlights which parameters are most instrumental in the decision-making process and proposes an assessment method that can serve the purpose of establishing the limits of a renovation project.

Keywords: post-war housing, obsolescence, renewal, demolition.

1. Introduction

Housing demand is still in part unsolved in Europe. Which actions could be taken in order to respond the actual need of dwellings? Building new constructions and extend urban areas? Retrofitting obsolescent buildings? Demolishing existing housings and rebuilding new ones? The growing awareness of soil value motivates the need of preserving non-urbanized land from soil-sealing process, shifting construction activity towards modification of the built environment.

European building stock consolidated during the thirty years following the end of the second world conflict and, nowadays, post-war housings account for more than 30% of the total housing stock. In 1945, a phase of economic and demographic growth started for European countries that corresponded to prominent production of new dwellings. Therefore, today's reflection on housing demand cannot avoid taking in consideration future perspectives of this part of the existing stock. Post-war housing stock is now more than 40 years old, it is ageing and currently facing a performance fall that prevent it from meeting current requirements and needs interventions before his expected life will have expired.

Analysing current obsolescence factors in Italian post-war building stock, this paper explores the field of building's end-of-life perspective and proposes some reflections about factors that could be instrumental in the decision-making process to select the preferable intervention for an existing building.

1.1 Italian post-war housing quantity and quality

Following the trend among other European countries, the Italian building stock consists of almost a half of constructions erected during the 30 years after the Second World War. As figure n°1 shows, building stock produced in 1946-1960 and 1961-1971 represents 45% of the total.

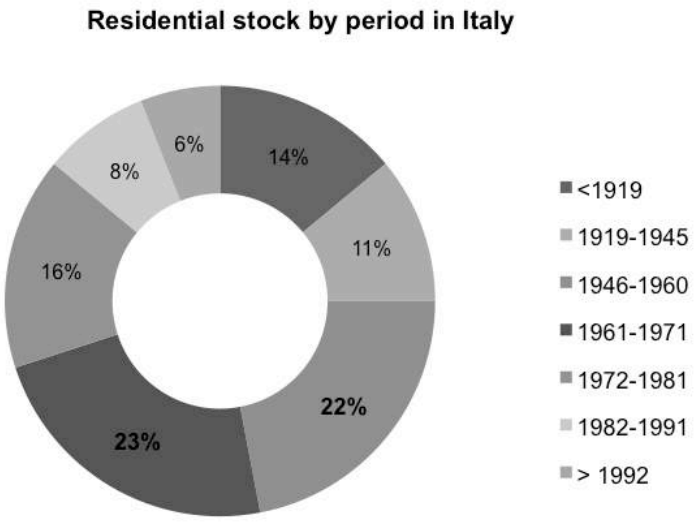

Fig. 1: Residential stock by age of construction in Italy (ISTAT 2001)

In particular, as Figure 2 shows, multi-storey *residential blocks,* identified as those buildings with more than 5 dwellings, account for more than 50% of the constructions built in Italy between 1946 and 1971 (ISTAT 2001). In the country this building typology is not only typical of the social housing production, though this latter type of housing is clearly the most common in the post-war period (De Pieri 2014).

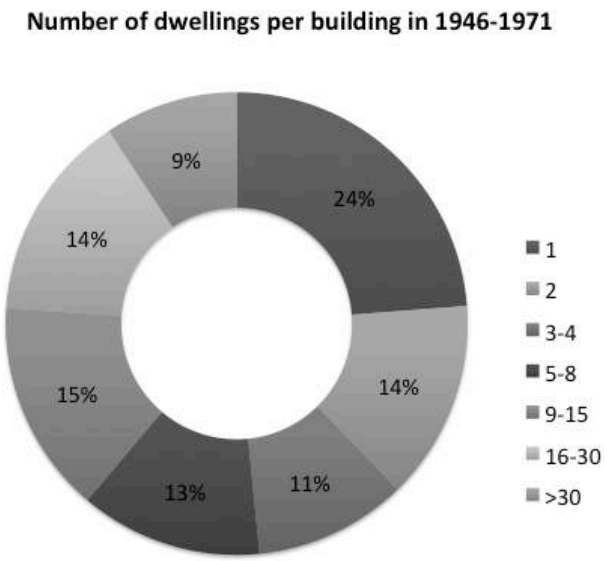

Fig. 2: Number of dwellings per building in post-war stock in Italy (ISTAT 2001)

Construction conditions during post-war period were characterised by the urgency of reconstructing housing buildings destroyed or damaged during the War[1], a demand rendered even more pressing by

[1] Considering that pre-war Italian building stock consisted of almost 30,000,000 dwellings, the conflict caused the destruction of 1.900.000, while 5,000,000 were seriously damaged.

the rural-urban migrations that intensified post-war. In 1945, an estimated 15,000,000 dwellings were urgently required[2]. The imperativeness of the situation led to a lack of concern for quality. Moreover, the building industry spearheading the economic growth was rapidly growing and therefore involved unspecialised workforce.
Therefore, these social and economic conditions are reflected in the buildings' quality of these year. Apart from a few cases of excellence, urgency of reconstruction and faith in economical growth caused the absence of reflection about materials durability and their possibilities of ageing that translate into lack of technical and constructive qualities, which in turn brought this stock to rapidly decay. Nowadays, as table n°1 shows, almost a quarter of the stock built in1946 – 1971 is in a poor or very poor state of conservation making it necessary to intervene.

Constructive period	Buildings conditions				Total
	Excellent	Good	Poor	Very poor	
1946-1961	262.252	919.050	440.821	37.706	1.659.829
1962-1971	421.296	1.189.107	339.915	17.639	1.967.957
Total	683.548	2.108.157	780.736	55.345	3.627.7861

Table 1 : Current building conditions (in 2001) of the post-war housing stock in Italy. Source : ISTAT 2001.

1.2 Recurrent obsolescence processes in Italian post-war housings

Multi-storey post-war buildings are facing several obsolescence processes, which are responsible for remarkably reducing their compliance to nowadays performance requirements. Because of similarities that typify this part of the stock, it is possible to identify specific recurrent phenomena affecting it.
Different types of factors can cause performance decline. Considering the difference between endogenous and exogenous obsolescence process (Thomsen, 2009), it is possible to delineate the most prevalent ones in relation to Italian building stock.

1.2.1 Endogenous obsolescence

Endogenous obsolescence factors are related to the physical state of the buildings and are primarily linked to their specific constructive features. Most of them are associated with structural components. The post-war building construction is characterised by cast-in-place concrete frame, which represented, broadly, the most widespread type of structure[3]. The material had shown, in past years, an unexpected lack of durability. Although it was supposed to be a long-lasting material, almost unalterable during his lifespan, it promptly started to show various signs of decay, appearing to be less reliable than foreseen, (Zevi 2001, 68).

[2] As reported in the "Survey acts of Italian parliamentary commission on poverty" 1951 – 1954.

[3] Unlike other European countries, as France or Germany, where concrete prefab structures put by building industry, in Italy this choice concerned only a few experimental construction sites as, e.g. in 1946-48 in the QT8, Milan.

Fig. 3: Examples of physical decay affecting post-war building stock (photos by authors unless last one Zevi 2001).

This especially concerns low quality structures, in which natural decay, due to ageing process, load bearing and weather action is incremented by poor quality of the materials, imprecise execution and recurrent inaccuracies in the design phase. Furthermore, in Italy a lack in technical legislation contributes to this accelerated decay process: concrete structures were regulated until 1971[4] by a 1939 law that presented insufficiencies in general requirements for reinforced concrete structures.
All these factors deeply influence current buildings performances. The figure below shows a series of the most recurrent decay processes in Italian multi-storey building stock, in relation to their primary causes, namely the action of natural decay, incremented by the presence of errors and defects in construction or in design phase. Each process is considered with respect to its influence on current performances for various categories of requirements.

[4] In 1971, a law was finally approved that updated the regulation relative to the requirements of reinforced concrete structures (L1086/1971 : Norme per la disciplina delle opere di conglomerato cementizio armato, normale e precompresso ed a struttura metallica).

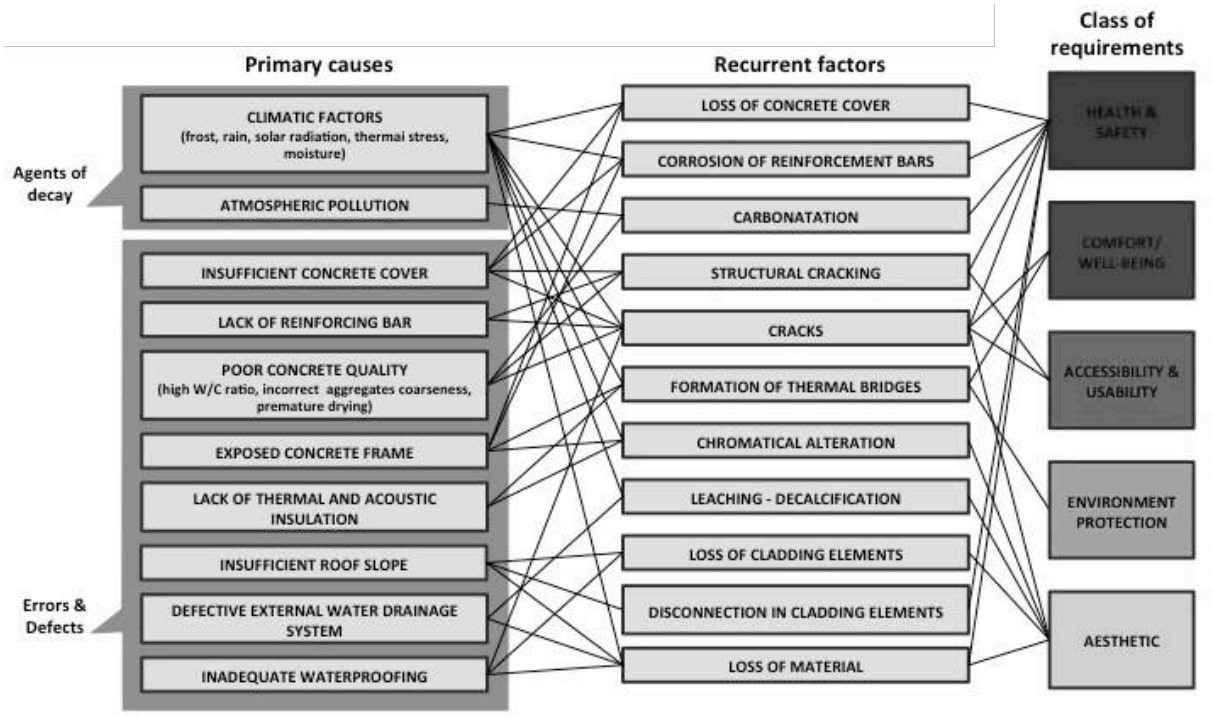

Fig. 4: Recurrent endogenous phenomena of obsolescence

1.2.2 Endogenous obsolescence

As summarised by Thomsen (2009), we can consider as exogenous all obsolescence processes related to mutations in external conditions that affect existing constructions, causing a reduction in their performances, to the point that they do not meet current requirements. The exogenous obsolescence factors include the physical building location as well as the general context where the building stands.

Firstly, the physical building location, evolutions are generally related to changes in the urban structure or the environment conditions, which render the building and its original features less compatible with the new situation or cause an unexpected reduction in residents comfort. For example, this can happen with the construction of a highway road in the surroundings that produces various negative impacts such as heavy traffic emissions. A lack of compatibility can also arise without modification of the building site but by simply acknowledging specific environmental risks or feature that were previously ignored. Secondly, the general context encompasses legislative, economic and social conditions that influence changes in housing requirements framework.

Post-war multi-storey buildings are currently facing three main types of obsolescence caused by exogenous factors, related to vulnerability to natural hazards, comfort and accessibility/suitability. Similarly as for endogenous factors, Figure 4 shows these recurrent obsolescence factors that affect Italian multi-storey housing stock, considered in relation to their influence on current performances for different categories of requirements.

Firstly they show environmental vulnerability in relation to possible hazardous situations. Dangerous conditions regarding the complexity of Italian geography concern an important part of the dwellings from different points of view. 24.147.000 persons inhabiting 6.627.000 buildings reside in high-risk earthquake areas. 35% of those buildings present a high vulnerability level. Moreover, 1.259.000 buildings are exposed to hydro-geological risk, which could be increased by exacerbating extreme weather events due to climate change. Finally, almost 2.000.000 persons live in a high-risk volcanic area (Cresme 2012). Two factors of obsolescence are here present, on the one hand, there is growing awareness of the real vulnerability of the territory (location factor) while, on the other, stricter constructions requirements are being applied in the areas most exposed to hazards (legislative context factor). Until 1974[5] there were no specific requirements for anti-seismic design and therefore, the entire post-war stock does not present sufficient performances in the event of an earthquake.

In addition, a widespread obsolescence affects building performances in relation to resident's comfort conditions. The choice of envelope's materials and the layout plan appear often indifferent to climatic

[5] In 1974 in Italy the law n°64, was approved concerning "Special constructions requirements in seismic areas".

conditions of the location, causing the inadequacy of the building with respect to the environmental features. Besides, a recurrent lack in acoustic and energetic insulation causes huge energetic costs and does not guarantee sufficient well-being inside dwellings, neither of which satisfy to current technical regulations at European and national level.
Furthermore, due to evolution in social and economical context, dwellings and buildings general typologies do not meet today's user requirements, especially those regarding accessibility and size.

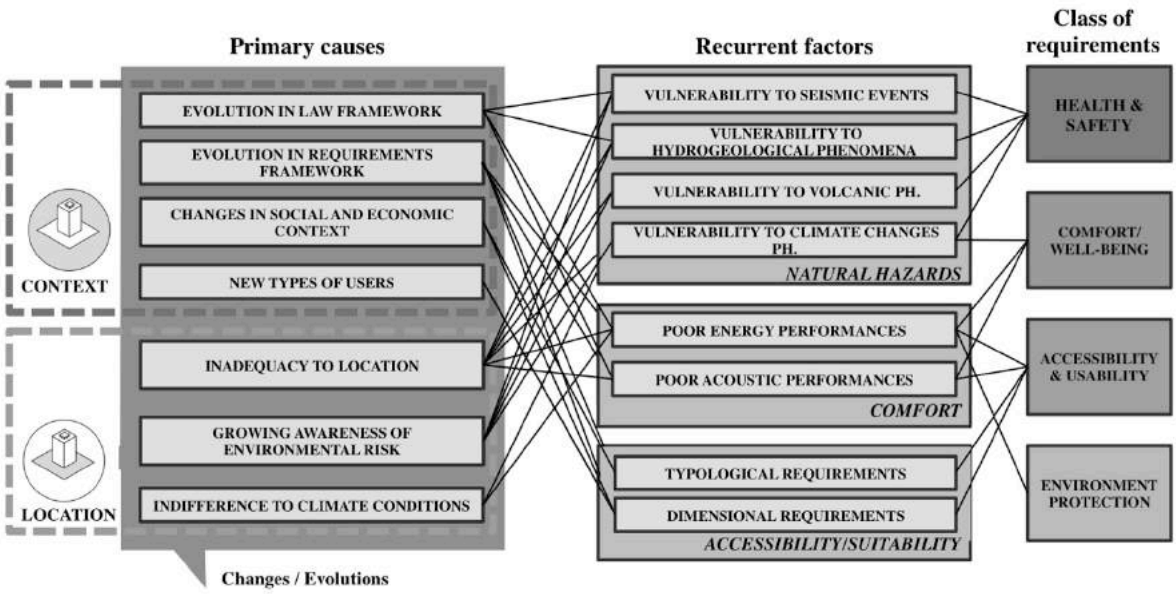

Fig. 5 Recurrent exogenous phenomena of obsolescence

2. Regeneration need

Through the analysis of the obsolescence processes that affect post-war building stock, it is possible to deduce that in many cases intervention is necessary. A part of these buildings has already reached the point to which a decision about their future must be taken. The choice is whether to extend their lifespan or, to the contrary, acknowledge the end of the building and proceed to its disposal, either completely or partly, in a lifespan conscious design perspective (see in Figure 6 below, the diagram developed from Lee (1997)).

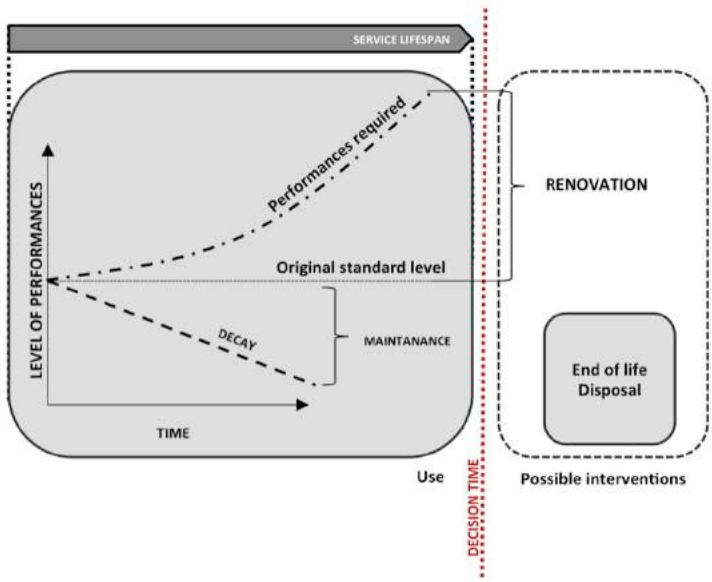

Fig. 6 Relation time/performances (Lee 1997)

Considering that demolition and renovation are both necessary actions for an organic development of urban environment (Choay 1996) and that, to investigate demolition's aspects it is necessary to develop a transdisciplinary research (Thomsen et al. 2011), we try to delineate circumstances in which a demolition action could be considered a possible option, focusing on the construction's physical conditions.
Frequently in Italy, urban renewal projects are led by a feeling of preservation, reverence and an aversion to demolition, even in the case of poor quality building stock (Laner 1998). In contrast to this way of thinking, we can consider the concept of *useful buildings,* that Zambelli introduced. They are buildings for which the primary aim is to accomplish a specific function, in our instance a residential function, without added cultural or symbolic values (Zambelli 2008). For this type of construction, demolition could be chosen as a legitimate option.

2.1 Critical aspects of demolition

Taken for granted that demolition cannot be an option neither for historical or listed building, nor for constructions with symbolic or testimonial qualities, it is also necessary to define other critical aspects of this type of intervention.
Very often, criteria that explain the choice of demolishing a building are not connected with its physical conditions. Physical obsolescence is rarely the main reason in choosing the replacement of an existing building, whereas this is probably the most instrumental aspect (Cairns, Jacobs 2014). Too often, the process of assessing a building's physical state and its subsequent choice of intervention is inverted, that is to say, the choice to demolish is made prior to the evaluation, which only serves as justification (Kohler, Hassler 2010). It also occurs that the, physical conditions are not assessed at all because the choice of demolition is motivated by other reasons.

2.1.1 Motives to demolish

The reasons to overlook the physical state of a building are manifold although we can identify three primary explanations. Firstly, the expected profit associated with a specific mode of intervention is the main driver to motivate demolition. In this case the building's economic life is considered to have come to an end although its physical lifespan has not. This type of profit-driven concern is mainly related with real estate property and management.
Secondly, the act of demolition can be used to "solve" acute social situations that are not directly related to buildings' physical characteristics. The decision process is here in the hands of administrative authorities and pertains in particular to social housing complexes. It should be noted that these destructions are often staged in the context of events that are connected to audiences, either on site or via television. These "ceremonies" take on an expiative veil as if by erasing the container, all the problems within it would vanish, in a sort of metonymic enchantment. In Europe[6], this type of demolition started in France in the late 1980's, where it occurred massively during the 1990's[7].

Fig. 7 Invitation to the demolition "ceremony" of Balzac building in La Corneuve (France), 2010.

In Italy, this type of intervention was much less applied, due to an already cited more conservative approach towards the building stock. A famous example though is that of the *Vele*, in the northern area of Naples, whose 7 blocks were reduced to 4, by demolitions realised between 1997 and 2003. Although these buildings presented acute urban and spatial deficiencies, their structure tenaciously

[6] We can consider the first operation of this kind to be the demolition of the Pruitt-Igoe complex in Saint-louis (US) in 1972.

[7] Emblematic cases encompass the spectacular demolition of the *cité de la Corneuve*, built in 1956-66 and partly demolished in 1986, 2000, 2004 and 2010.

resisted demolition (before eventually bowing down), underlining the political nature of the decision and the lack of consideration for the physical condition of the buildings. Finally, the expiative demolition of large social housing complex built during the post-war years can also be construed as a willingness to dispose of the urban and architectural product of a now considered failed ideology[8].

Fig. 8 Le Vele during a demolition action, 1997 (Costruire in laterizio n°65/1998).

2.1.2 High environmental costs of demolition

Even if the physical lifespan of a particular building depends, in an obvious manner, on its physical state, real service lifespan is influenced by more complex reasons. As illustrated in the above-presented cases, for various reasons, the choice to demolish is regularly not based on physical conditions of the building, whose assessment is often biased, causing the premature destruction of many constructions. In this case, environmental impacts of the intervention are huge and generally not justified (Thomsen, Van der Flier 2008). According to researches, demolition is a less sustainable choice than renewal intervention, especially considering the considerable resulting waste flow (Lavagna 2008).
Nowadays, the interventions made on the building stock cannot avoid taking into account the limitation of environmental impacts and energy consumption, due to the recognised impact of the construction industry. Therefore, demolishing a whole building should be considered inappropriate, surely unsustainable, if the choice is motivated either by ideological reasons or justified by partial assessments based on economical or functional lifespan. Even considering that there are different stakeholders, with differing objectives, who participate in the decision-making process, the ultimate decision should be based on the material state of the building, in order to select the most suitable and less environmentally expensive option.

2.2 Possible actions of demolition

Therefore, without overlooking critical aspects of demolition choice, it is possible to delineate conditions in which a destructive action could be chosen as a legitimate one. In the main research (Larizza 2015), we conducted an in-depth analysis of the various reasons that motivate demolition, which allows us to establish that legitimate demolitions, with respect to the improvement of the built environment, are of two types. Those connected with the physical conditions of the site on one hand and those related to the building itself on the other.
For what pertains to the site's conditions, the choice of demolishing can be motivated by the objective of either compensating or mitigating the impact of the building on the construction site. Compensation is a possible action when valued site's characteristics have been affected by the construction of the building. For instance, when a building is located in a valued landscape or urban situation in which its presence brings negative impacts, its destruction may represent a legitimate compensation action in order to rehabilitate the quality of the site (Lanzani 2012). In this case the erasure of the volume represents a tangible compensation, not only from a symbolic point of view (as for expiatory demolitions), but also as actual liberation of the site. As for mitigating purpose actions, they refer to an existing risk for the construction and its inhabitants, caused by the vulnerability of the building to the area. In this case, demolition followed by reconstruction of the volume, possibly in another safer location, can be a suitable option to reduce the risk[9].

[8] The exhibition *Cronocaos*, from the 12th Biennale of Venice (2010), highlighted this aspect as an instrumental driver of the destruction of modern architecture.

[9] Various Italian regional laws encourage, by volumetric bonus, the transfer of volumes from sites characterised by high hydro-geological risks to safer zones, as a strategy to reduce risk (see e.g.

Compensation- or mitigation-driven demolitions are related to assessments on a larger scale than the building itself. Focussing on building constructive conditions, demolitions represent acts directly aiming at regenerating the building stock. The main purposes for this type of demolition actions are substitution to upgrade performances, destruction followed by reconstruction to improve construction qualities and life conditions.

3. How to choose the intervention?

In the light of what has been discussed above, it is evident that the choice of the intervention should be made in an in-depth assessment framework that tries to evaluate all possible entailments and complexities involved in an intervention on existing building, considering the feasibility from a technical, economical and environmental point of view.
In order to improve decision-making process, a first evaluation with the aim of filtering possible interventions should anticipate design choice. This first evaluation would allow to give architects preparatory indications to face up the (re)design of an existing building. Based on the analysis of various case studies (carried out in the main research), we propose an assessment method to evaluate renewal possibilities, focusing on buildings' physical conditions.

3.1 Phase 1: Definition of the current conditions of the building

To define the most convenient intervention, the first part of the analysis involves the examination of the current conditions of the targeted building. This is the first phase, whose major objective is to describe the construction, focusing on its principal features and highlighting its major qualities and deficiencies. This process will provide knowledge of the building (relative to its age, typology, technology, dimensions, use and environmental performances), and its location (integration in its urban environment, characteristics of the urban and physical environment).

Fig. 9 Model of phase 1.

3.2 Phase 2: Selection of the intervention

Once this first analysis of the physical conditions of the existent building and its site is completed, the next step (phase 2, shown on Figure 10) consists in the selection of the most suitable intervention with respect to nowadays demands of buildings' performances.

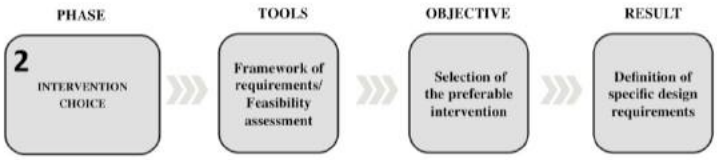

Fig. 10 Model of phase 2

At the heart of this second phase lies the requirement framework assessment. This framework rests on the information collected during the first phase and consists of a list of priority objectives to upgrade the construction, identified on the basis of a specified series of priority requirements, derived from more general classes of requirements. For example, as shown in Figure 11, the objective to improve the structural resistance to seismic events derives from the analysis, made during phase 1, of the

Nuovo Piano Casa Sardegna 2015 2016 – Regional Law n .8, 23th of April 2015, Capo 2 ; Regional Law of Molise n.7, 14th of April 2015).

current state of the building and its location and descends from the requirement of structural stability, which itself belongs to the class of requirements 'safety'.

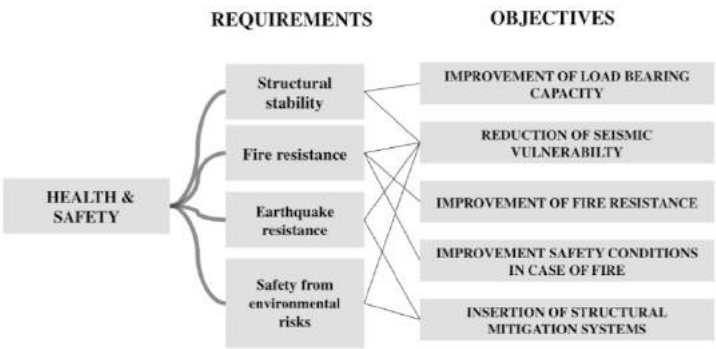

Fig. 11 Example of the main objectives of the intervention in relation to health & safety requirements.

Specific requirements should be considered hierarchically, in order to weight every obsolescence condition according to its importance. For instance, an obsolescence process that affects performances related to aesthetic requirements is less important than one affecting static security or comfort conditions. Since a renewal operation can hardly ever reach the level of performance of a new building, accepting substandard implementation of secondary objectives is necessary if we wish to avoid systematic destruction. Therefore, only in case of obsolescence process affecting overriding performances, demolition should be considered as a legitimate option.
When these predominant requirements and their related building performances are chosen, it is then possible to define the main goals that the intervention has to achieve in order to adequately update the building. Then, a first assessment can be performed to define the improving actions in relation to the site's features. Thereafter, the building itself is assessed (second assessment) to determine the real possibility to carry out the upgrading actions. This process is summarised with Figure 12.

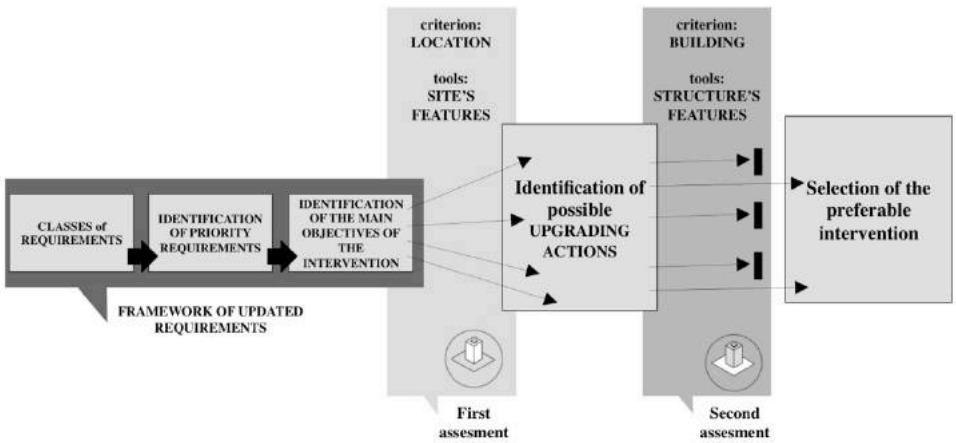

Fig. 12 Model of phase 2.

The first assessments objective is to evaluate the site's conditions in relation to the objectives of the update in order to set a list of specific updating actions to be performed on the building to guarantee optimised performances in relation to the configuration of the site. These site's conditions can be considered as additional restrictions. Their presence can affect real renewal possibility and influence the achievement of overriding upgrading goals.
For the second assessment, the structure characteristics represent the main constraint to the type of intervention possible, for two reasons mainly. Firstly, the structural framework's features (dimensions and conditions) directly limits the modalities of the intervention. Secondly, the intervention on the structure itself defines terminologically the intervention as a whole: as long as the structure remains, even when substituting the envelope (and/or other parts of the building), it is a (deep) renovation. Otherwise it is a demolition. Figure 13 shows a possible application of phase 2.

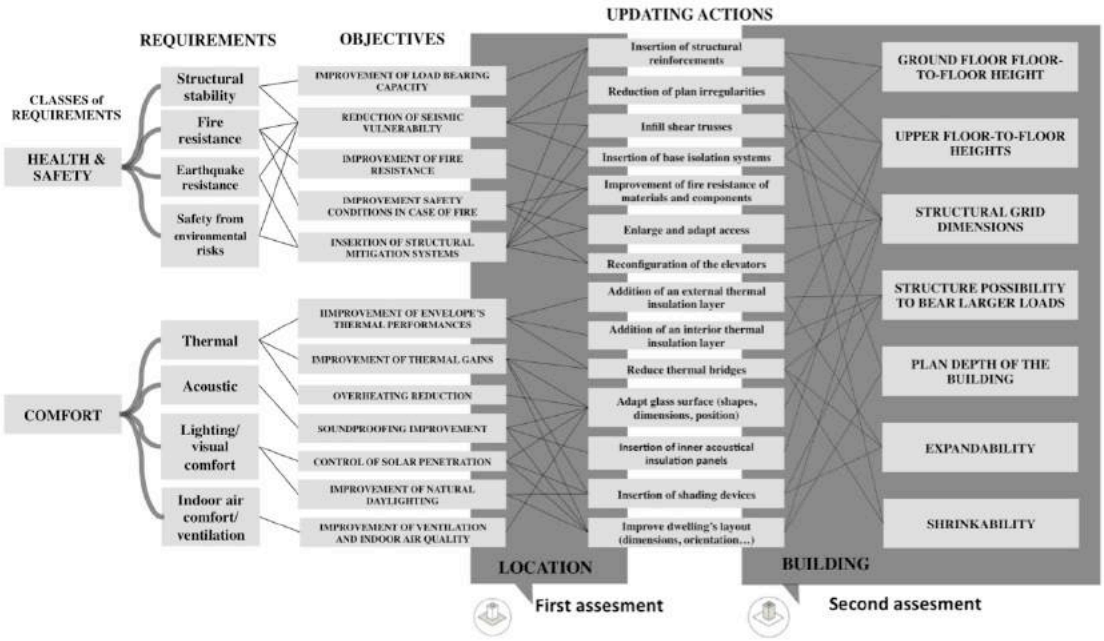

Fig. 12 Possible application of phase 2 assessment methodology..

4 Conclusions

In this paper, we have argued that current housing demand must be addressed by modifying the existing building stock, because of necessity to limit soil-sealing process. European building stock has consolidated massively during the thirty years following the Second World-War. This part of the stock is ageing rapidly as a consequence of the urgency of reconstruction and the lack of concern for durability that characterised this period. The quantitative aspect as well as the qualitative justifies the emphasis of the paper on this part of the stock.

Specifically, we have focussed on Italian building stock and have defined its main obsolescence factors, in reference to endogenous or exogenous causes. This brought us to conclude that an intervention is necessary on this part of the stock in order to meet current level of requirements.

Demolition interventions are rarely well enough motivated, especially in reference to environmental impacts. Indeed, they are not justified when the decision to demolish overlooks physical conditions of the building and its location for economical, political or ideological reasons. Nevertheless, demolition can be considered a suitable option in specific cases, those that seek compensation, mitigation or upgrading. Compensation occurs when the destruction allows to recover valued qualities of a site that were altered by the construction and mitigation refers to the reduced risk that results from the destruction. Upgrading implies the improvement of the building's performances at an appropriate level.

Elaborating on this framework, we have defined a method to guide stakeholders in the selection of the intervention. The process consists of the systematic analysis of the physical features of both the constructed site and building, allowing to delineate the boundaries of renovation in the face of current requirements.

The limits of a renovation project mentioned in the title could be considered as the boundaries that a renovation project has to respect. These limits have an influence on reaching current performance's requirements. They are represented by physical characteristics of the building and its site, and mark the material limits of a renewal intervention.

The assessment is largely based on the study of Italian context and it remains to be seen whether the formalised assessment process applies to other European built contexts. Since post-war stock is facing an important performance fall, everywhere in Europe, this systematic approach could prove useful elsewhere.

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Symbiotic architecture in suburbs

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Abstract
Recent international economic crisis highlighted the limits of present development models. In the light of problems arising from land consumption it's necessary to question the models of unlimited urban expansion acting on cities with new strategies for requalification and enhancement of dequalified spaces through rational densification of existing urban fabric. In many countries we can observe examples of ongoing densification processes, that provide reinterpretations of consolidated urban fabric types in which they act: in Beijing some examples of the insertion of new volumes into historical fabric manifest an attempt to protect the siheyuan through their upgrade; in the UK there are many examples of addition of new volumes for the expansion of terraced houses, with the partial saturation of their courtyards; in North America, where urban sprawl generated endless suburbs of isolated houses, new buildings were placed in the spaces between a house and the other; in Paris apartment blocks suburbs, starting from the rereading of critical issues of urban fabric the upgrading and retrofitting of low-quality social housing was obtained through articulated interventions of volumetric addition. Furthermore, the paper proposes a rereading of Italian suburban districts and their requalification through densification interventions by rational interventions of symbiotic architecture.

Keywords: Symbiotic architecture, suburbs requalification, volumetric additions, built fabric densification, building refurbishment

1. Urban sprawl containment and symbiotic architecture
Urban sprawl is a low density edification phenomenon, that in recent years has been often driven not by housing or productive necessity, but by real estate speculation leading to the construction of unnecessary built volumes. Due to the low edification density, urban sprawl leads to extensive land consumption. Here the word consumption is used with the meaning of "use of a resource that lead to its loss", while the term land identifies the cortical layer of earth not covered by water and not urbanized (i.e. both agricultural and natural land). The transformation of agricultural and natural extra-urban land for new uses is not reversible, thus we can state that «land is a finite environmental resource, not reproducible and not renewable» [1]; the consumption of land is a serious problem that concerns the whole of society, therefore its management should be held by society itself [2], since a single private operator does not take into account negative externalities to society [3].
Agricultural and natural land plays a multiple role (in the preservation of ecosystems, in the protection from hydrogeological risks, in the mitigation of local distortions to climate – e.g. urban heat islands –, in food-production, in psychophysical well-being of people thanks to their link to cultural factors and to possible leisure use [4]) thus its preservation should be considered a primary social goal. Agricultural or natural land consumption should be reduced to a minimum and limited to cases in which a social need cannot be satisfied otherwise, and only when a feasibility study has demonstrated that these requirements have a degree of necessity and a permanence in time comparable to the need for land preservation [2]. Reuse of abandoned peripheral areas (functional redensification) and addition of new volumes in existing built contexts (building redensification) are the strategies that must be promoted as alternatives to land consumption; they are particularly important because they can lead to a capillary,

rational and targeted action to improve quality of dequalified urban textures with neither waste of land or material resources, nor deletion of cultural testimonies [5]. In particular, building redensification is the right strategy for dequalified urban districts where a low building density coexists with the absence of an overload of infrastructures or with the possibility to enhance them.
In the design of functional or building redensification, two opposite and antagonizing approaches can be followed [6]: the “theory of destruction”, a selective action and the expression of a judgement on existing buildings [7]; the “theory of conservation”, suspension of judgment and ambition to the full protection [8]. Arbitrariness and ideologicity of selective judgment, historical and documentary value of existing buildings, the value of built fabric as cultural and memorial landscape [9], the environmental unsustainability of widespread demolition and reconstruction [10] are evident limiting factors for “theory of destruction”. Conversely “theory of conservation” has some self-admitted technical and ethical limits: technical limits are connected to the fact that everything undergoes changes over time, ethical limits are connected to the fact that sometimes need for conservation and needs of contemporary life can clash one another; hence the theory of conservation doesn’t propose the static embalming of built heritage, but the government of its continuous evolution, aiming at the maximization of its preservation [8].
The addition of new volumes in existing built contexts (building redensification) is an alteration of built fabric and it usually requires modifications of existing buildings, from this point of view it’s in contrast with theory of conservation; however the satisfaction of the same needs through the realization of new volumes in previously non urbanized areas would cause an irreversible consumption of agricultural or natural land. Therefore needs for the conservation of built fabric and of territory come into conflict, giving rise to a new approach to the management of built and natural environment which seeks to reconcile issues of conservation and sustainability: symbiotic architecture [6].
Symbiotic architecture aims to combine the protection of existing constructions (intended as a material evidences of culture) and the need to fulfill social needs of present population and of future generations (i.e. architecture must be made consistent with the needs of the present life) acting on existing buildings [6]. Two are the basic ideas underlying symbiotic architecture: the approach to built environment should be based on addition, and demolitions must be avoided as far as possible [11]; the addition may originate a synergy with the existing building (as in the biologic interaction of mutualistic symbiosis). The added built volumes must not be a parasite which exploits pre-existence and harms it, conversely addition and pre-existent volumes should achieve a symbiotic relationship in which both derive benefits from the mutual interaction (e.g. functional and technical upgrade, aesthetic requalification, cultural valorization) [5, 6, 12].

2. Urban sprawl containment and symbiotic architecture

The most basic level of interaction simply involves saturation of residual spaces within building fabric (obtaining a saving in soil consumption), while a more complex symbiosis involve a direct interaction between addition and pre-existence (e.g. rooftop additions or extension in adherence): new volumes may take advantage of pre-existence (e.g. at the structural level), but in reverse they can provide benefits by upgrading pre-existence from the social, formal, typological/functional, and technological points of view [5]. In following subsections some significant cases of intervention strategies in specific contexts built will be presented. These building interventions provide some protection of urban historic fabric while preventing the replacement of the same and potentially the gentrification phenomenon; the trait common to presented interventions is the increase in surfaces and volumes through additions to buildings that insert into built fabric modifying it without denaturing it.

2.1 Beijing siheyuan

In last decades the fast growth of Chinese economy has led to a substantial expansion of the market of new constructions. In Beijing the historical urban fabric is mostly composed by siheyuan: the typical urban blocks of single floor buildings arranged around a rectangular courtyard. Many of them don’t have modern sanitary facilities, and compose a fabric characterized by narrow lanes that make modern means of transport difficult or impossible to transit. The combination of these factors has resulted in a gradual abandonment of these neighbourhoods by traditional population who preferred to move to new neighbourhoods characterized by contemporary building standards. As a consequence, these abandoned neighbourhoods have been progressively substituted by high-rise buildings arranged in super-blocks to increase the benefits of the advantageous position of areas [13].
The replacement of large parts of the historic fabric and the consequent loss of urban identity has finally began to stimulate the debate on cultural built heritage protection in China [14, 15]. This led to the realization of projects that seek to update siheyuan to current hygienic and functional needs (many courts were missing also modern sanitary facilities) by inserting new added volumes partially saturating domestic courts, to prevent phenomena of social and building replacement. In addition, added volumes allow to integrate new services absent in existing fabric ensuring an appropriate mix of functions that improves the social context.

Fig. 1: Additions to Beijing's siheyuan – *Hutong Bubble 32* (top left) by MAD Architects (presented at Venice *Biennale* in 2006) imagine the diffused insertion of new volumes in Beijing's historic fabric aimed at hygienic and typological upgrading of siheyuan [16]. Two projects by ZAO/standardarchitecture: *Micro-Hutong* (top and bottom right), a 2013 project, saturates residual spaces with new minimum housing units [17]; *Micro-Yuan'er* (bottom left) in 2014 propose volumes for housing new functions (e.g. a small library) that can improve services supply [18].

Fig. 2: Additions to terraced houses in London – House extension in Brockley (top left) designed by FORA is the occasion for the typological upgrade of a Victorian terraced house with 36 m^2 of GFA added; as it regards materials, the project recall the existing exposed brick wall although it emphasizes the difference from existent building with a large skylight placed at the interface between addition and terraced house [19]. House extension in Annis Road (top right) by Scenario Architecture is another example of typological reconfiguration of a post war two storey semi-detached house to adapt it to the needs of a young couple [20]. *Tree House* in Whitechapel (bottom left) by 6A ARCHITECTS (2013) is the extension of a 1830s listed building aimed at connecting the raised ground floor of the existing building with the garden thus improving the accessibility of both for the elderly mother of the household [21]. *Writer's Shed* in Hackney (bottom right) by Weston Surman & Deane is a detached workplace for a writer, placed at the far end of the back garden; it is distinguished from the pre-existence for the use of materials: a cedar shingle cladding façade and a large window [22].

2.2 British terraced houses

Since the first industrial devolution, in the UK the system of terraced houses – characterized by a front and a back garden – became the widespread fabric of housing districts. This residential type has had great diffusion until present day, although standards have varied over time and depending on the social class for which houses were built.

In the early twenty-first century an increase in the construction of house extension took place. These extensions were often placed in the back garden, almost always no longer used as a vegetable garden and therefore oversized for the needs of modern lifestyles. The addition of new volumes in back gardens has enabled a typological upgrade of buildings allowing to readapt the typical small masonry houses to modern living, thus ensuring these building to remain as a living part of the city in daily use – de facto preserving this urban typology – and allowing the permanence of inhabitants. We can notice different types of additions, the main ones are: in adherence to the building; with longitudinal orientation along the back garden; as a stand-alone pavilion at the end of back garden. Beyond expanding living spaces, additions are an opportunity for a typological upgrade by creating new stairs, or a technological one with greenhouses that improve bioclimatic control or with the addition of new systems (e.g. those exploiting renewable sources).

2.3 North American single-family houses neighbourhood

In North American continent the low population density and high availability of not urbanized land allowed the affirmation of an urban model in which downtowns – that have very high building density (i.e. skyscrapers) and a mainly tertiary destination – are opposed to suburbs, that are characterized by low building density and single-family house with large and widespread green space, the main attraction of this neighbourhoods. In recent decades, the unbridled urban expansion has degenerated the periphery in a vast expanse of low-density building fabric: the phenomenon of urban sprawl. However in many cases the distance between two houses is such as to allow the insertion of a new built volume; this consents to increase building density and the amount of people settled, without excessively reducing the quality of life, and thus fostering an efficiency improvement of the urban system. Increasing the building density of existing urban fabric, it would be possible to: increase the settled population reaching the minimum threshold to enhance the provision of services; develop the social mix by improving the typological variety of the urban fabric.

Fig. 3: New houses in existing built fabric in Canada and USA – *Shaft House* in Toronto, Canada (top left) by Atelier rzlbd (2010) is an affordable accurately designed house that fits in a just 6 m large lot in the suburb [23]. *Galley House* in Toronto, Canada (top right) by Williamson Chong is a 3,65 m x 19,00 m house built on a urban-infill narrow site, just west of the downtown core [24]. *Haffenden House* in Syracuse, NY, USA (bottom left) by Para-Project (2014) is the studio for two poets and it's inspired by the *Ice House* by Gianni Pettena (1972) [25]. *3106 St. Thomas* in New Orleans, Louisiana, USA (bottom right) by Jonathan Tate (2016) is the first realization of Starter Home*, the project of re-use of urban voids which focuses on the topic of the access of low-income families to new-housing market [26].

Both in Canada and in the USA, suburbs are characterized by a very regular urban fabric and many projects experimented the insertion of new independent built volumes in the residual space between two pre-existing single-family houses. In the USA, some architects have focused on the social aspect of these projects. For example, Jonathan Tate developed the Starter Home project, which aims to diffusely use marginal land in US suburbs to build affordable housing for new families. The pilot project was recently completed in New Orleans [27].

2.4 Paris popular apartment blocks

At the beginning of the twenty-first century in Paris suburbs some refurbishment work of huge residential complexes has been carried out. In these cases, volumetric additions on façades allow to increase the floor area of flats and to improve their type by the addition of loggias, which contribute to shield and protect façades from direct solar radiation and form greenhouses that improve the bioclimatic behaviour of the building in winter. From a structural point of view, there are examples of: suspended volumes, whose weight is entirely carried by pre-existent structure; self-supporting volumes, whose structure is completely independent from the pre-existent one; collaborating volumes, which can carry in whole or in part their self-weight and vertical loads, but require collaboration from pre-existent structure for lateral load resistance or otherwise contribute with their structure to lateral load resistance of the pre-existent one.

Fig. 4: Additions to and refurbishment of social housing blocks in Paris – *Square Vitruve* (top left) by Atelier Dupont (2013) it's the refurbishment work on a 56 flat building, which improved the type of the flats (e.g. by adding balconies) and retrofitted the energetic behaviour of the building in order to achieve Paris City Council's Climate Plan: the added volume entirely remodels the façade and it is made of building modules consisting of prefabricated elements assembled in the construction site; added volumes are suspended from the existing roof with a technical solution that have been carefully designed not to overload the existing structure [28]. Refurbishment of *Tour Bois-le-Prêtre* (other images) by Frédéric Druot, Anne Lacaton and Jean-Philippe Vassal (2011): the 16 storey reinforced concrete building (height = 50 m) – built by architect Raymond Lopez in 1962 – contains 96 apartments of public housing and it has been completely redeveloped through: a typological improvement (40% increase in area, addition of new loggias and increase in size variety of flats), formal renewal (e.g. greater transparency of building envelope), energetic upgrade (by the addition of bioclimatic greenhouses made of prefabricated modules) [29, 30, 31].

2.5 Researches for typological integration

In addition to the examples of insertion of new volumes in urban fabrics with interventions that are based on an integration in typological continuity with the existing, there are also projects looking for innovative typological solutions. These projects try to saturate the residential urban fabric using residual spaces that would not be exploited in any way by iterating building types existing in the neighbourhood (e.g. extremely thin strips of land between existing buildings or at the end of a block).

In particular, there are some examples of single-family homes inserted in adherence to existing buildings inside compact urban fabrics of large apartment blocks. These new buildings are comparatively smaller than those to which they adhere, therefore they can take advantage of them without harming them from many points of view: structural (e.g. cantilevered or suspended structures), constructive (e.g. reduction of material needed for the building envelop), of electrical, hydraulic, etc. systems. Usually, in these cases living spaces are defined starting from the functional minimum and the projects push at the limits the research on new ways of living in post-modern metropolis.

Fig. 5: Researches for typological integration – *Live Between Buildings!* (on the left) by Mateusz Mastalski and Ole Robin Storjohann is an unbuilt project winner of the 1st prize at the design competition *New Vision of the Loft 2* (2013) promoted by A10 and FAKRO; it is a concept project for narrow constructions filling thin gaps between existing buildings(contextualized by way of example in Copenhagen, London, Berlin, New York, etc.). The architects designed a series of small single family houses that make the most of the limited space available and minimize the necessary building materials, since they leave in view blind walls of existing buildings [32]. *Keret House* in Warsaw (top right) by Jakub Szczęsny (2012) – whose project was first drafted in 2009 as art installation – is the prototype of a narrow residential units on different levels, raised off the ground; with a width varying between 92 and 152 cm, it fits into an otherwise unusable residual space and leads to the limit the functional minimum of living [33]. *Haus Neumann* in Neubrandenburg (bottom right) by Peter Grundmann (2008) is a single family house built in adherence to an apartment block of which it partially exploits the structures; the difference of housing type – compared to existing buildings – increases the typological variety of residences in a neighbourhood with mainly elderly population, thus allowing to attract new residents and improve the social mix, favouring a gradual generational renewal [34].

3. A proposal of symbiotic architecture in Italian suburbs

In suburbs of Italian medium- and small-sized cities, lots with low or medium built density are quite common. Many of them dates back to the 1950s and 1960s, thus buildings are quite old and often decayed; in addition in these neighbourhood (especially those of social housing) the age of residents is fairly uniform and quite high because of poor renewal of tenants [35]. Usually buildings were built according to a rather established and widespread building type: they are multi storey blocks with three or four habitable floors and two flat per floor for each stairwell. Given the low housing density, open spaces inside the lots are generally quite large, but they are often in state of abandonment or mainly used as parking areas [35]. Furthermore, these peripheral areas are poorly equipped with public services due to the low population density. The whole of these aspects create ideal conditions for symbiotic architecture interventions.

Hereinafter a preliminary proposal for intervention in a urban lot in Pavia (a medium-sized city in northern Italy) will be presented. The lot that will be studied is part of a residential district entirely characterized by a similar situation in terms of building density and types, therefore the considerations that will be made as an example about this lot can be qualitatively extended to the whole neighbourhood.

The lot has an elongated rectangular shape (about 47 m x 120 m, 5640 m^2), whose main axis is about 15° east of north (therefore not far from heliothermic axis). On the lot there are eight multi-storey buildings substantially identical to each other: a rectangular plan (about 10 m x 16 m), one stairwell, a basement and three habitable floors, each with two flats (total height to the eaves 11 m). Buildings are arranged in two rows of four elements, with main axis parallel to the long sides of the lot; the two rows are about 20 m apart from each other and there is a 16 m gap between each building of a row. The courtyard has a few trees and some shrubs, for the rest it is abandoned to the use as messy parking. At present it is subdivided in four fenced areas – each one containing two buildings – which can be accessed from the long side of the lot. The main façades of the buildings face the street and the internal courtyard; they have some balconies and the windows of living and sleeping area. On short façades, buildings have only one small window per floor (the one of the bathroom).
Existing buildings were built in the early 1950s with the funds of the first INA-Casa plan and were managed by IACP – now ALER – the institute for social housing [36]. During the 1990s part of the houses were sold to tenants, and now the buildings are partially private and partially public, therefore the implementation of the proposed project should require the involvement of many actors.

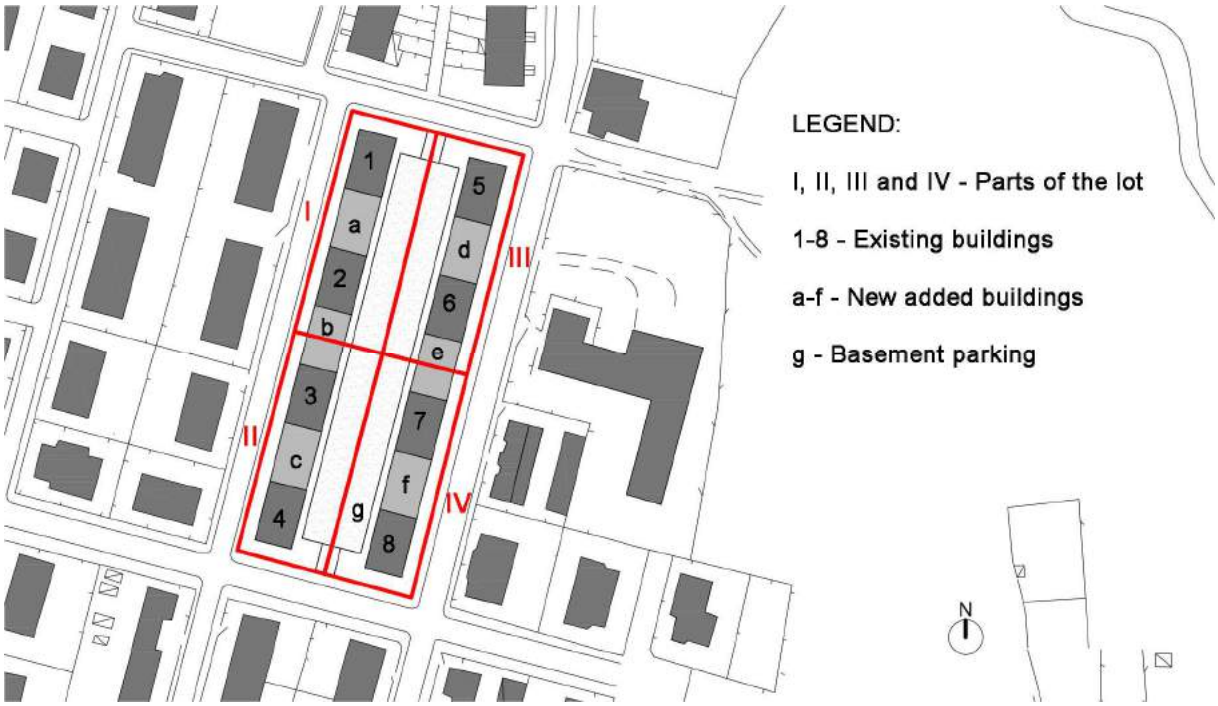

Fig. 6: Master plan of the project of addition of new housing volumes and of underground parking (scale 1:2000).

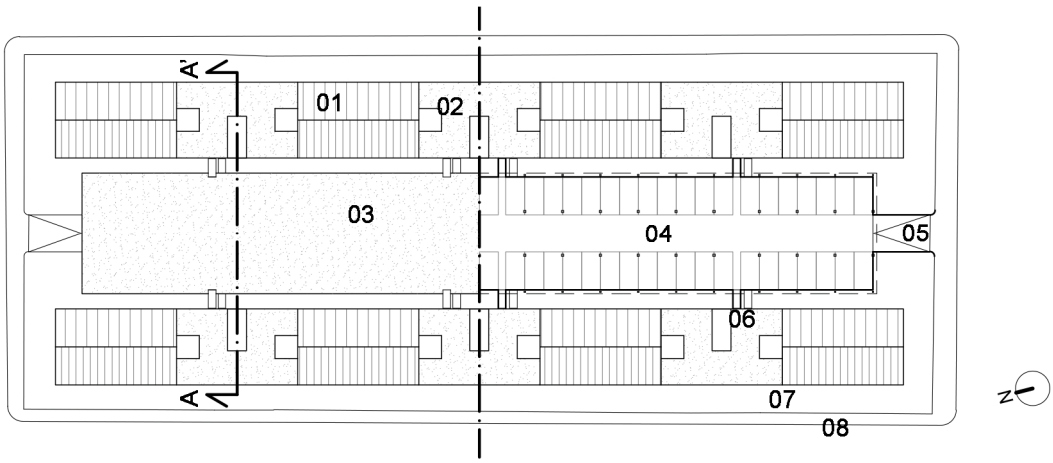

Fig. 7: Plan of the lot with added housing volumes and parking (scale 1:1000). The half on the left shows the garden roof of the parking, while the half on the right shows the level of the basement parking for 80 cars. 01 - existing buildings; 02 - new buildings; 03 - green roof of the garage; 04 - basement parking; 05 - entrance to the parking area 06 - stairs that connect ground level to the basement parking and to its roof; 07 - existing front garden; 08 - pavement.

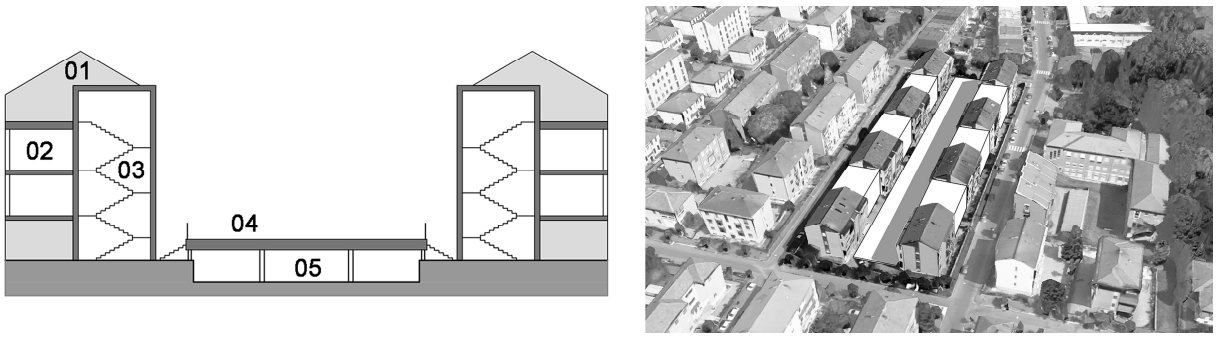

Fig. 8: *On the left* - Cross section of the new buildings (scale 1:500): 01 - existing building; 02 - new residential units; 03 - staircase; 04 - garden roof of the parking; 05 - basement parking. *On the right* - Aerial view of the lot with the drawing of added volumes.

The drafted project includes: the construction of six new buildings, one in each of the spaces between two of the existing buildings in the same row; the realization of a basement parking (partially underground, positioned approximately 1.5 m below the current ground level) with 80 parking spaces.
The roof of the added volumes and of the parking will be partly used as a shared leisure garden for inhabitants of the block and partly subdivided into small vegetable gardens for single users.
Pedestrian access to buildings will be maintained on the long sides of the lot, while vehicle entrances will be moved to the short sides.
A number of design choices have been made to ensure maximum symbiosis between added volumes and pre-existence (i.e. technical, functional and formal compatibility):

- to ensure air and sight permeability of the long (about 110 m) multi-storey linear building that is created, new buildings rest on a three metres high pilotis ground floor; only the staircase goes down to ground level;
- not to interact negatively with the eaves of existing buildings, added volumes will have only two habitable floors;
- to ensure natural ventilation in existing bathrooms, new buildings will have air shafts in correspondence to windows on the short façades.

Each floor of new buildings will have two flats, therefore each building will have four flats, and the project as a whole will add 24 flats.
In present conditions, the total virtual population (calculated assuming 25 square metres of GFA per inhabitant) is about 144 inhabitants, the addition of new volumes allows to house about 60 more people, thus increasing by about 42% the virtual population of the lot. Even assuming a smaller increase of virtual population in some of the neighbouring lots, one can suppose a total increase of more than 30% in the whole district. The increase of the values of urban indexes shows the passage from a medium density urban fabric (0,62 m^2 of gross floor area over 1 m^2 of area of the lot) to a medium-high one (0,89 m^2 of gross floor area over 1 m^2 of area of the lot).
If properly managed by public administration with an intensification in public transport services, such a growth in population can bring benefits to the entire district; otherwise, it could lead to the loss of efficiency of existing public transport services and therefore lead to prefer private transport, thus congesting traffic in the neighbourhood.

Part of the lot	Building	A_L	S_c	H	n	h_{mean}	V	GFA	P_v
I	1	1403	160	11	3	3,67	1760	439	18
	2		160	11	3	3,67	1760	439	18
II	3	1422	160	11	3	3,67	1760	439	18
	4		160	11	3	3,67	1760	439	18
III	5	1418	160	11	3	3,67	1760	439	18
	6		160	11	3	3,67	1760	439	18
IV	7	1422	160	11	3	3,67	1760	439	18
	8		160	11	3	3,67	1760	439	18
Tot.		**5665**	**1280**	**11**	**3**	**3,67**	**14080**	**3510**	**144**

Tab. 1: Urban data of existing buildings: A_L – area of the part of the lot; S_c – surface covered by buildings; H – height to the eaves; n – number of storeys; h_{mean} – mean height of the floor; V – built volumes; GFA – gross floor area; P_v – virtual population.

Part of the lot	Building	A_L	S_c	H	n	h_{mean}	V	GFA	P_v
I	a	1403	142	9	2	3	426	257	10
I-II	b	-	142	9	2	3	426	257	10
II	c	1422	142	9	2	3	426	257	10
III	d	1418	142	9	2	3	426	257	10
III-IV	e	-	142	9	2	3	426	257	10
IV	f	1422	142	9	2	3	426	257	10
Tot.		**5665**	**852**	**9**	**2**	**3**	**2556**	**1539**	**60**

Tab. 2: Urban data of new buildings: A_L – area of the part of the lot; S_c – surface covered by buildings; H – height to the eaves; n – number of storeys; h_{mean} – mean height of the floor; V – built volumes; GFA – gross floor area; P_v – virtual population.

	A_L	S_c	V	GFA	ρ	r_p	I_L	U_L
Present	5665	1280	14080	3510	0,23	0,77	2,49	0,62
Project	5665	2132	16636	5049	0,38	0,62	2,94	0,89

Tab. 3: Urban data and indexes in present conditions and after the additions of new volumes: A_L – area of the lot [m^2]; S_c – surface covered by buildings [m^2]; V – built volumes [m^3]; GFA – gross floor area [m^2]; ρ – ratio of covered surface and area of the lot [m^2/m^2]; r_p – ratio of uncovered surface and area of the lot [m^2/m^2]; i_L – ratio of built volumes and area of the lot [m^3/m^2]; u_L – ratio of gross floor area and area of the lot [m^2/m^2].

4. Conclusions

The examples of symbiotic architecture from many countries all over the world – in different urban and socio-economic contexts – testify that it's possible to increase the density of existing urban fabrics and to upgrade existing buildings, thus preventing widespread building demolitions and the deletion of the morphology of the existing city. Architectural choices are different: always respecting the very nature of existing urban fabric; sometimes fully respecting the material consistence of constructions, sometimes making the choice of sacrifice some part of existing buildings aiming at upgrading them and therefore allowing their permanence and preventing natural or agricultural soil consumption.
The schematic project proposed for the Italian case study highlights the possibility to apply the theory of symbiotic architecture also in Italian suburbs, which are often abandoned to their destiny of dull decadence, especially of residual spaces.

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World Heritage in Hue Vietnam. Its degradation and preventive measures.

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Abstract
Hue citadel, the capital of Imperial Vietnam since 1994 has been listed as a UNESCO World Heritage Apart of conservation and restoration activity in a complex of imperial palaces and temples, there are also needs to form a better service for tourists and visitors. Polish experts collaborating with a local authority HMCC since 2011 acted threefold. On site training in conservation and restoration for local specialists, performing conservation activity at the Tu Duc Stela pavilion, as well as elaboration program for improvement quality tourists service by establishment of the Visitors Center and establishment a tourists road in the Eastern part of the Citadel providing access to a natural reserve area of Tinh Tam lake. The project idea was to regenerate cultural heritage in neglected area with inclusion of a natural reserve being at present without tourist interest. This should considerably enlarge tourist interest to other activities, providing them not only access to historical monuments, but also to have pleasure of a rest and satisfaction of local craftsmanship. Implementation of these projects should also upgrade the standard of tourist services, as well on activate and create a new job and business opportunities for a local community
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Keywords: Vietnam, Hue, Restoration, Historic monuments

1.1 Hue historic site .
In the end of the XVIII century a new greater Vietnamese Imperium had been created and in 1802 victorious Emperor Gia Long established Nguyen dynasty. The location of Hue the new capital town was carefully selected at the Huong river. The architectural layout of a capital city followed the geomantic principles set out in the Book of Changes and Feng Shui. The Imperial palace complex was surrounded by a great wall with decorative gates. Around the Imperial palace complex with numerous edifices, outside the wall there were edifices for administration, military barracks, as well housing areas for high ranking administration and military officers as well numerous servants and artists active for the emperor court. Defense of Hue was secured by a brick wall fortification with bastions and water system employing Perfume river with its canals encompassing the town. Along the river being an important commercial route connecting the capital with interior and the see, were set numerous temples and burial complexes of following emperors. There are 5 burial complexes with the emperor graves and set of palaces and temples constructed to secure his afterlife.[1], [2],[3]

Heritage of Hue is closely related to the Court of Vietnamese Emperors. Except of numerous architectural monuments and garden complexes, there are also important evince of a immaterial heritage consisting of various imperial court ceremonies i.e. music, dances, and ceremonial food.[4] Listed above heritage show that Hue is not only the most important Historic Monuments of Vietnam, but also of international value, what was confirmed by listing Hue in 1993 at the UNESCO World Heritage List, and in 2003 at the UNESCO List of Immaterial Heritage. Spectacular Hue Festivals annually organized in the town confirms bi-natural character of this Heritage. Apart of this beautiful and attractive for tourist face, there is also an ugly side, rather not seen by tourist. In fact Hue town

growing on historic site very little is gaining from its natural reserves encompassed in the Citadel area, and this can be of a great potential.

In a tropic climate protection of a great number of cultural heritage monuments creates numerous problems especially when the country is under numerous oppressions. Until Japanese occupation repairs of the palaces, temples and in burial complexes were performed in traditional way with replacement of deteriorated elements or renewal of painting. In the post war period and political tensions in the South Vietnam a protection of monuments was not an important case. Situation rapidly turned to the worst with the Tet offensive in 1968. After almost one month of heavy fights 2/3 of the monuments were destroyed or affected by serious damage. Some of them were completely ruined. In 70ties UNESCO delegated to Hue the expert W. Brown Morton III who established a frame of necessary activity in the area, and calculated budget for such activity.[5] After liberation of the 1975 year monuments were simply left aside. Historic monuments create enormous problems in their conservation and protection. Therefore a specialist body was established the Hue Monuments Conservation Center, a local authority to control and protect historic monuments. Their activity can spread only in a frame of governmental money.[6],[7] There were also some international actions undertaken to aid local possibilities and protect individual monuments. Hue got plenty of international aid to protect spectacular monuments. Due to these money it was possible to restore and reconstruct few palaces and burial complexes. International partnership promoted also international cooperation projects. There were some conservation projects organized by international bodies in close cooperation with HMCC. We should mention here projects realized by Japanese Waseda University, German, French and Poland. At present, tourists concentrate their interest mainly to Imperial Palace complex and 2 – 3 funeral complexes of Ming Mang, Tu Duc, Khai Dinh. Other areas are neglected, however there are a great potential if developed to modern purposes. Only some tourists visits museum located in Royal pavilions outside the Palace complex. Since 1980 Polish conservators are active in Hue doing both conservation projects and training of HMCC staff. Apart of the Polish – Vietnamese cooperation there were also projects completed by French, Japanese and German conservations. These projects concentrated to restore the spectacular monuments being well promoted by media. On other hand foreign industrial concerns offered to the Hue Palace complex equipment supporting their international recognition. Some reconstruction of destroyed monuments were reconstructed by a local masters using traditional techniques.

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1. 2 Polish – Vietnamese Cooperation in Restoration and Protection of Historic Monuments.

The great destruction of Polish historic towns and historic monuments in the WW2 stimulated a Nation wide post war action to historic monuments reconstruction. As a result a strong and effective structure for education and practical restoration was stablish in Poland. Destruction of heritage monuments in Vietnam was also serious and affected apart of Hue numerous historic sites Hue. Scale of war destruction as well damages caused by following years of neglect ion was incredible. War time was not helpful to even simple activity. Post war reconstruction of the country included restoration of damaged historic monuments, however it was not a priority goal.

Poland in 1980 offered to Vietnam an assistance and scientific support in conservation projects in Hue as well as Cham sites with their historic center in My Son. Polish Vietnamese Research and Conservation Mission led by architect Kazimierz Kwiatkowski KAZIK started its activity in Hue and My Son.[8] Missions consisted of architects, building engineers and archeologists. Elaboration of photogrammetric documentation of the Ngo Mon Gate in Hue and numerous destroyed Cham Towers was a first task of the Mission. In the following years, the activity of the Mission concentrated in My Son and lasted until the 1994. Works resulted in maintenance of several ruined towers as well as building a local museum, where discovered decoration elements are exhibited. Simultaneously to works in My Son, Mission director Kazik was also active in historic town of Hoi An. Thanks to his active contribution, historic center of Hoi An was protected, and none modern building was allowed to be constructed in this area. Today Hoi An is not only an important historic site on UNESCO World Heritage List, but also a good example of right doing. Kazik's contribution to this success was enormous, therefore he was commemorated with a monument in the center of Hoi An. In 1997 in Hue Polish conservators with assistance of Vietnamese contractor completed a huge conservation project to restore The Mieu Temple in the Hue palace complex. Polish Vietnamese cooperation resulted in a great success. Polish experts contributed also with conservation research programs. At present, every day, tourists and visitors from the whole World appreciate beauty of the building and scale of

completed restoration work. Important part of conservation projects was education program and involvement of the local experts to techniques of painting research and conservation.[9]

1.3 Smart projects

In 2010 a new chapter of Polish Vietnamese cooperation was opened. Acting on invitation of the Hue Monuments Conservation Center, experts of the company the Polish Conservators of Historic Monuments (PKZ Baranski and Associates) signed an agreement for mutual cooperation in restoration of historic monuments. Established cooperation in a frame of ODA development programs was a new field of a big potential. Polish experts activity was planned threefold, in practical training, historic monuments conservation, elaboration of restoration programs as a base for future cooperation. Collaboration was possible due to the fact Polish Embassy signed agreement with HMCC to support on site training programs for Vietnamese specialist. In a frame of this program founded by the Polish Aid found in 2011 and 2013 year, a group of almost 30 trainees participated in lectures and practical trainings. Vietnamese participants were from Hue and other conservation centers from Hanoi, My Son, Hoi An. Training programs were combined with restoration works to historic stele, stone sculptures, as well as conservation of paper and textiles. During two training courses conservation actions were done to the Thic Hoc Stele, the Bao Son Stele and the Tu Duc Stele, as well as to Kylan statues in front of Hien Nhon gate and the gate Hien Lam Cac, as well as cleaning and protecting against a green growth group of 8 statues of mandarins and generals standing at the courtyard of the Tu Duc stele pavilion. Preliminary inspection of the Tu Duc stele, the greatest monument of this kind in Vietnam confirmed its bad state because of a Stele pavilion damage. There were a few destructive factors. Rain water leaking contaminated with lime as well as bats urine dropped on stone stela. Close observation confirmed that a crucial is also a water condensation on a cold stone. Such situation created an aggressive chemically environment to limestone stela. To prevent stele against destructive factors it was necessary to stop degradation immediately by cleaning and removal of a waist layer as well as building a temporary shelter over the stele. Selection of a righteous material for a shelter preventing bats hanging was an important measure. Repair of the Stele pavilion roof was the next action. Research works confirmed that pavilion construction was in a very dangerous state, and also needed an urgent action. Cracks in the pavilion structure, as well as numerous damp spots and lime leaking confirmed that destroyed roof and uncontrolled rain water leaking were a major causes of the damage. In the 2013 year training course was planned to restore pavilion roof and decoration of interior. Restoration of the pavilion as well as providing lectures on adopted techniques and technology for this restoration became a challenge. HMCC declared to provide a scaffolding. But in reality it was done partly because lack of budget. Therefore Polish team had to program a step by step activity providing access to the building from outside and inside. Inspection of the roof confirmed that roof structure as well as a gutter at the balcony are totally damaged. It was due to rich vegetation in a debris and soil collected at the balcony. The damage was serious because of numerous cracks and fractures of the masonry structure. Research of historic documentation became useful to establish a scale of destruction. was of an important Polish expert after recognition of the monument elaborated restoration design and solutions for roof repair. Preservation of Internal decoration in Tu Duc pavilion was another problem. Conservation research was helpful in recognition of paint layers. Polish experts in painting conservation proposed measures needed for protection and better exposition. With cooperation of local specialists it was possible to restore part of the decoration. However the Tu Duc Restoration project had not been finished yet, already completed protective works limited destruction rate.

Another part of Polish experts presence in Hue was dedicated to elaboration development programs for the historic center. Being active in Hue experts had a great opportunity to analyze a situation of the both, tourist services and presentation of the Palace Complex, as well as effective usage of the historic site of Hue, being framed by the citadel walls. It became obvious that historic area of the Imperial Palace complex is still exposed in a traditional way offering tourists museum presentations, being improved by imperial court music and dance performances. Tourist services system was on very low level. Discussion with local experts confirmed their approach and thinking are focused on reconstruction projects or ideas to built modern structures dedicated to commercial purposes. Between those extremes completed project for Imperial pavilion adoption as a traditional coffee house was a good example, showing living potential. Apart few tourist information points in the Hue town, there was no a Visitors Center in the historic area. Building a modern facility for such Center, would be a challenging idea in a historic site, but thorough investigation of could find a solution. The second activity was dedicated to analyze the historic site of Hue Citadel in order to find solution and tips for its activation and development. Cooperation with a local architect Pnung Phu, expert of the Building

Technique Institute in Hue provided us a possibility to elaborate development programs and projects anchored in a local reality. Proposed programs got approval from the representative of the Polish Embassy, who saw possibility of development loan granting in a frame of Polish ODA support for Vietnam. The both programs were presented to the local authority of the Province and Hue Town President. Development program were proposed as a two separate projects, who could be implemented individually or by their junction create a bigger and more complex approach. Their economic scale were different with possibility of a flexible approach.

The first program, a smaller one was dedicated to the Imperial Palace complex in Hue Citadel. In expert opinion the smart idea would be creation a Visitors Center in a one of historic monuments. The Imperial Treasure house (Phu Noi Vu building), being abandoned and out of function was proposed for this function. Its big size could perfectly host all activities of the Center. Brief investigation of a structure confirmed possibility for such adaptive reuse. It was a two story building, of architecture characteristic for French XIX century Historicism, but of much different character than Imperial pavilions. At present the building is neglected and need urgent restoration. The benefit of setting a Visitors Center in this building was a possibility to adopt an air condition system there. A big number of a great rooms in the building gave a chance to adopt them for a different purposed as a reception hall for visitors with a rest areas, café and tea shop, souvenir shop, museum and presentation halls, where architectural models and multi media presentations would be possible. A lecture room with media facilities was also proposed to organize small conferences for specialists visiting heritage site of Hue. Observations done on site proved that for a most visitors coming to Vietnam and Hue in a summer period a tropic climate in fact limits possibility for a longer stay in historic site where so plenty is to be seen and appreciated. After one or two hours visit tourists are looking out to find a cool and shadow place to rest. Cold drinks under umbrella are only available for them. Such situation is against an idea to provide them more historic monuments to be visited and seen. European or American tourists are over helmed with an idea to run to the air conditioned bus, and go back to the hotel. Therefore a special refreshing facilities were proposed in the Visitors Center where tourists could take a shower and change a wet T shirt for a new one offered as a included service. Such service of a special character is devoted to those who in tropic summer do not feel comfortable in hot and humid days. Service being rationally calculated will be frequently used and appreciated by those who willing a longer visit and appreciate more monuments in a day trip. Creation of the Visitors Center with accompanied small cafeterias located in a service facilities to some palaces or temples should make an order and keep alive a noble atmosphere of the Imperial Palace.

The second program was dedicated to development and activation of neglected areas of the Hue Citadel. Implementation of the Program should provide tourists a possibility to stay longer and visit more at Hue historic site. At present those areas are not visited by tourists, however there are plenty interesting places to be visited. In the recent decades the Citadel area around the Imperial City became a great habitation center with two or three stories houses along small streets. Original houses were composed in gardens. Now, at the main streets houses and shops are densely over built causing impression of Oriental chaos. Except a main street encompassing a palace complex there are no restaurants or other facilities accessible by the tourists. If there are any, tourist access is difficult especially at evenings. Chaotic development influence a local character of the area. There are only few historic buildings being adopted for a museums, other were converted for pure tenement housing causing their destruction. Some of them are located in interesting places. For example Tang Tho pavilion on the island. The Thinh Tam Lake area was a former Imperial rest area with wooden pagodas and bridges. Unfortunately those pavilions and bridges were demolished at the beginning of the XX century by typhoon and structures had been never restored. Only one important building survived there, the Imperial Archive (Tang Tho pavilion) built on the island. Unfortunately being abandoned, its state of preservation is bad. Important for this area is a system of canals, which enables communication around the Hue Citadel as well entering through the water gates to the inner system of canals and lakes. In general those canals are abandoned and at present serves mainly as a fish ponds to local habitants. Canals are also used as a supportive savage system, because those built in town is not enough efficient. Hopefully in 2012 some canals were cleaned what improved the situation. Apart of chaotic and uncontrolled situation, there are also positive situations, can been seen as a bright stars showing a great possibilities of private entrepreneurship. There are few restaurants of an individual architecture, as well as a specially designed handicraft center – Kim Hoan.

The Eastern area of the Citadel as well as Tinh Tam lake, however touristic attractive are not a tourist destination. Elaborated program proposed for this area a parallel to the Palace complex a touristic route, starting at the Museum of Imperial Art and the Military Museum, and ending at the Tin Than Lake, where restaurants, cafeterias and tea houses around lakes would provide rest for tourists. Along a tourist route numerous craftsmen centers, workshops, and art galleries could be set up

offering traditional handicraft and art objects being offered directly by talented local artists and skilled masters. Profits generated by such activity would be also an attractive job offer for young and able people. It is worth to mention that around Hue town there are plenty craftsmen villages specialized in traditional manufacturing of a blacksmith, embroidery, hat making, pottery, lacquering, would carving, but for most of tourists it is too difficult to get there.[10] Revitalization of the Tinh Tam Lake district will be helpful in extension of a tourist offer there, both as a day and evening destination for tourist visits. New arrangement program will activate an area offering more cafeterias and small restaurants around lakes. Therefore it would be more attractive for tourists to spend evening there at the lake area, than rest at crowdie and hot streets in the town. However, we should not expect all tourist will come there to rest or dine, but tourists offer in Hue will enlarge considerably offering completely new service in spectacular area. Another attractive proposal for tourists would be a small boat rides on canal and lakes. At present only a great boats offer cruises on the Huong River. Creating a small boat tourism around and within the Citadel would be a new tourist attraction being helpful in activation of neglected areas. Having possibility to cruise on canals tourists could choose between taxi or boat. Such communication system would be helpful in penetration attractive but distant and not accessible areas in the historic site of Hue Citadel. Creation of such tourist route would provide to individual tourist a possibility to see more architectural monuments, appreciate numerous craft centers and galleries, to rest in a perfect conditions of the Tinh Tam lake as well as visit areas accessible only by boats.

These programs were presented to the local authorities of the Thua Thien – Hue Province and president of the Hue City. Its completion would enhance tourist service in the World Heritage site of Hue. Elaboration of a master plan and management program should be the next step. However until now there is no positive decisions for their implementation, good ideas and proposals can be helpful in maintaining the great area of historic Hue and prevent its degradation by uncontrolled development.

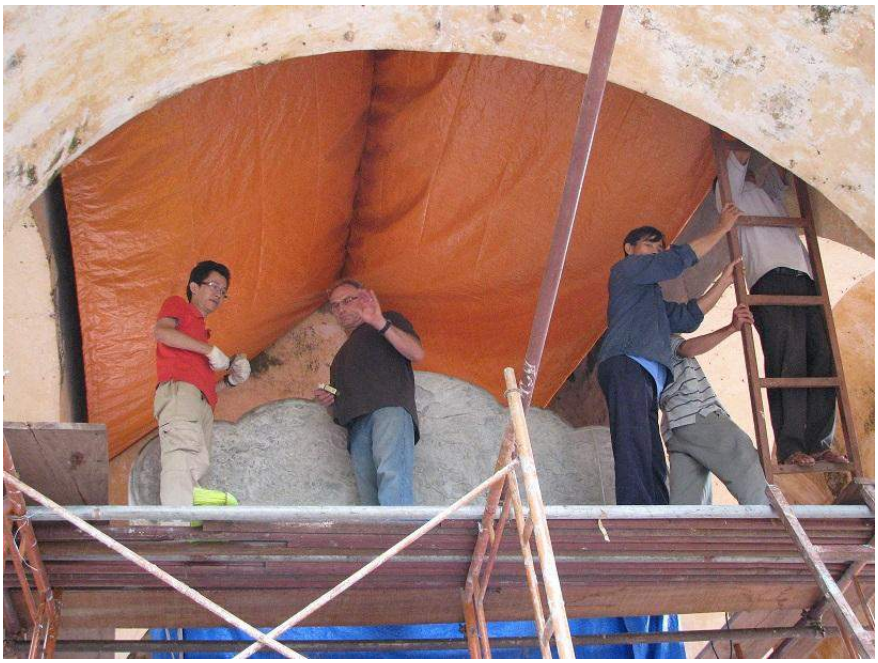

Fig. 1. Hue, Tu Duc Stela Pavilion. Building a shelter protecting the Stela against bats.

Fig. 2. Hue. On site training

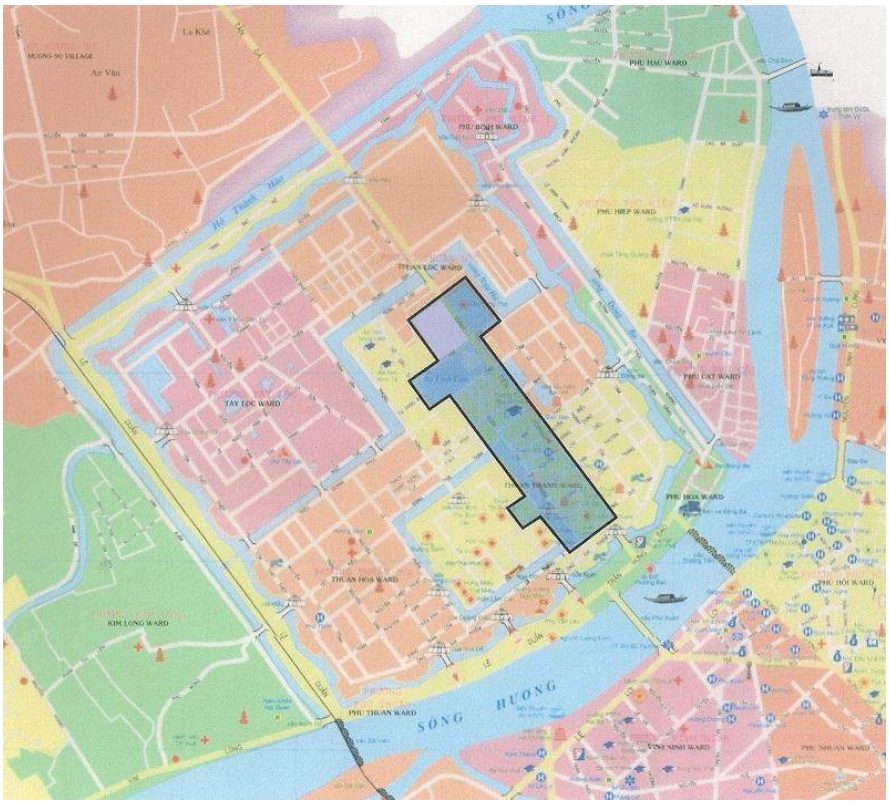

Fig. 3. Hue. The Citadel. Eastern area foreseen for a development activity.

Fig.4. Hue. The Citadel. The main street in the Eastern area.

Fig 5. Hue. The Citadel. Abandoned canals.

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An advanced diagnostic plan applied to a significant national monument: the Royal Palace in Naples

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Abstract
To achieve adequate restoration project, the phase of choice the type of intervention it's a very delicate step that necessarily involves a thorough understanding of the asset in all its aspects, such as the location, the history, the architecture, the state of preservation, the signs of deterioration, the materials analysis and their degradation. The set of all that it's possible investigate on a product (cultural), the obtaining of important informations for subsequent maintenance actions, the conservation and/or restoration, is what is called a diagnostic plan. The significance of this work reside to consider a monument of national importance, the Royal Palace in Naples, on which apply a diagnostic plan. The science is an useful completion of the diagnostic field and this is why it's flanked now in this study; it provides in situ observations and laboratory measurements using advanced microscopic technologies (Scanning Electron Microscopy SEM/EDS for morphological and chemical studies at micrometric scale) on samples taken directly near the Palace.The final results have allowed the creation of a series of analytical cards containing digital data required to detect future intervention actions.

Keywords: Royal Palace, Naples, SEM

1. Introduction
The diagnostic plan, intended as the protocol of a set of activities and ensure proper implementation of any cultural asset, is essentially developed in three phases: pre-diagnosis (mostly consists in the analysis of the environmental, territorial and urban); diagnosis (it is aimed at the full knowledge of the product, the characterization of the constituent materials and the identification of the causes and mechanisms of degradation); post-diagnosis (covers techniques aimed at the protection and enhancement of the property).[1]
In this context, it presents the methodology of finding investigation that must be taken before establishing any draft actual restoration, directly applied on a real case study: the Royal Palace of Naples.
The main objective is the development of a cognitive framework for the planning of maintenance and conservation / restoration necessary for the preservation of the building, pausing appearance and medical history, thanks to the drawings made by enumerating the sampling phase and thus , developing the analysis of samples.

2. Territorial analysis
The city of Naples, located about 17 m above sea level, dominates the eponymous Gulf, surrounded by places such as Mount Vesuvius and the Sorrentine peninsula to the east, the Campi Flegrei with Monte di Procida to the west and the southern slope of the flat bell that across the lake Patria until Nola [1].

The Royal Palace, is located in what is called today, the historic center of Naples (area included in the perimeter of the National Museum, Via Cesare Rossaroll, Piazza Garibaldi, Piazza Municipio, Via Roma and National Museum) (Fig. 1).

Fig.1 Localization of the Gulf of Naples and the Royal Palace

3. Historical and architectural framework and study of the constituent materials

The construction of this palace, is not the work initiated by the Bourbons, it was decided at the end of the century XVI, in anticipation of a visit (never made), King Philip of Spain, to replace the existing Palazzo Vecchio, built in the first of the ' 500.

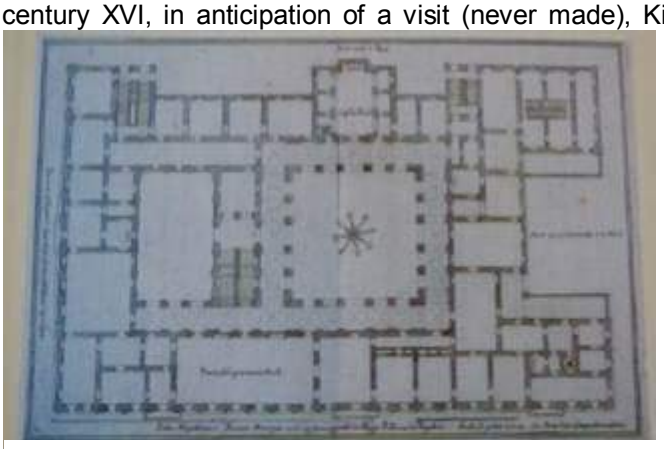


Fig.2 The Royal Palace : the project by Domenico

For the construction of the palace, whose construction was started in 1600, was called to Naples, in 1592, the viceroy Juan Zuniga, the Roman architect Domenico Fontana. These, in the realization of the project, tried to solve the relationship of the new building with its surroundings (widening of the Palace, area of the "Old Palace" and the sea), through a diagram "open". On the southern side, the architect lays out a series of spaces prospectively disclosed on Gulf view (Fig.2).

The Palace provides for the application of the classical orders on the facade, following the canonical superposition of Doric, Ionic and Corinthian. The materials that marked the new building, were the rosy brick and dark Piperno stone. The building was equipped with large balconies on the ground floor, connected to the rituals of the viceroy hearings. The three entrance portals, were marked by granite columns. In the classical frieze above the first order, the Doric metopes break down the emblems of the Spanish Empire, the Golden Tosos, the lions, the snake, the tower, including outfits and drums [2, 3, 4].

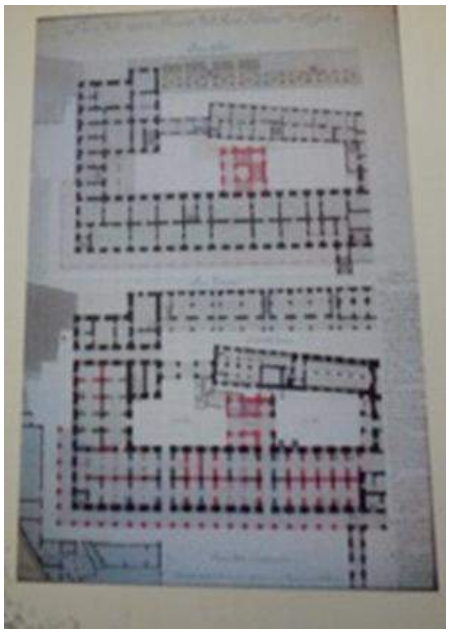


Fig.3 Royal Palace between the ‘700 th and ‘800 th centuries

After the death of Fontana, they will be encountered, for over a century, the extension works, landscaping and renovation. The first major change to the Fontana project came about in the mid '600, when the viceroy of the time commissioned a new double flight of stairs to Francesco Antonio Picchiatti. Subsequently, the viceroy Pietro Antonio of Aragon to provide water to the courtyard, make two monumental statues to be placed at the foot of the staircase, beautify the park and build a stylish lookout later demolished.

With the establishment of an autonomous Kingdom, since 1734, the palace became the permanent residence of a king. His condition is presented to King Charles of Bourbon rather precarious: the Palace was in a complete state of abandonment and then demanded a general restructuring plan to which he also added an extension. The wedding of the king formed at numerous embellishments with decorations and frescoes. Only with Ferdinand IV, were initiated

important work was entrusted to Ferdinando Fuga was built the large wing to the Castel Nuovo, the so-called New Wing, he was enlarged on the terrace of the Belvedere and was started the construction of the front facing the sea. With this expansion and secondary utilitarian buildings (such as the Horseman or for China building), it greatly reduced the extension of the gardens. A substantial change to the main facade was made, in 1756, by Luigi Vanvitelli to solve a static problem, manifested with showy injuries and crushing phenomena of the pillars. To consolidate the facade, he decided to alternately buffer the arches with a brick wall in which opened niches. A general renovation of the building took place under the reign of Ferdinand II.
It was planned a radical modernization of facilities and services with the introduction of gas lighting, advanced current water distribution systems, a steam engine for hydraulic facilities and ribbed sheets of zinc to replace the roof tiles (Fig. 3).
With the arrival of Joachim Murat and Carolina Bonaparte, the building was modernized with neo-classical decor and furnishings from the Touleries. They had big plans for the Royal Palace, but only partly managed to realize them. As for the landscaping, the architect Antonio Niccolini was commissioned to redesign the whole town planning around which involved radical changes both in the field to the city, as in that towards the sea. It was planned the building of the guard as a hinge between the facade of San Carlo, also designed by Niccolini, and the main front of the Royal Palace.

Fig.4 Royal Palace - Draft of Genovese

Towards the sea it was planned for a new place with terraces and sloping down a staircase. Architect tienne-Cherubin Leconte was entrusted with the renovation of the interior, which, if totally completed, would have resulted in much destruction. Some of his assumptions were reduced, while the interior took on an elegant "Empire" style atmosphere [5, 6].
A fire in 1837 the Palace was the occasion for an overall restructuring that affected the exterior and interior, recovering, in part, some of the themes from unrealized projects of the Napoleonic era. The task was entrusted to the architect Gaetano Genovese who extended and regularized, without changing the original structure. (Fig. 4) The intention was to obtain not only new areas, but also to standardize all parts, giving unity and monumentality to the Palace: they were demolished those buildings that seemed incongruous, such as the Palazzo Vecchio and the Scuderia; the building was expanded and, in short, the themes that had marked the seventeenth-century facades were recovered. It underwent a significant expansion toward the front of the sea, while the interiors were redesigned, both from the functional point of view, and from a decorative. The baroque staircase took on a new look thanks to refined decoration, the wide profusion of marble facing and increased brightness, obtained with the new openings on the front towards the now demolished Palazzo Vecchio. a new scale was created, the so-called scale of strangers, of neoclassic style and, retaining many fine decorations and seventeenth-century paintings, many rooms were redone, including the ballroom (now part of the National Library) and private rooms on the second plan. With Genovese, the Palace could say definitively completed. With the unification of Italy, the palace became the Neapolitan home to the House of Savoy. In 1888, the King of Italy Umberto I, ordered changes to the main facade of the palace, where the niches were occupied, created with vanvitelliano consolidation by giant statues of the leaders of the dynasties that had reigned over Naples. In 1919, the Royal Palace became the property of the State of opening it to the public. The bombings suffered by the city during the Second World War caused serious damage to the building and made it necessary for a restoration which involved, in particular, the small theater in which they tried to return the original eighteenth-century line, providing for the reconstruction of the roof of the stage, to restoration of the decorations and the peeling of the cement coating developed by the allies. Other restorations date back to 1994. Since 1995 is presented in the form of museological Apartment Historic and National Library (Fig. 5) [7, 8].

4. The analysis of the state of conservation

Today, the Royal Palace, is a shipyard in activity as they are conducting important restoration work for the safety and recovery of the architectural elements. For this reason the site visit did not allow to be able to identify macroscopically, elements of degradation (Fig.6) [9, 10,11].

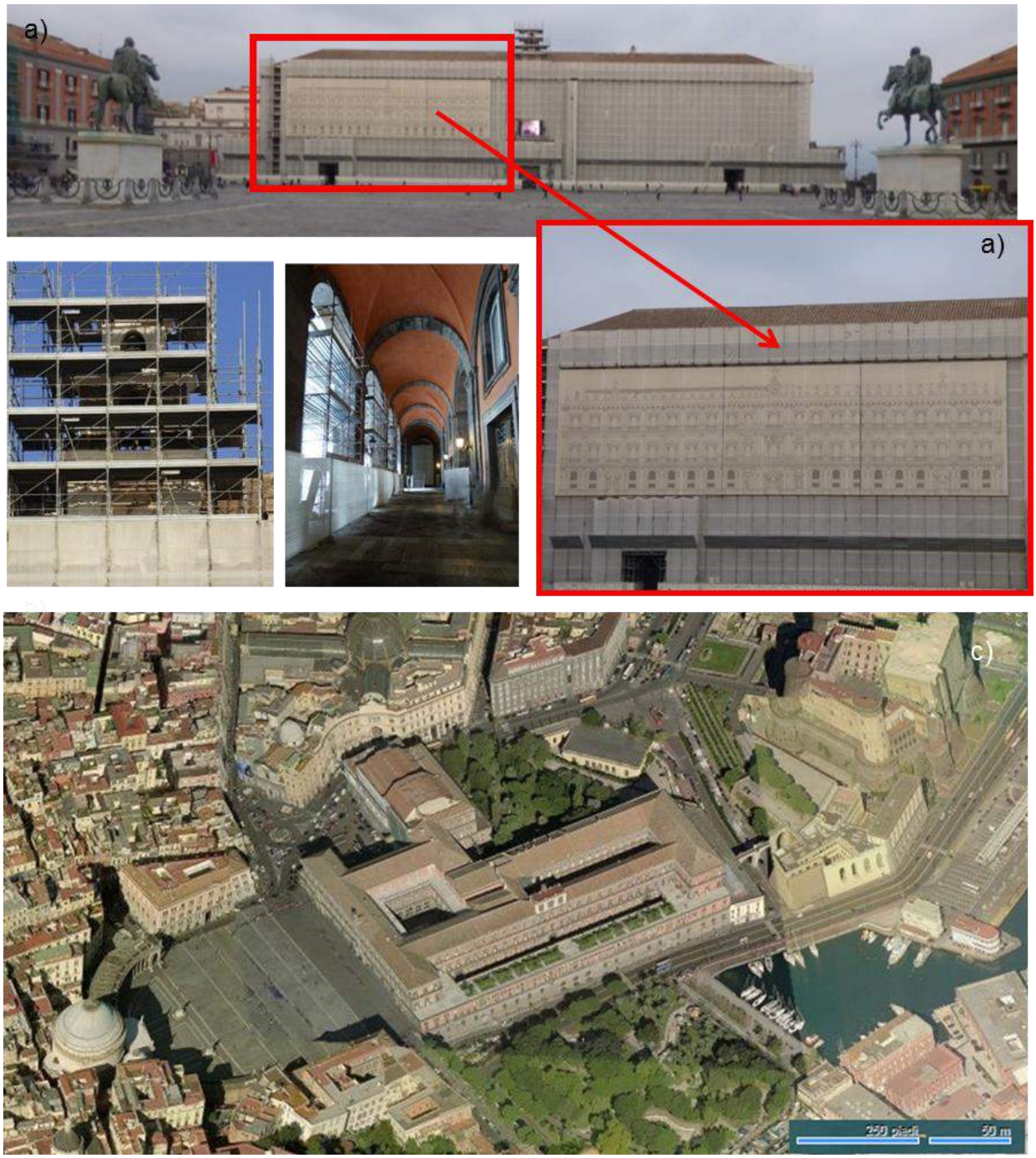


Fig.6 The Royal Palace in restoration phase and as today appears

5. Sampling and characterization of materials

This study implies also intrinsic knowledge in materials that characterize it, besides its historical and artistic knowledge. In order to perform studies on constituent materials through specific diagnostic tests, the analyzes should be preferably non-destructive type. For example the observations through SEM/EDS technique, which allow to get information about the morphological and chemical character, it's required a microsample (few millimeters for each significant sample picked) Specifically, the sampling was carried out at different and significant points (Fig.7, 10,13), and then were developed fact sheets to organize the data and generate information to enrich the knowledge path of the investigated monument [12, 13, 14].

5.1 Morphological and chemical analysis of BIO sample moss portion

The sample taken from the Fountain of the Carriage Courtyard (Fig.7) was dried and then sent for the SEM observations carried out at lowest energy (2 kV), to avoid damaging the vacuum biological structures.

Fig.7 Portion of moss taken from the "Fountain of the Carriage Courtyard"

porous body and very vulnerable (Fig.8a). At higher magnifications, we realize that the observed structures, have nothing to do olnly with the mosses apparatus: there are diatoms, micro-algae and marine organisms of fresh water (Figure 8 b, c). They include a feature siliceous wall, said frustule, well visible in Fig.8 d, on which there are pores, whose structure and position are important characters for their systematic classification. Those observed (12-14 m) are a mixed colony in which predominate those *pinnate*. Their presence is very important as biological indicators of good quality for fresh water.

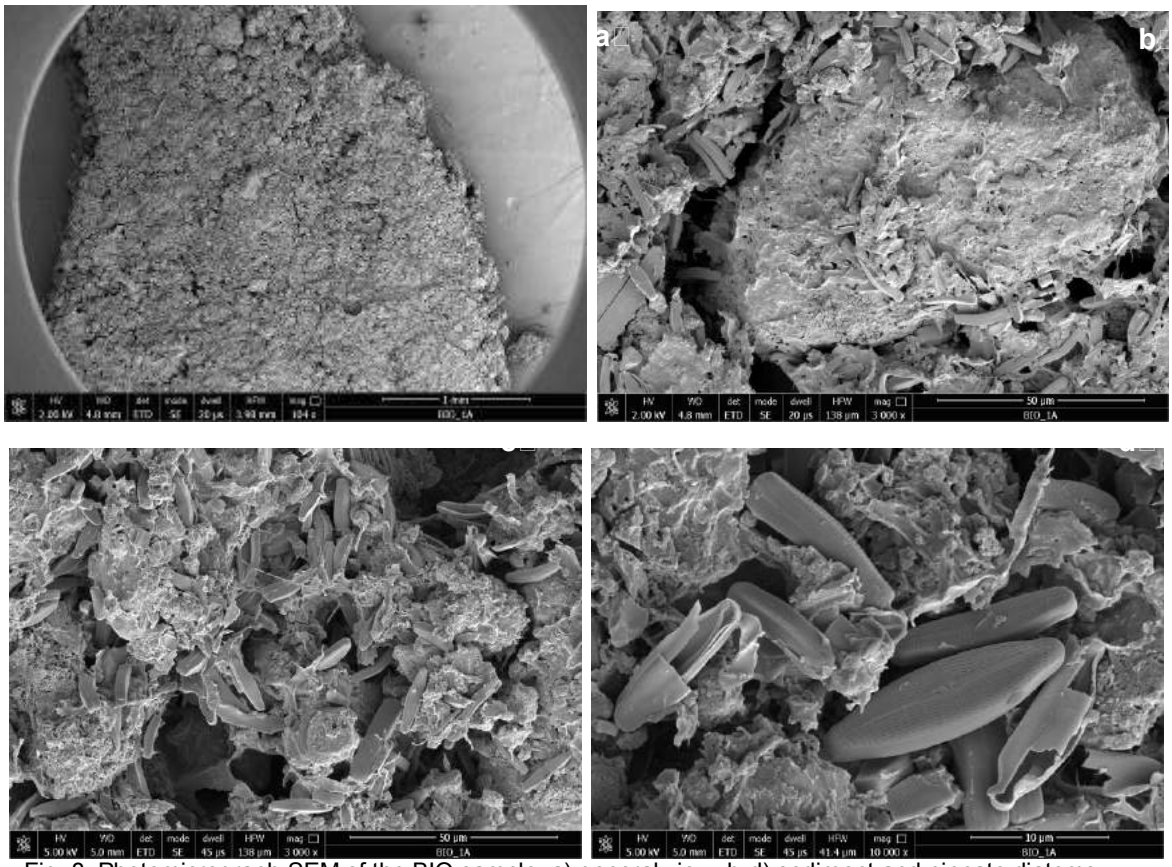


Fig. 8 Photomicrograph SEM of the BIO sample: a) general view; b-d) sediment and pinnate diatoms.

The multi-element map and the relative EDS spectrum in Figure 9 show the siliceous composition of the skeleton of these micro algae, immersed in a mixed carbonate sediment (Ca and Mg carbonate).

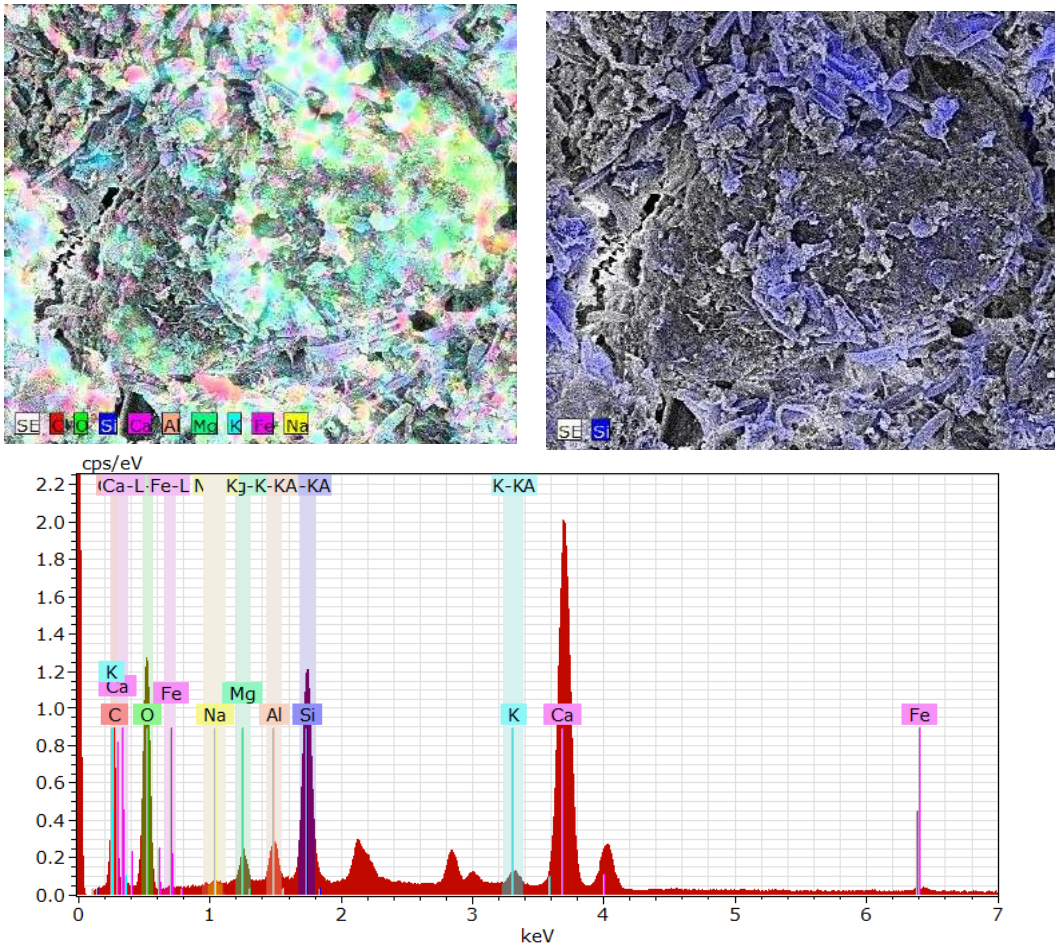


Fig.9 Multi-element Map and relating EDS spectrum of the surface of the Bio sample.

5.2 Morphological and chemical analysis of sample 2A mixed carbonate conglomerate

The fragment observed to Dino Lite looks like a incoherent material, crumbly and dusty (Figure 10) and for that reason does not lend much to adhere to the stub for subsequent microscopic observations. To overcome this problem has been selected fraction grainy - powdery that constitutes it.

Fig.10 Sampling point of the sample 2A

From SEM observations of grainy-powdery it is possible distinguish: a coarse and porous matrix, covered mostly by moss and fungal hyphae (Fig. 11 a, b, d), the probable responsible for the disintegration of the sample and loose clasts that have low affinity respect to the matrix (Fig.11 c).

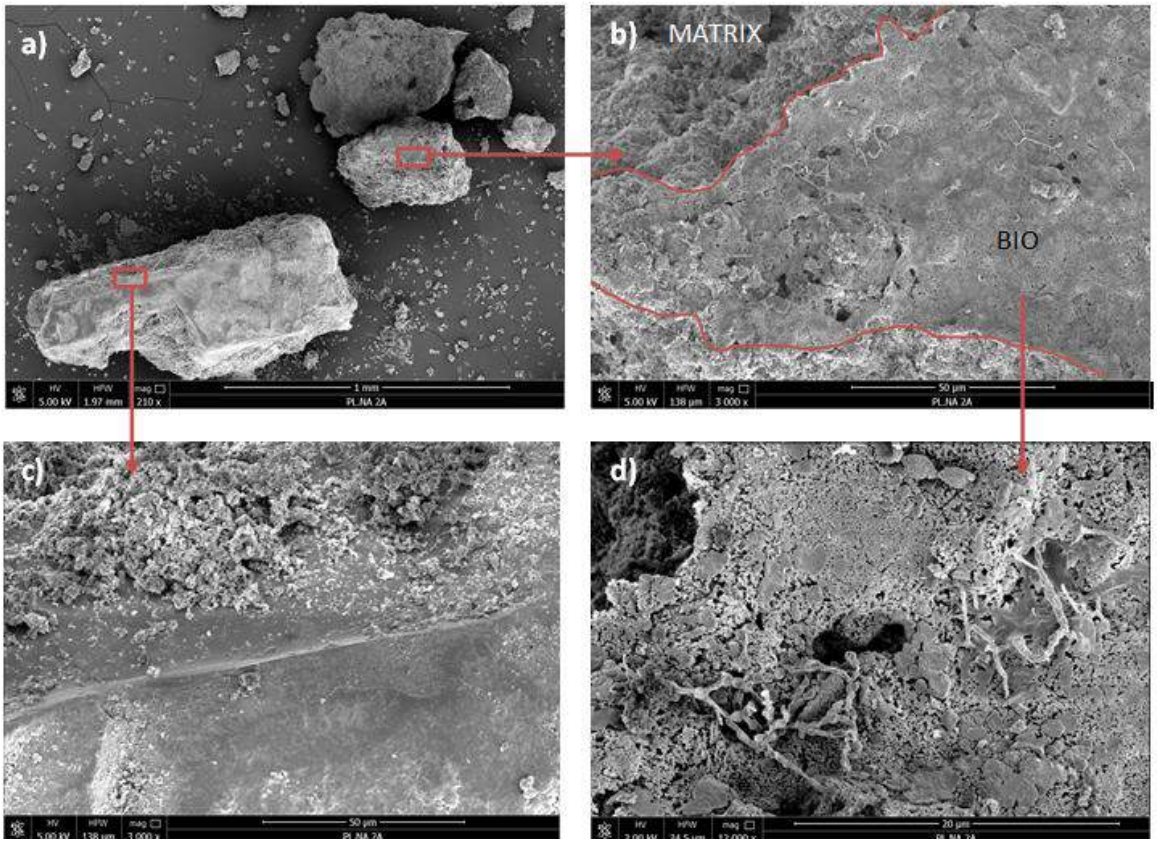
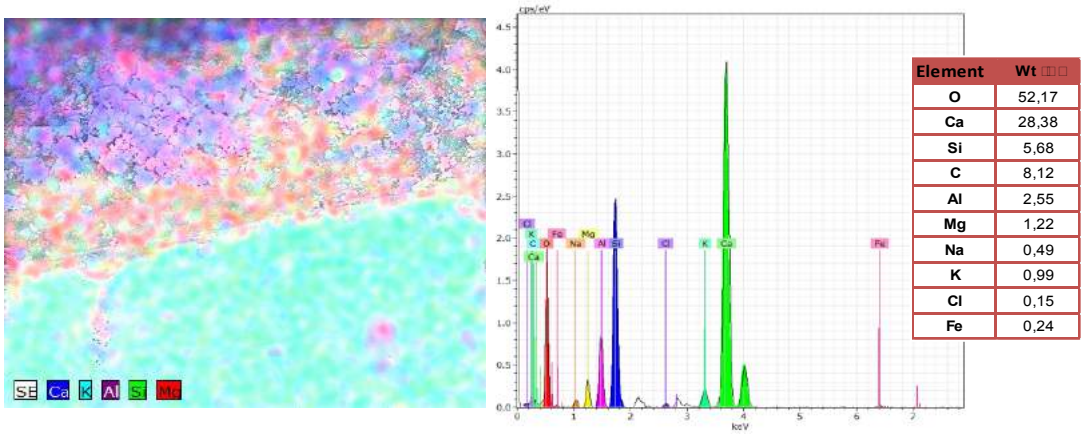


Fig. 11 SEM image of the sample 2A: a) general view; b) matrix and biological coverage; c) pebble detail covered with powdery matrix; d) detailed biological coverage with fungal hyphae.

The multi-element Map and the EDS spectrum were performed directly on the clastic part, partially covered by the matrix, at the interface for precisely highlight the differences described above, even by a compositional point of view (Figure 12). The friable matrix is a mix of carbonate (Ca and Mg) mainly, and also Al and traces of other elements. The homogeneous presence of Si and K refers to the underlying pebble detached by the entire sample. With a good approximation we can define that it is a mixed carbonate conglomerate.



Element	Wt
O	52,17
Ca	28,38
Si	5,68
C	8,12
Al	2,55
Mg	1,22
Na	0,49
K	0,99
Cl	0,15
Fe	0,24

Fig.12 Multi-element map and its EDS spectrum of the interface between the pebble covered partially by the matrix.

5.3 Morphological and chemical analysis of sample 7 tuff

The fragment observed to digital microscope presents mixed, consisting of a very porous matrix, that reveals both macroscopic structures, clearer, perhaps comparable to or clasts to crystals and regions very large yellow striate (Fig.13). It is observed that, as a result of mechanical pressure on the streaked areas, these

crumble leaving the place to very deep holes; the crumbled material is sand. Also given the lightness of the material, it could be tuff, which is also used as a building material.

Fig.13 Sampling point of the sample 7

The SEM microscope, the surface looks very jagged and porous even at low magnifications and you can recognize the regions described before, like crystals and sand, analyzed separately in the EDS surveys. The crystals are tubular, not reworked, widely distributed, and willing to tufts, enclosing the center lamellar structures, typical of the finer fractions and silt, crumbling and covered with powdery matrix (Figure 14). Also here they are absent of biological degradation traces.

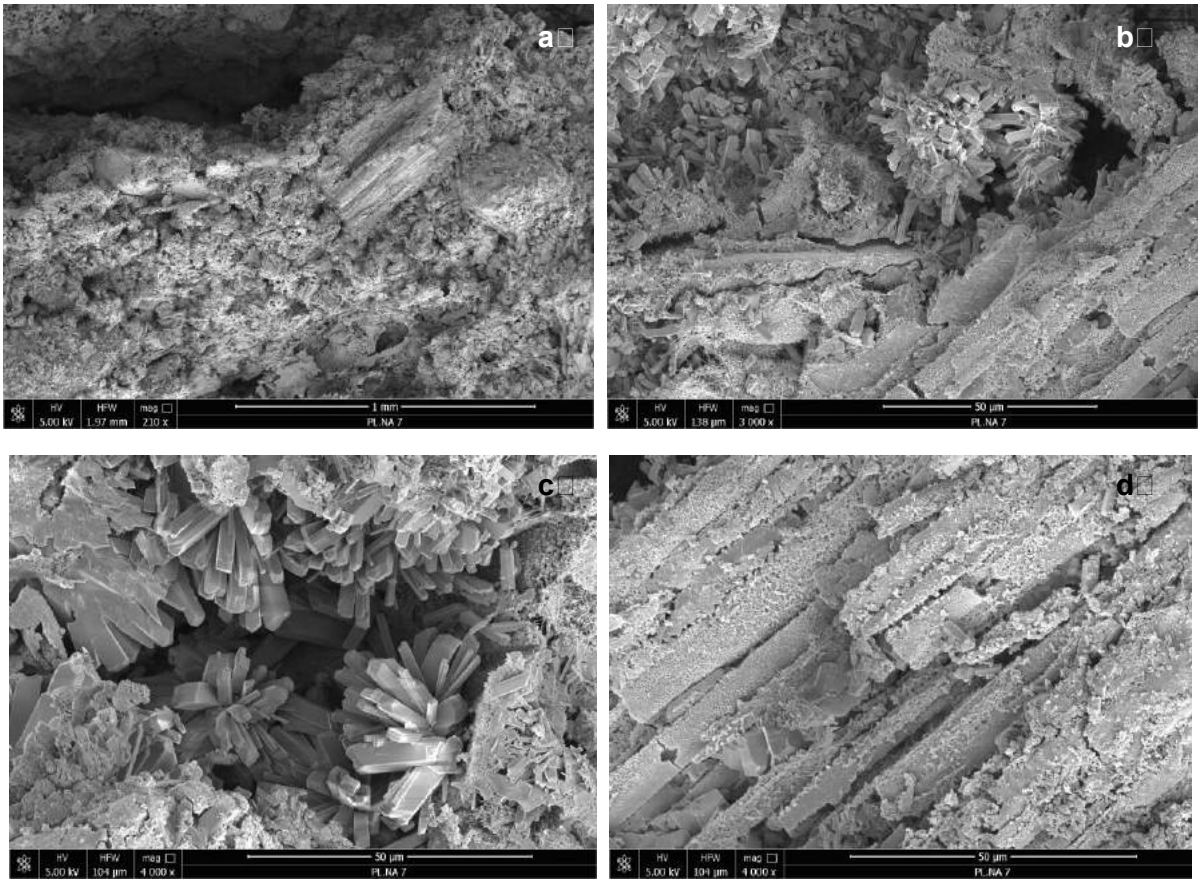


Fig.14 Overview of the sample (a), crystal-sand interface (b), the detail crystals (c) and sand (d)

As can be seen from the EDS spectrum and the multi-element maps, the main elements such as Al, Si, K and O, mainly refer to the crystalline fraction, the Fe oxides and little K are mainly concentrated in the yellow sand, while the remaining elements are the dusty fraction that covers it (Figure 15).

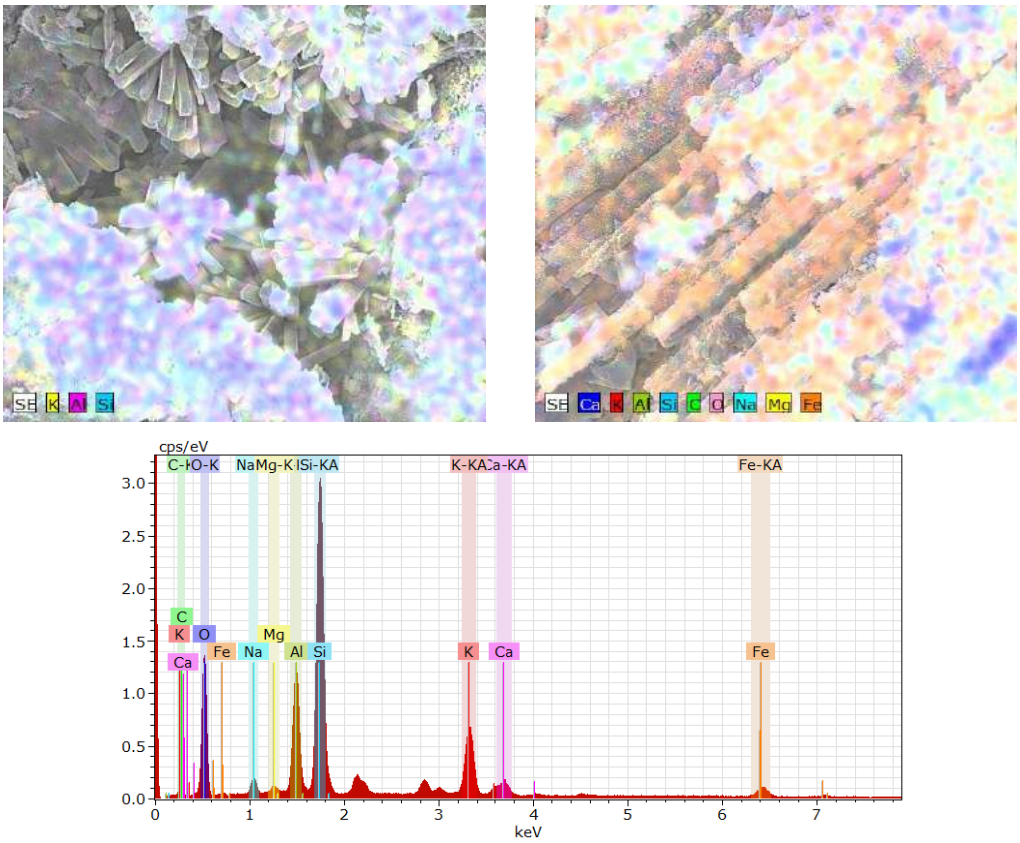


Fig.15 Multi-element map of the crystalline and sandy region and the total EDS spectrum obtained

6. Conclusions

The conglomerate sampled, probably one of the many material used for the construction of the Royal Palace, have a great need of restoration works: the high content of fungal hyphae and other organisms that have colonized it, favored by carbonate bedrock and wet environmental conditions where the building is exposed in many points, permits their propagation between the grains, causing the slow detachment and degradation. Instead materials such as bricks and the tuffs, compact texture, are hardly attacked by these organisms. The sample in proximity of the fountain give also some information about the really good quality of the water used there, for the presence of bio indicators organisms. These results represent the point of starts of new deepening studies on structural materials, highlighting the importance of the construction of a diagnostic plan and descriptive folders, representative of each significant sample considered.

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Diagnostic project for the enhancement of the cloisters of the Franciscan Proto-Friary in Castrovillari (CS)

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Abstract

The diagnostic evaluation of a product is carried out to produce a dossier in which to bring together a critical and organic all the information and data collected useful to define the state of preservation .With this study aims to illustrate a diagnostic project aimed at enhancing the two cloisters inside the Franciscan Proto-friary of Castrovillari in the province of Cosenza. For this purpose has been defined and applied an analytical structure-oriented cognitive synergistically to build a diagnostic plan prior to restoration and conservation appropriate. The cognitive analysis of the work in addition to understanding the spatial analysis, the history, the architectural analysis, the file photo, individualization and characterization of diseases present, also focuses on experimental investigations carried out in the laboratory (analysis SEM-EDS), which allows to characterize the material of the work itself. The survey will become analytical opportunity to promote Cultural Heritage through the creation of a poster / tourist information panel to be placed in situ in order to give greater visibility and recognition to the work in question, by improving communication, dissemination and knowledge of the monument , also in order to provide the observer a new interpretation of the same so as to arouse interest and curiosity.

Key words : La Civita, Proto-friary ,Castrovillari. SEM

1. Introduction

The diagnostic analysis of an artifact allows to create a file in which merge, in a critical and systematic way, all information and all useful data collected to define the state of conservation. With this study we want to illustrate a diagnostic project aimed at enhancing the two cloisters inside the Franciscan Proto-friary of Castrovillari in the province of Cosenza. To this end it has been defined and applied an analytical-cognitive structure synergistically oriented to the construction of a preliminary diagnostic level in the restoration and preservation adequate (Fig. 1). The work-finding investigation in addition to understanding the spatial analysis, the history, architectural analysis, the photographic dossier, the identification and characterization of these diseases, also focuses on experimental investigations conducted in the laboratory (SEM/EDS analysis) that allow you to define the constituent material of the work itself.

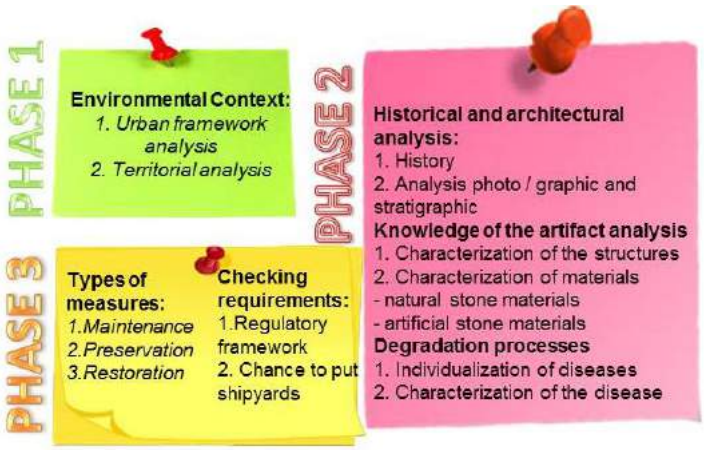

Fig. 1 Schematization of a diagnostic plan typology

The analytic investigation becomes an opportunity for enhancement of Cultural Heritage through the creation of a poster / tourist-information panel to be placed in situ in order to give greater visibility and recognition to the work in question, by improving communication, dissemination and knowledge of the monument, providing the viewer a new interpretation of the same so as to arouse curiosity and interest [1, 2, 3, 4].

2. Spatial analysis and geographical location

The Franciscan Protoconvento is located in the center of Castrovillari, in the province of Cosenza. The territory of Castrovillari, whose name derives from Castrum Villarum meaning "Fortress of the villas", is the largest center of the Pollino National Park and is situated in a natural depression called "King's Basin", bordered by the river and surrounded Coscile Lucano from the Apennines. Castrovillari is little more than 30km from the Ionian Sea and 70 km from the Tyrrhenian Sea. The prevailing climate is Mediterranean in the summer and average Apennine mountains during the winter season. The complex, known as the "Barracks Peace" or "District" had the last destination, occupies a good part of the Laurel Hill and is located in the center-old said the country "La Civita." The old town, situated on a limestone outcrop (Fig. 2), is characterized not only by the presence of small alleys and buildings very characteristic, but also to some remarkable historical monuments, including the Church of the S.S. Trinity, the Aragonese Castle, the monumental Basilica of S. Giuliano and the Sanctuary of the Madonna del Castello [5, 6].

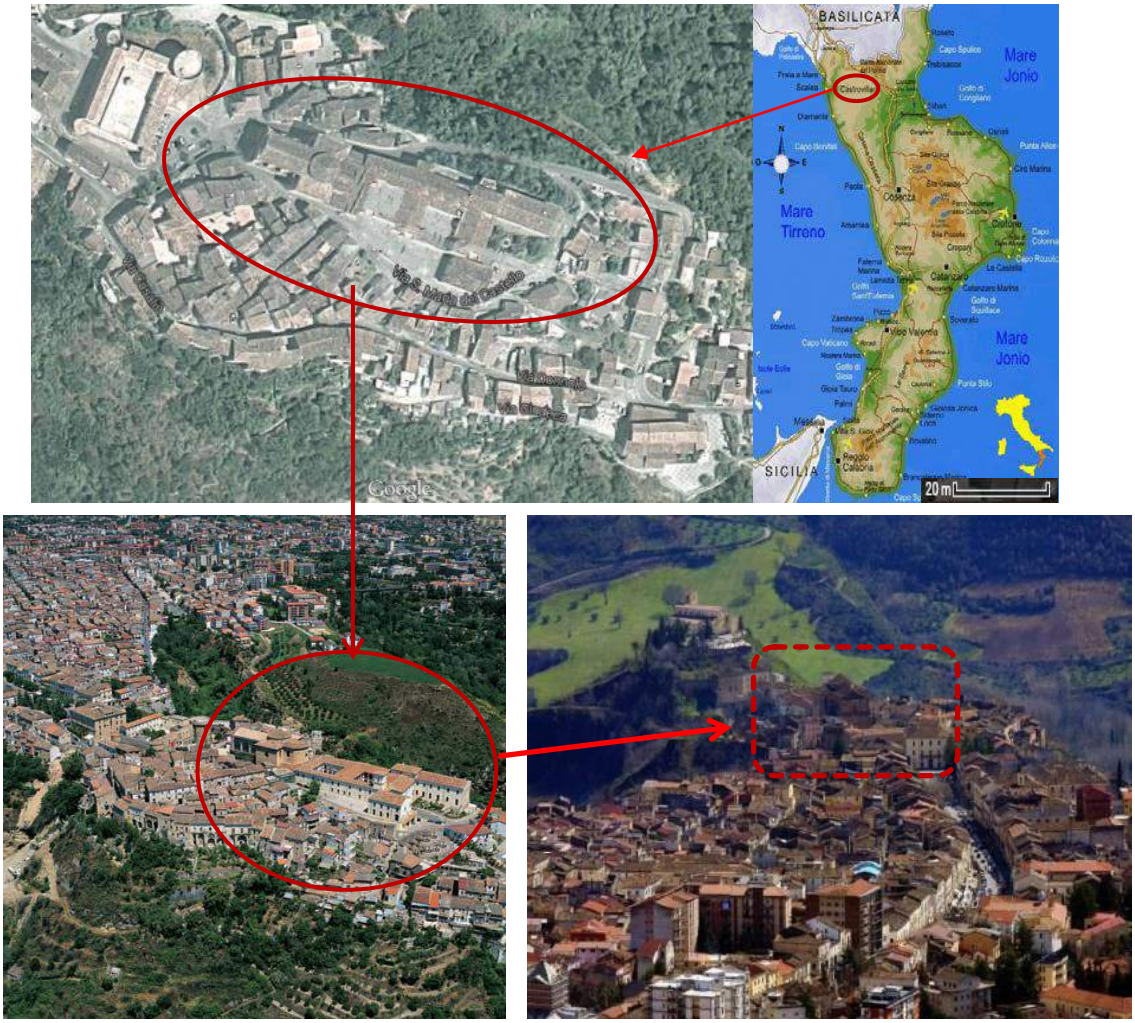

Fig. 2 Localization of the Franciscan Proto-friary in the urban context of Castrovillari (CS)

3. History and architectural description

The complex in question is the first Franciscan convent built in Calabria, whose origins date back to 1221, when Peter Cathin was sent by St. Francis to bring in Calabria the ideas expressed by the order of monastic Poverelli of Assisi. Arriving in Castrovillari, he did start the construction work of the first nucleus of the building using the remains of an earlier monastery, of uncertain age, perhaps greek or Benedictine, next to an ancient church dedicated to the Madonna del Lauro. This was possible thanks to donations and legacies of various kinds that helped the magnification of the original nucleus.

In 1586, Philip Gesualdi, descended from an ancient and noble castrovillarese family, who later became Minister General of the Franciscan order, decided to renovate the building to make it more comfortable and dignified. The monastery is presented consists of a square body characterized by a central cloister, which was built sideways the Church with bell tower.
In 1670 the building underwent further changes and then in 1702, thanks to the legacy of Felice Pellegrini who left the convent a large sum of money, the prior of the monastery began building a second cloister joined to the first, which was completed in 1731, date on the ledge of the new entrance characterized by a lytic portal carved according to the rococo era.

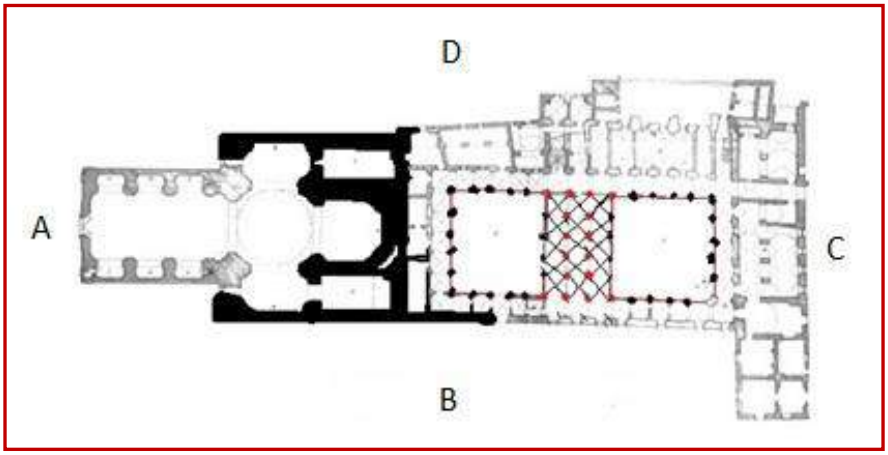

Fig. 3 Plan of the Cloisters and the Complex

Later, around 1750, it started the building of a new church next to the new cloister, the SS. Trinity, which, however, remained unfinished because of the suppression of the monastery took place in 1809. So it was that the great monastery was used first as a military hospital and later used as a barracks. The old church instead became in 1845 the seat of the theater "Sybaris" [7]. The first cloister, dating from the XVI century., Has a quadrangular plan and consists of a series of arches placed along the perimeter and supported by pillars characterized by pilasters of Tuscan order. The upper part is characterized by an alternation of pilasters of Tuscan order with rectangular windows in wood. The second cloister, built in the eighteenth century., Also has a quadrangular plan and a series of rounded arches along the perimeter and pilasters of Tuscan order. In the upper part of the arches they are placed in correspondence of the arched windows, which alternate with always pilasters of Tuscan order. The two cloisters are separated by a large porch divided into three strands of arcades with arches and vault (Fig. 3).

3.1 Photographic dossier

The photographic documentation proves enormously useful in the process of finding investigation of an architectural artifact because you can get a more complete view of the subject. Below are some pictures of the most representative, of the photographic dossier made for the whole of the Franciscan Protoconvento (Fig. 4). The first image is the Church of the S.S. Trinity, mother church of reference of the Franciscan monks, connected posteriorly to the two cloisters, through which the monks could move freely reaching easily the Church and their rooms. The other photos correspond to images documenting the cloisters and their architectural details observed from different angles. Specifically they depict the gateway to the two cloisters, the overview of the second cloister and the details constitutive-decorative.

Fig. 4 Belonging Church and overviews inside the cloisters

3.2 State of conservation

All products are submitted to the passage of time, heading for a series of progressive and irreversible deterioration processes beginning from the moment of their creation. These processes can be triggered by

factors both natural and anthropogenic, assuming different development conditions depending on the type of material used, the morphology, exposure to physical, chemical and biological agents and the type of use [8]. In the specific case of cloisters, various alteration and degradation processes can result in various pathologies, among which the most common are the deposition or formation of side products, the loss of the morphology of the article and from the surface of materials or phenomena that do not worsen the conditions of the same. Even the absence of interventions aimed at regular maintenance helps to greatly increase the status of the artifact degradation.

3.3 Identification of major degradation diseases

Careful visual analysis conducted on the surfaces of the two cloisters has allowed the identification of various forms of degradation which occur in more or less extended way. The results obtained have been organized for the creation of a photographic dossier containing all the images in which are highlighted the main alteration of pathologies identified (Fig. 5,6).

Fig. 5 Alteration: chemical (Red); physical (Green); biological (Blue)

It was also possible to produce a summary table containing all the identified pathologies associated with graphic symbols laid down by the recommendation NORMAL 1/85 and their location within the artifact [9].
As can be seen from the pictures, below is, the degradation diseases are more present on the pillars, the bases of the same and on top of the edges of each side of the cloister.
In particular there has been a strong presence of black and biological patinas crusts on pedestals of the pillars and part plastered, caused most likely outdoor environment in which they find themselves. In most of the pillars are visible discoloration, biological attack, disruptions, exfoliation, and gaps.
The pictures also indicate the presence of a particular form of biological attack which manifests itself in the form of incrustations due to some forms of lichens. In the specific case lichens be to undermine the bases of actively piercing the surface pillars and creating a kind of pitting, through the secretion of their acids, called precisely lichen acids. It is endolithic organisms that colonize the surface of the rock.

Fig. 6 Other examples of chemical alterations (Red) and physical (Green)

4. The sampling and knowledge of the artifact analysis

In order to conduct specific laboratory analysis about the materials the two cloisters, you chose to perform a non-destructive sampling which involved the removal of two samples, one of which belonged to the cloister A, dating from the sixteenth century. (Fig. 7) and the other part of the cloister B, dating from the eighteenth century. (Fig. 8). On sampled materials we were conducted laboratory tests aimed at their morphological and chemical characterization with the aim of getting a better reading of the conservation status and more complete information for the purpose of any restoration project. The sample 1 (called PROCAS1) belongs to the cloister A collected on the stem of a pillar, is macroscopically very friable to the touch and when subjected to even slight pressure crumbles easily. The coloring is whitish with little pieces of light brown color. The sample 2 (called PROCAS2), taken in the cloister B on the base of a pillar, is too crumbly to the touch and light in color tending to light brown. Apparently compact, the surface appears to be porous.

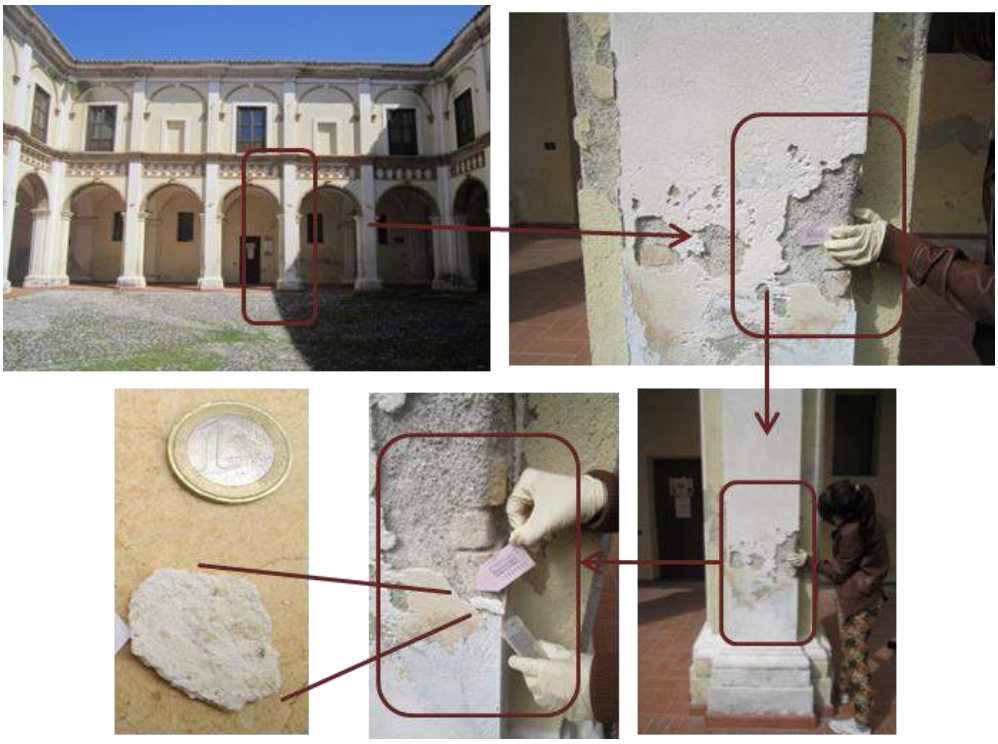

Fig. 7 Sampl*i*ng point of the sample1, Cloister A

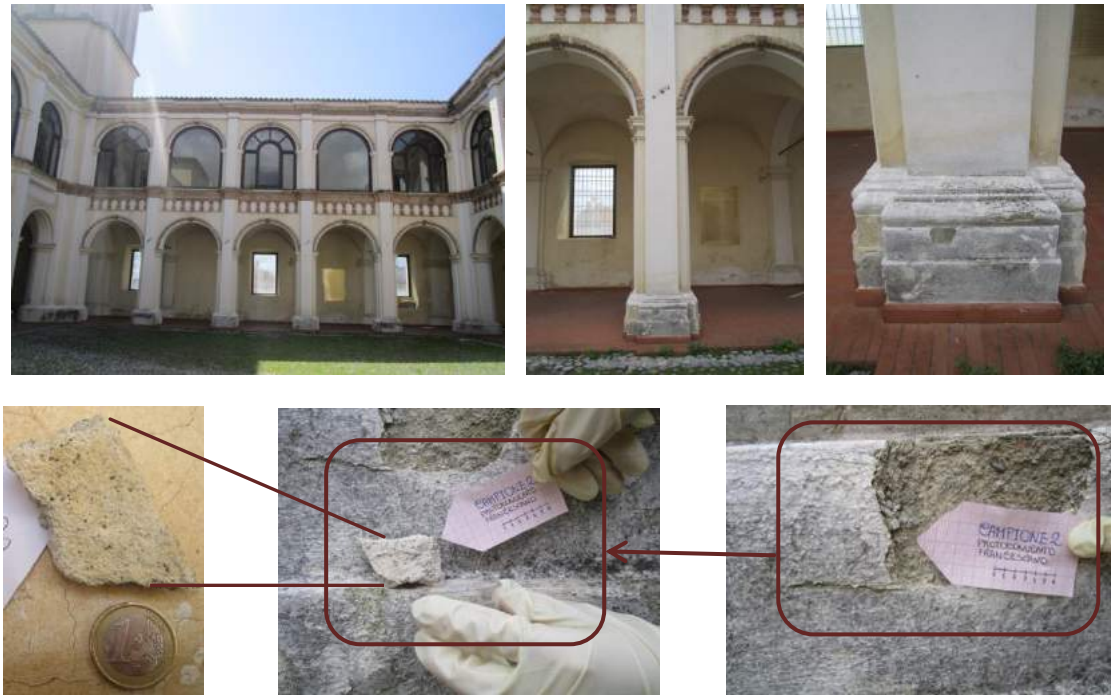

Fig. 8 Sampling point of the sample 2, Cloister B

5. Materials characterization

The characterization of the samples was carried out by means first by a digital microscope (Dino Lite Pro series) and then through an advanced technique: the Scanning Electron Microscope (SEM/EDS). This kind of microscope does not use the light as incident source as in the optical microscope, but an electron beam emitted from a thermionic source or field emission (Fig. 9). Since the resolving power of a microscope is inversely proportional to the wavelength of the radiation that it uses, using an electron beam is possible to reach a resolution of several orders of magnitude higher. Furthermore, the SEM is equipped with an energy dispersive microanalysis system (EDS) to perform quantitative and qualitative chemical timely analysis, expressed in weight percent (Wt□) [10, 11, 12]. In the specific case of the preliminary analysis we were conducted using the Dino-Lite digital microscope in order to better target subsequent analysis by SEM/EDS. Subsequently the fragments observed were prepared for the observation with a scanning electron microscope by placing them on an aluminum stub provided with a graphite disc and double-sided metallized with Au and Pd.

Fig. 9 Scanning Electron Microscope with EDS probe (SEM/EDS). In this study is it Nova

5.1 Microscopic characterization: PROCAS1

The observation of the sample 1 to the digital microscope has made it possible to highlight the presence of a layered structure. In particular it is visible a surface layer in homogeneous composition characterized by high porosity. Overall the tested material appears to be predominantly friable (Fig. 10).

Subjecting the sample to 1 observation SEM was possible to draw some conclusions about its morphological appearance by capturing images of the whole and in detail.

The images of the whole of the sample have allowed to better examine the layered structure that characterizes it, allowing the identification of a surface layer and a lower layer (Fig. 11 a, b). The acquisition of images using a magnification of from 1500X to 1600X, starting from the surface layer passing through the

Fig. 10 Dino Lite picture of sample 1

interface to finally reach to the bottom layer, have highlighted varies as the morphology of the surfaces. Specifically it passes from a compact and homogeneous surface layer, in increasing porosity surfaces until reaching the lower layer characterized by a high porosity represented by very large pores and consists of variable size granules (Fig. 11c).

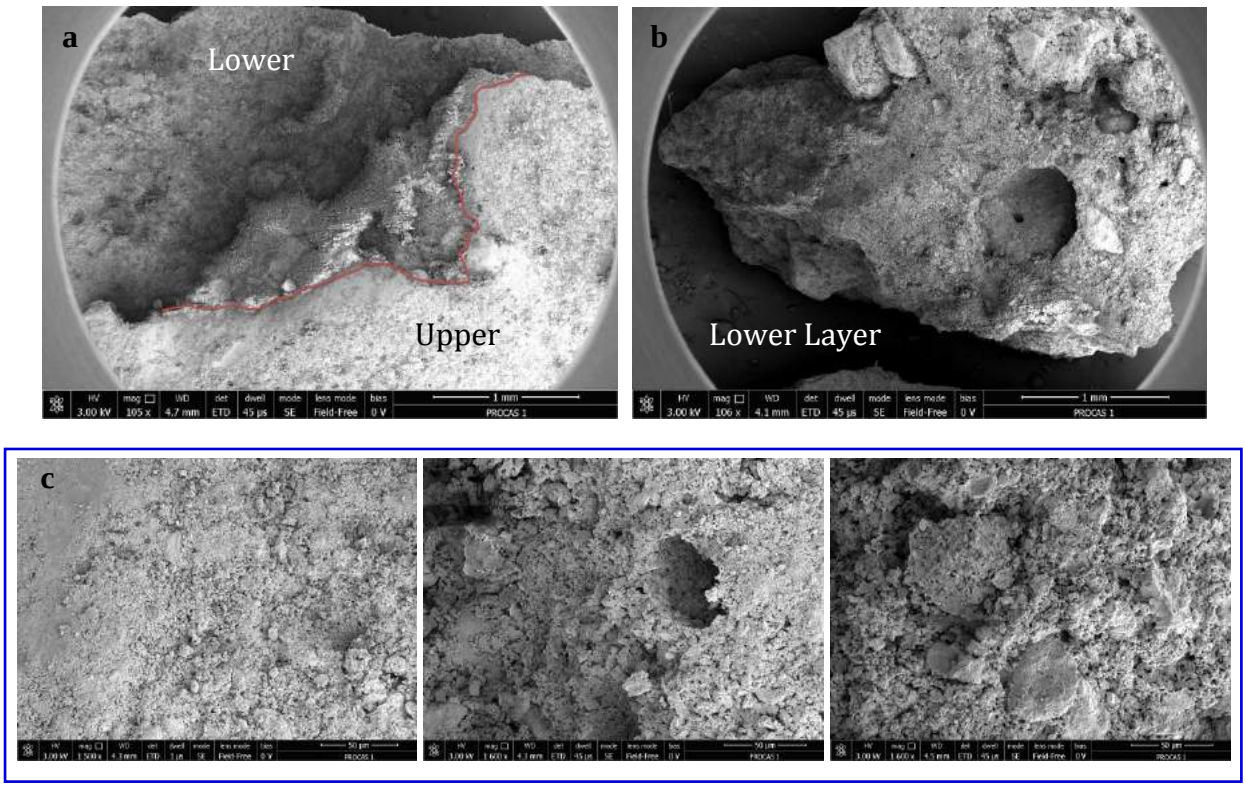

Fig. 11 Sample 1: overview of the layered structure (a), the lower layer (b); details of the surface layer, and the interface of the lower layer (c)

We have chosen to conduct the chemical microanalysis on two layers identified and interface layer - bottom layer. However having a similar composition is obtained in the surface layer than in the lower one, is provided below, only the fluorescence spectra relative to the bottom layer and to the interface.
From the results obtained it was found that the two analyzed layers (upper and lower) have a predominantly calcitic composition being composed of Ca and very low amounts of Na, Cl, Si and Al. The Na and Cl elements are attributable to the presence of salts albeit in small quantities. One and the same chemical composition has been detected on the interface even if the amount of Ca is less as is apparent from the results shown in the table (Fig. 12).

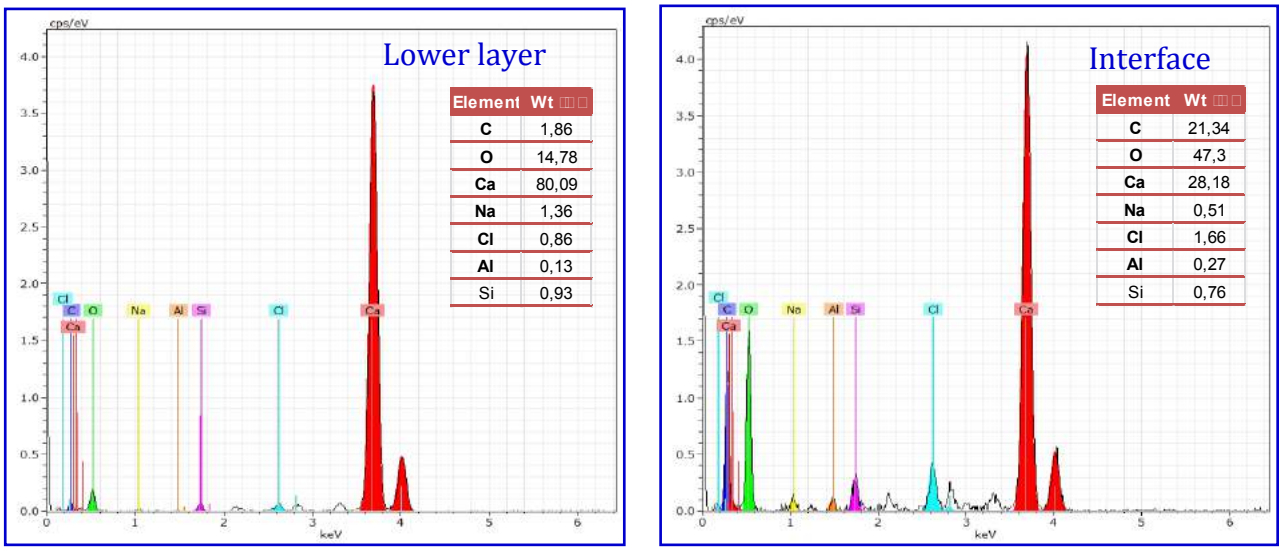

Fig. 12 Sample 1: EDS spectra and tabulated results for the bottom layer and the interface

5.2 Microscopic characterization: PROCAS2

A first observation of the sample 2 to the digital microscope has allowed to identify a more compact structure and cemented with respect to the sample 1, on which surface are visible granules of various nature strongly linked to the surrounding matrix (Fig. 13).

The images acquired by the morphological conduct SEM analysis showed an irregular and discontinuous surface characterized by a matrix in which are immersed large granules of variable shape. Focusing attention on the matrix and increasing the magnification (6000x), it was possible to identify a diffuse microporosity, although the surface of the sample in the complex is characterized by a low porosity (Fig. 14).

Fig. 13 Dino Lite picture of sample 2

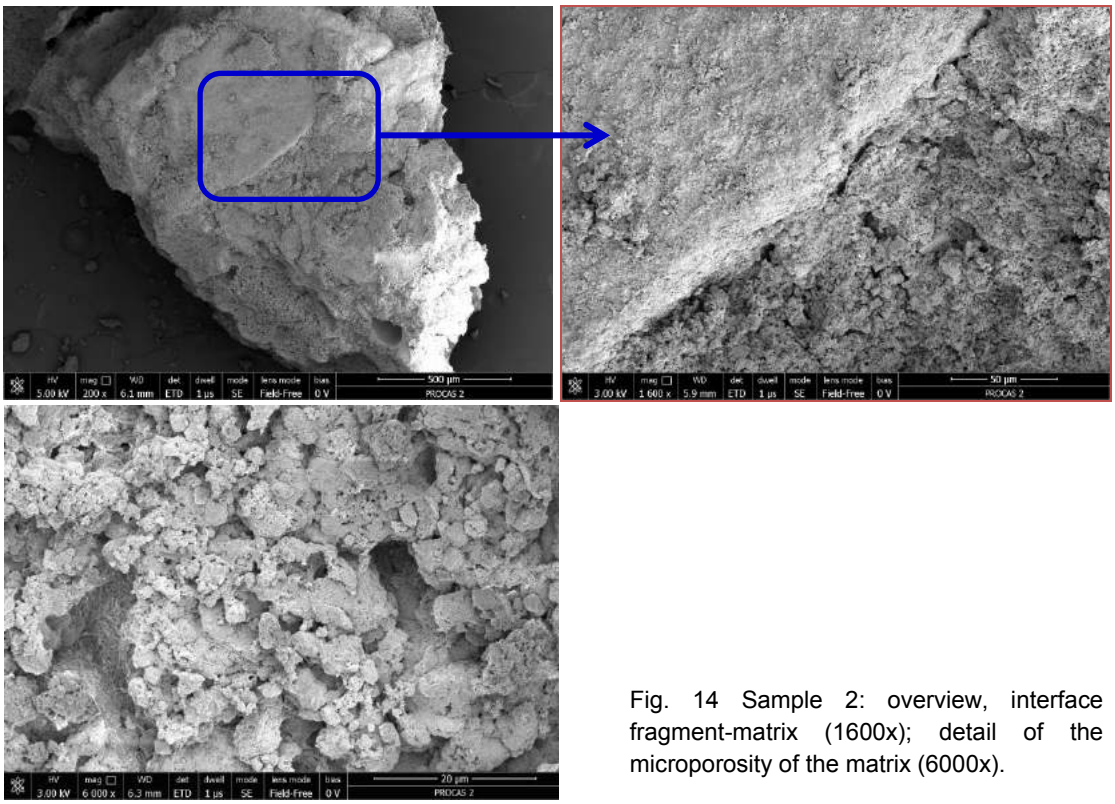

Fig. 14 Sample 2: overview, interface fragment-matrix (1600x); detail of the microporosity of the matrix (6000x).

In this case the chemical microanalysis was carried out both on a granule that on obtaining the matrix for each analyzed area of the EDS spectrum and the chemical composition.

From the results obtained reported in the corresponding tables it showed that the matrix is essentially composed of calcite (Ca) and from a low amount of siliciclastic material (K and Mg), also the presence of salts has been detected (Na, Cl). The analysis performed on the granule has provided a chemical composition represented for the most part from Ca and very low amounts of Na and Si (Fig. 15).

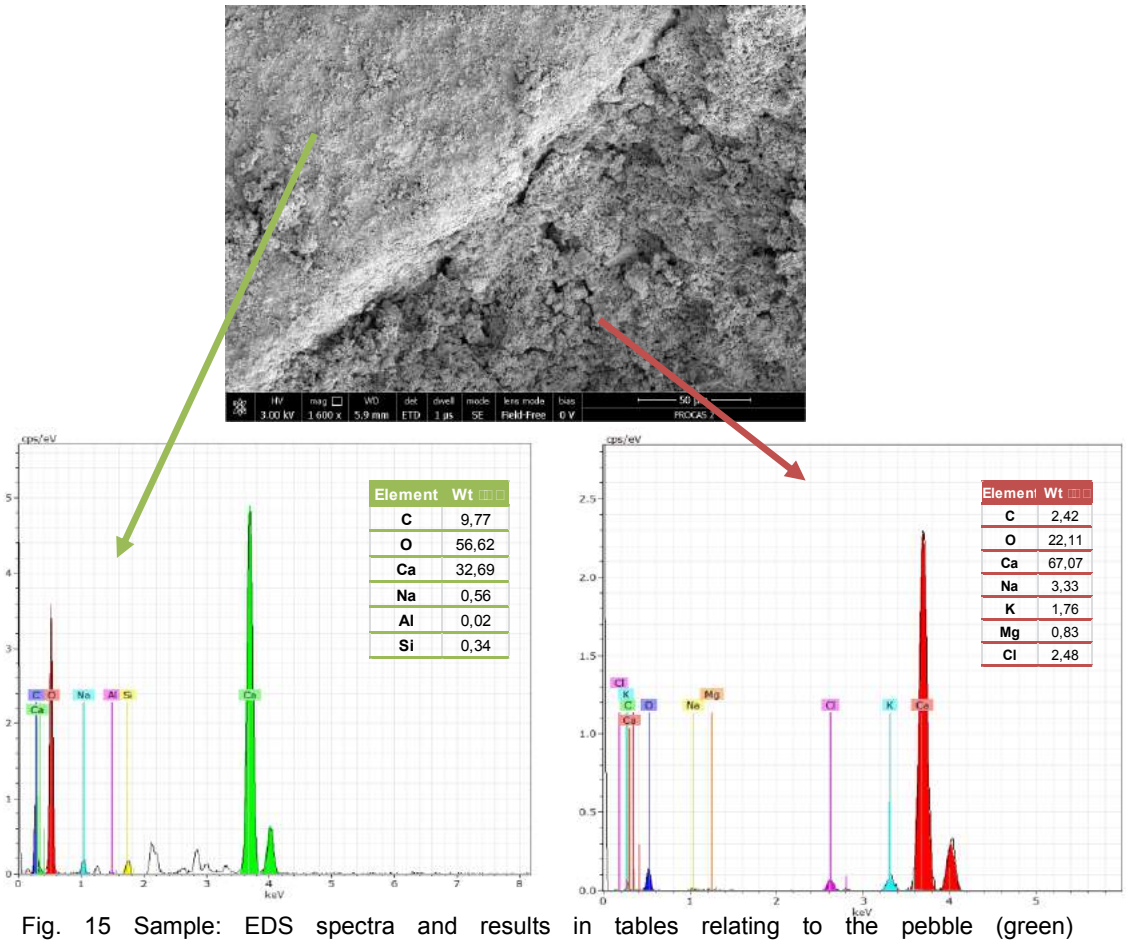

Fig. 15 Sample: EDS spectra and results in tables relating to the pebble (green) and to the matrix (Red)

6. Development

The enhancement of the State Cultural heritage is the product and the result of a series of actions and activities edited by the Administration of Cultural Heritage, aimed at promoting knowledge and to ensure the best conditions of use and access to the heritage for all audiences, with the aim of promoting the development of culture.In order to provide a direct contribution to the cultural and tourist development of Castrovillari, and in particular the Franciscan Protoconvento with extreme attention to its two cloisters, proposes the construction of a tourist-information panel (Fig. 16). The panel will therefore be placed in the vicinity of the subject through the use of rigid substrates and will have to provide a general overview of and what the observer has before. It must be completed by a board, which will deal with specific topics such as: geographical location (Prediagnosi), history, architectural description, file photo-graph, state of decay, sampling and characterization of materials (Diagnosis). The goal is to want to give more visibility and recognition to cultural heritage, both historical and architectural in our region by improving communication, dissemination and knowledge of monuments, returning and assigning to them a renewed and enhanced image, making a quality service to tourists who visit the city, providing a new interpretation to the observer so as to arouse curiosity and interest in the work.

Fig. 16 Franciscan Proto-friary : Tourist-Information panel type

7. Conclusions

In the present work, the objective to develop an analytical-cognitive structure for the development of a diagnostic level required for programming of restoration and conservation appropriate, has been achieved through its direct application on a real case study, the Franciscan Protoconvento in Castrovillari. In particular, the work was carried out by following the main steps of a typical diagnostic level: the prediagnosi, ie spatial analysis of the urban system; the diagnosis, which included a thorough work of historical-architectural research, the creation of a dossier Photo and perform specific analyzes on the technical and scientific materials; and finally the postdiagnosi by which it is sought to provide a direct contribution to the cultural development as well as the tourist area of Castrovillari, creating a tourist-information panel, which would give greater visibility and recognition of the cultural and artistic heritage of the center itself.

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Scientific investigation on Pompei's plaster to characterize the painting technique, the remaking and the protection or restoration layers

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Abstract
The multidisciplinary pathway necessary to reconstruct all aspects for a possible approach to historical, artistic and architectural artifact, must create appropriate synergies in order to allow appropriate coordination, correct and integrated, of all various information coming from different areas of expertise, used anyway to define the precise state of preservation of the artifact concerned.
To allow greater understanding of the work, the use of tools and techniques commonly used by the restorer and lab technician, facilitate the exchange of information and interpretation of the data collected, helping the interpretation of historical and scientific data according to their experiences and technical expertise. According to the above, it's therefore proposed a study aimed at diagnostic understanding of a work of Pompeian style, not yet investigated. The scientific investigations used, refers specifically to the painting materials and their stratigraphic articulations, related to the painting technique, the remakes, the layers of protection or restoration performed during its lifetime, as well as the alterations due to several factors, both environmental, both resulting from conservative practices.
The data collected are of notable importance because, besides contributing to the identity work reconstruction, give new information on the procedures carried out by the culture of the time, to protect their cultural heritage.

Keywords: Pompei, painting technique, Scientific investigation

1. Historical and geographical framework
Placed in a position from which dominated almost the entire coast of the Gulf of Naples, the ancient city of Pompeii has been developed in a plain about 30 meters above sea level, near the Sarno mouth, between Vesuvius, the only active volcano of the European continent at west and the mountains Lattari at east, representing the western extension of the Picentini mountains, of the Campanian Apennine. The Soil fertility due to the presence of the volcano encouraged the exploitation and the cultivation of the vine and cereal allowing Pompeii to become, even for its good climate, its sumptuous gardens and its abundant crops, a market town with a thriving economy. Towards the end of 400 century. B.C., the tribes of Samnites, from the mountains and Sannio, conquered the Vesuvian and coastal cities giving a strong impulse the urbanization. Around 500 BC, Pompeii had become a fortified center of about 63.5 hectares, bounded by 3 km of town wall, set on the basis of a previous and of similar shape in volcanic tuff and then reinforced with Sarno limestone, interspersed with 7 ports and 12 towers.
After various vicissitudes Pompeii was destroyed in few hours with the eruption of Vesuvius, which took place in 79 B.C: the entire assets composed of stylish villas, temples, baths, gardens, shops was buried under several meters of pumice and ash. The population of about 12,000 people, was trapped in part because of home collapse , partly smothered by volcanic clouds and partly "frozen" during the

belated attempt to outdoor escape. The Pompeii site since 1997 has been included in the list of UNESCO World Heritage [1-3].

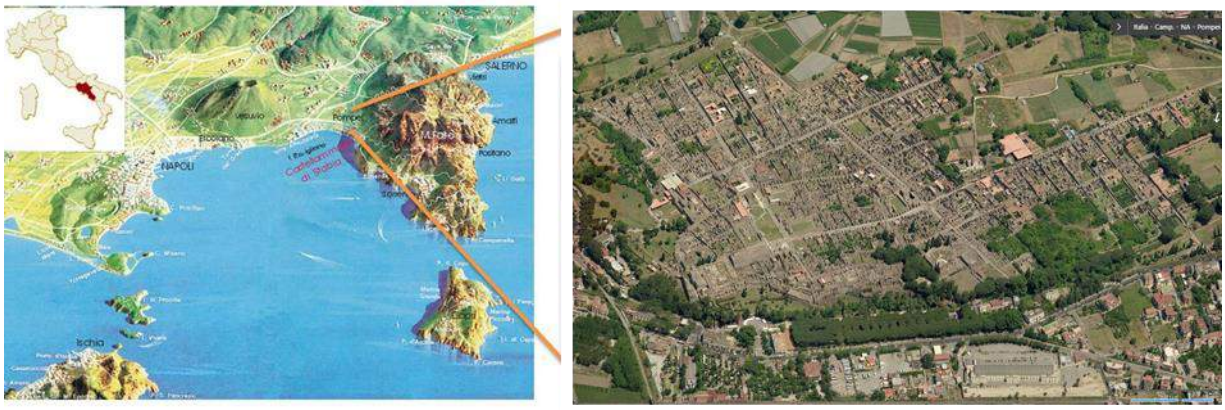

Fig.1 The site of Pompei, Campanian region, Italy.

2. Work description and first observations.

The wall painting that will describe, has not yet been studied, which is why it will be the subject of the following diagnostic path, aimed at its knowledge and future enhancement. At the time of the inspection carried out in November 2015 at the Restoration Laboratory of the National Archaeological Museum in Naples, where it was retained, it was still in the original wooden case of the archaeological recovery (height: 150 cm, length: 72.5 cm, thickness: 10 cm; on the wooden frame is engraved the word "DIX", probably related to age of the work). The restorers of the museum have partially adopted measures to remove an opaque *surface covering*, yellow-brown of unknown origin, which made and still makes it difficult to recognize the underlying design, very articulate, but of extraordinary charm. It observes the face of a woman with sharp outer outlines, but much altered, with her hair gathered, on a bush background. To her right is visible a thin red stripe that runs along the length of the work; on dark green background in the branches, with parallel oval leaves, pale green, with a few red flowers, stands a bird with sharp lines and still evident, between dark brown and light brown, yellow and white. To the left of the woman depicted, a yellow colored band is visible in part covered with plaster, on which the branches protrude, highlighting the leaves of dark color; in detail you notice the engraving on wood. In the most opaque and hidden area, it can be seen a tray, which she carries in her hand and a red background at her feet (dotted shapes in Fig.2).

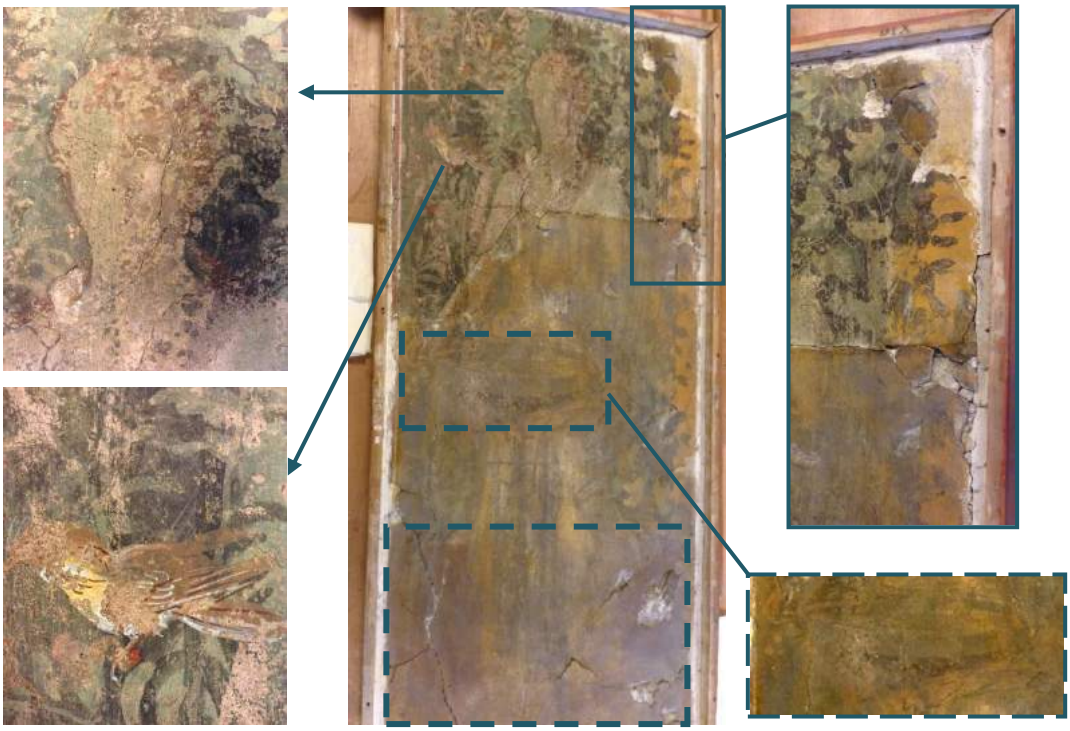

Fig.2 The ancient wall painting with details: female face on garden background, little bird placed on a branch, right-angle with branches and leaves that stand out on the yellow band. In the dotted areas it can be seen in her hand a tray that women brings and a red background at her feet.

2.1 Digital elaborations.

ou can have an immediate recovery of the legibility by modifying the parameters of brightness and contrast of the picture (Fig. 3). As you can see there is an immediate improvement in the path of knowledge, as it stand out better details described above.

Fig.3 Preliminary inspection with photographic documentation of ancient painting: the first image as it is, the second contrasted and the third equalized.

2.2 The state of preservation

The work presents a whole a bad state of preservation; are in fact evident different types of degradation, spread on the entire surface, which make difficult the interpretation. The structure of the wall paintings is strongly heterogeneous and complex, composed of more layers, since support on which it is placed, up to the various layers of plaster (from coarser to those fine), the last of which there is the paint layer as the last finishing [4,5]. The state of preservation analysis must consider the interaction between these layers, in order to identify the possible causes which led to a simultaneous presence of various forms of degradation and alterations, which in various parts of the figure represented are overlapped, creating difficulties for the interpretation. Some representative typologies that, with regard to the critical points are briefly described below (digital and optical pictures in Fig. 4), have however been detected. Some of these diseases can be observed with the digital microscope (Dino Lite Pro series) which allows to acquire optical and high quality images at high magnification. Beside forms of chromatic alteration diffusely distributed on the surface and obvious in some cleaning points (Fig.4 a, b) are noticed areas with bulges (c, d), especially in the lower part of the representation, perhaps due to renovations works. The upper portion of the representation, partly cleaned, has a evident horizontal score line that runs through the entire work width. Evident even vertical fractures, and close of holes (Figure 5 a, b, c). The alteration phenomena have also affected the opaque *surface covering*, which generally appears homogeneous, but going into detail it appears fractured and in chemical degradation. (Figure 6 a, b). The observations to the digital microscope at 32x and 91x, have also allowed to obtain more information about the *surface covering*, which does not appear as a powdery coating, but as an almost vitreous paint and brilliant at the first observations. The craquelure of crackle have a consistency almost "resinous", crumbled because of the succession of mechanical traction over time, and further to the modification of environmental parameters and factors to which the work has been subjected or to even not proper storage conditions. Last but not least there arises the question concerning its function, if about the protection or not. As you can understand, the study takes such different directions, because of its complexity and the multidisciplinary approaches, allowing parallel investigations on the protective layers, on the ones painting as well as support plasters [6]. For this reason is deemed more appropriate to proceed slowly, so here the focus will be on the first results of microscopic observations of the *surface covering*, whose insights will be the subject of future studies.

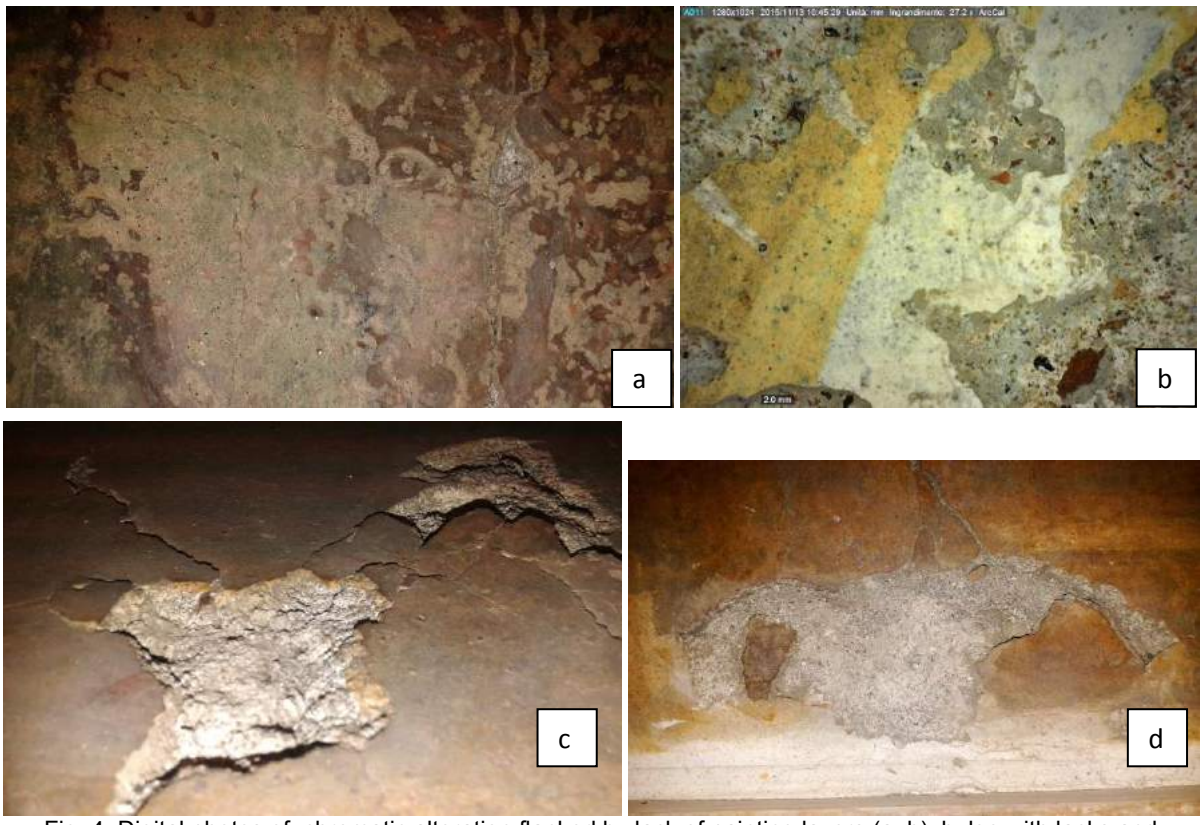

Fig. 4 Digital photos of: chromatic alteration flanked by lack of painting layers (a, b); bulge with lacks and fragmentation with detachment of plaster and loss of three-dimensional portions (c, d)

Fig.5 Digital photos of fragmentations and lacks (a,b,c) due to the bulging of the painting layer.

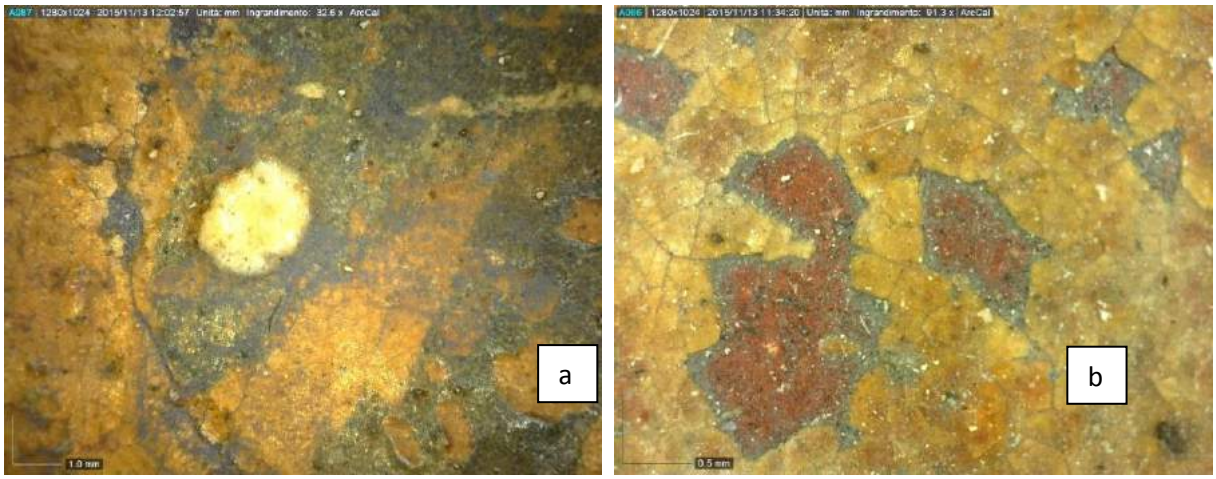

Fig.6 Chemical (a) and physical (craquelure) (b) alteration of the opaque *surface covering*

3. *Surface covering* as a consolidant, adhesive, protective or other?

As we know, consolidants, adhesives, protective and fillers fall all into a group of substances applied on the painting layers with more or less ancient techniques and with different functions; we see now, the surface object of this study in which category belongs. By definition, a consolidant (animal and

vegetal waxes, natural gums, artificial polymers, acrylics) is a substance that penetrates in a fluid state inside a material, in order to reconstruct it into a cohesive texture, as uniform as possible. But in this case the formation of net craquelure, that go in flaking, it would seem discard this function. The adhesive function (animal glues based on casein, albumin) is to be discarded, since it is a substance which is interposed between two detached surfaces allowing their junction, but this is not the case. Remain to be considered the protectives (natural and animal resins, paints) with specific optical characteristics, applied as a thin film on the surface paintings of art, in order to protect them by the various environmental agents [7]. In this case the covering surface, maybe transparent in the past, become dark in the time, it may have had a protective function of the underlying painting layers. These assumptions opens the way for a new line of very complex investigations, dealt in part in this study.

4. Sampling

Completed all the preliminary observations in situ (not invasive), you must pass to investigations to be carried out in the laboratory using advanced techniques, to deepen the diagnostic path of knowledge of the work and in particular of the layers that constitute it. Following the regulations we proceeded to the sampling of fragments already detached from an area bordering a part already partially restored (right) and another one still covered by the yellow-brown *surface covering* (to the left), belonging to the upper portion of the wall painting object of study (Fig.7).

The two fragments taken, for brevity called "DIX1" and "DIX2", have size range (1-1.5) cm; the coloration that is visible is yellow-green, as the pickup area lies precisely in the yellow band on which protrude the branches and the leaves of the vegetation present behind the depicted woman. The DIX1 sample was used for the digital and electronic microscopic observations that follow.

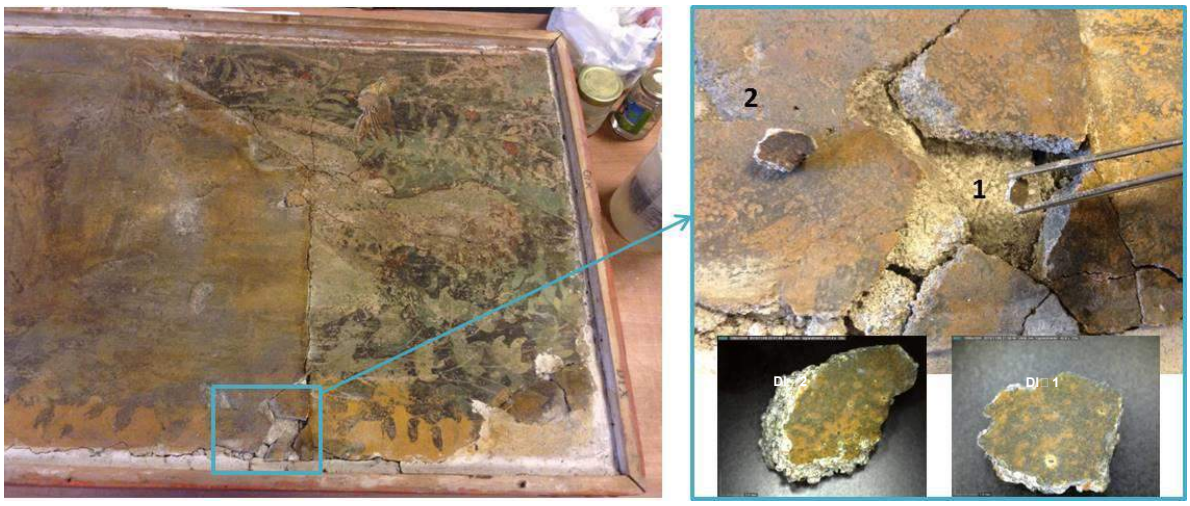

Fig.7 Pre-restoration of the fragments levy ”DIX1" and “DIX2" in a point fractured of the parietal work.

5. Digital and electronic microscopic investigations

The digital microscopy (Dino Lite Pro series) is very versatile and immediate especially for surveys in situ, since it allows to detail observations both in surface and in cross-section.

5.1 DI□1 on surface

Acquisitions reported in this study related DIX1 fragment, showing a perfection of detail, even in low magnification, subsequently observed and deepened at micrometer scale, through the Scanning Electron Microscopy (SEM). As can be seen by the Fig. 8 A, the *surface covering* has many craquelure and alterations, probably chemical, as already seen above (Fig.6 paragraph 1.2); these phenomena are typical of paint in alteration that suffer a sharp contraction (Figure 8 B).

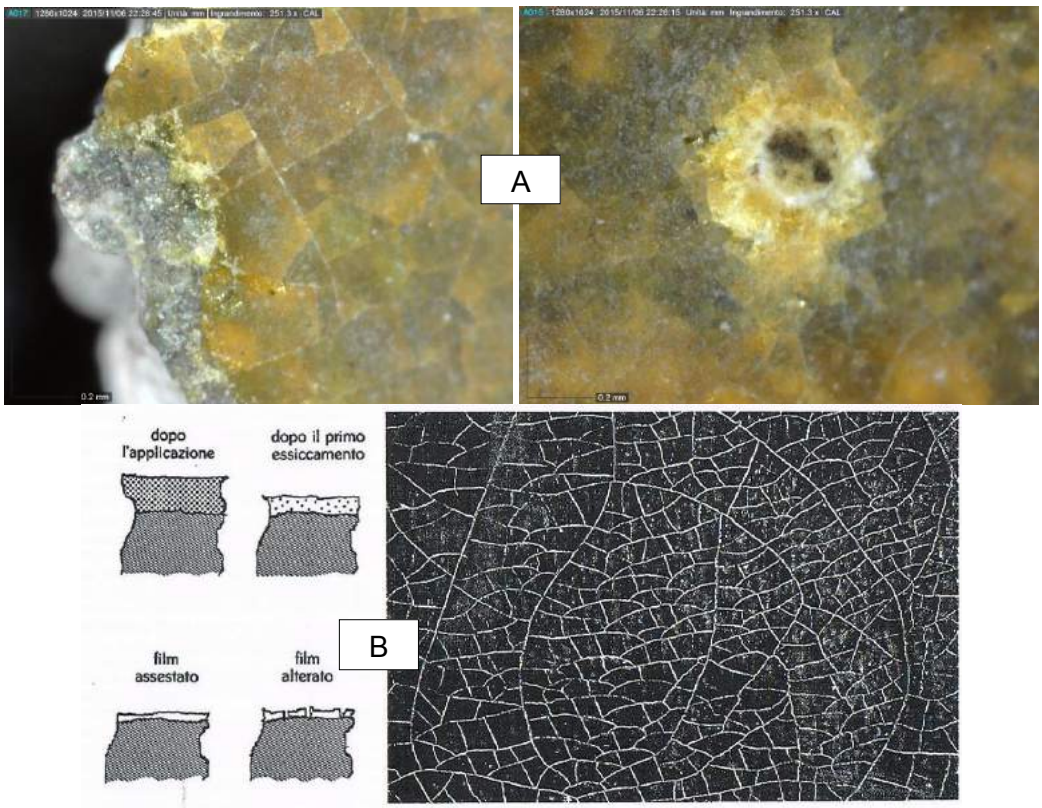

Fig. 8 Craquelure digital acquisitions due to physical stress and punctual alterations maybe chemical of DIX1 sample (A); drawing of the formation and degradation of a coating film and an example of dense craquelurepattern on a painting (B).

The area of coating even if delicate has proven resistant because it allowed to keep up until now the original representation below in some places intact. Despite its presence various areas are strongly altered, so it is possible to assume that its deposition is not very old, or perhaps immediately after the archaeological recovery. The deepening of the knowledge path was used the Scanning Electron Microscopy (here is used the Nova NanoSem 450, EIF), whose operation requires a sample "charged", to be investigated at different levels of voltage and magnification (at micrometric scale), ie placed on aluminum stubs provided with graphite double sided disc and metallized with Au and Pd for the observations and the microanalysis (the latter will be dealt in new investigations). As can be noted already at low magnification (250x) the surface appears fractured, as seen previously, with craquelure disseminated and more evident at high voltages (18.00 kV, 1067x). The surface appears to be strongly altered and crumbled and the margins of the islands formed, seem deep and distant from each other, a sign that they are in detachment (Figure 9).

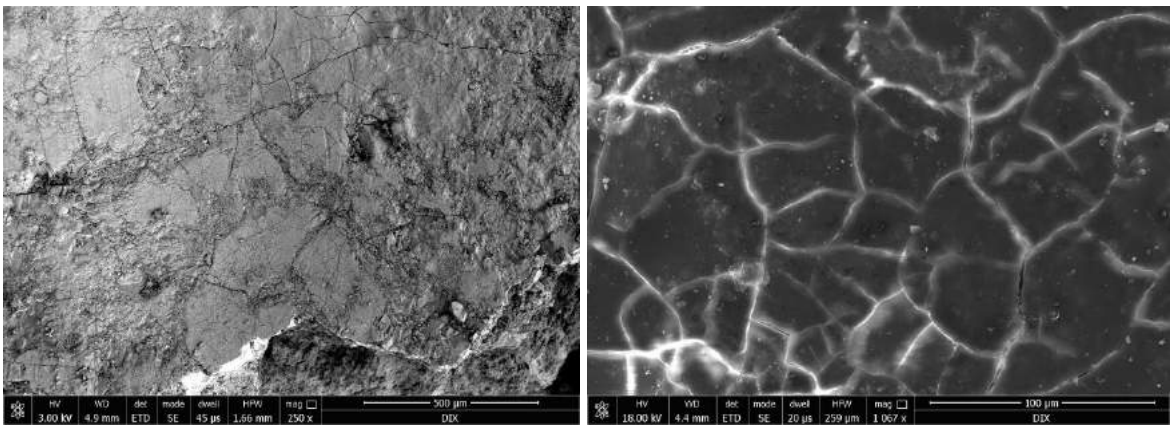

Fig.9 SEM photomicrographs of DIX1 surface. Craquelure widespread (250x), with separate margins more evident at high voltages (1067x, 18.00 kV).

Tilting the sample of 35 □, it is possible to reap additional and important information on the coating surface that is being characterized: the surface appears to follow the discontinuity and the ripples of the painting layer (1500x, 300x) and this suggests a very slight "hand" of deposition probably not for

protection purposes. However we stand in a contour area of the painting, so even seems better understandable to preserve the main part of the painting, rather than dwell on the outlying areas (Figure 10).

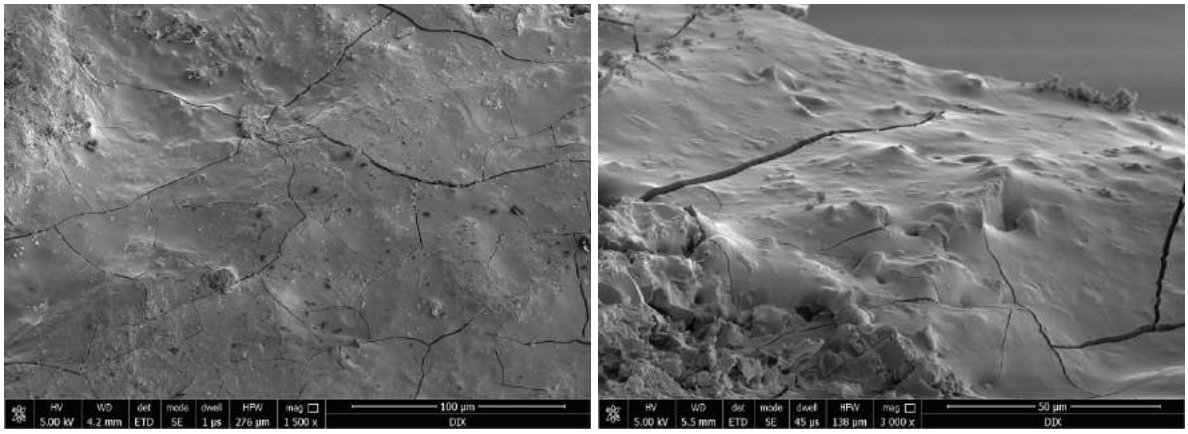

Fig.10 SEM photomicrographs of the superficial *surface covering* observed, tilting it of 35□are shown new morphological details

5.2 DI□1 in sectional view

Vertically looking at the sample, it can distinguish several layers: the first yellow-brown bright color, which represents the *surface covering*, the second gray, probably the painting layer and finally the whitish support with interposed clastic and mineralogical fragments, represents the plaster support (Fig.11 to the digital microscope). This sharp stratification is well recognizable in the picture acquired through the scanning electron microscope (Fig. 11 SEM) in which a inhomogeneous distribution of the first layer is noted, which seems of greater thickness than those underlying; another clear aspect is the porosity: absent in the first layer, scarcely present in the second and very noticeable in the third.

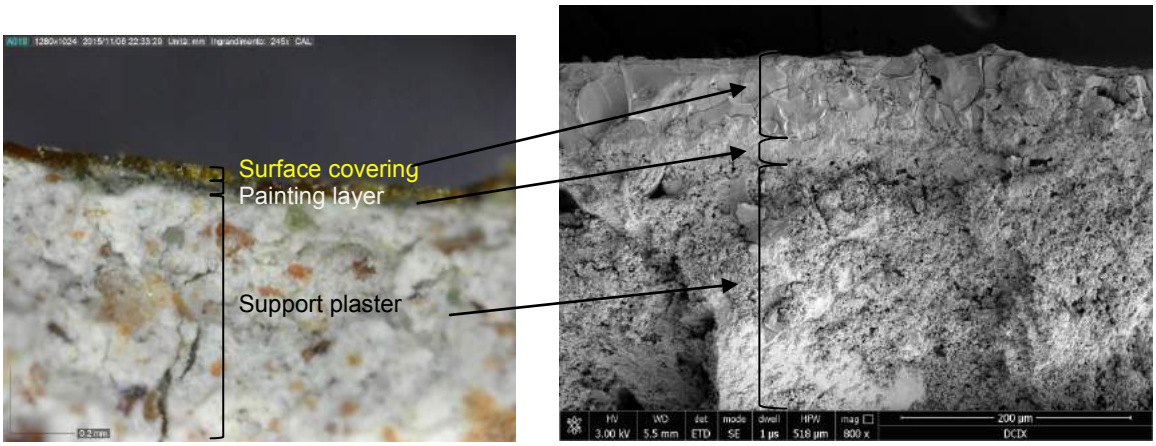

Fig.11 Sectional view of the sample DIX1 (left at digital microscope and right at SEM); In both pictures are recognizable three layers: the *surface covering*, the painting layer and the support plaster.

By measuring of the layers in fact it emerges that the thickness of the surface covering is approximately double compared to the second layer (45-70 □m of the first layer than 15-36 □m of the painting layer) (Fig.12 at 1500x). This, however, vary from area to area, in fact, there are more small thickness areas (20 □m) and maybe this depends on its different level (more or less greater) of deposition and also alteration. Assuming then a "hand" generous and double compared to the layer on which it was placed, we can say that its function was almost certainly of protection from degradation factors.

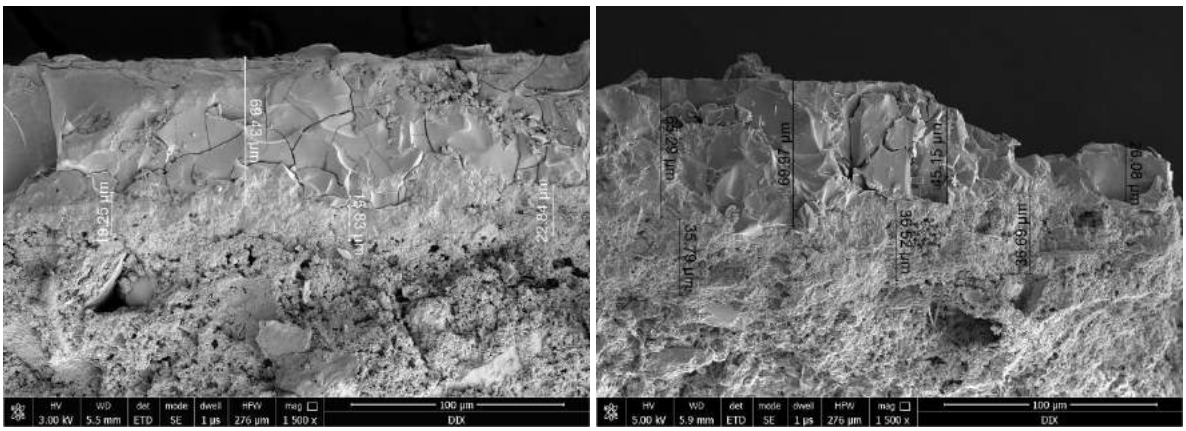

Fig.12 SEM photomicrographs of the sample DIX1 in sectional view: layers measures observed.
The two images at 1500x refer to two different areas of the sample.

6. Conclusions

The critical investigation carried out in this article it is essential in the diagnosis of cultural heritage, as it is placed just in the preliminary stages of the process of knowledge itself. In addition, the collection of this information is of great help not only for the restorer and the critic of art, but also for the humanist and scientist in the broad sense, because aimed at the conservation and the search of its "values". The instruments used from those commonly used in situ (camera, magnifying glass,..) to laboratory ones (digital microscope, electronic SEM,...) are themselves enhancement media, for the enrichment of knowledge process, highlighting both the strong points, that the weak points of the work. In detail some preliminary investigations for the characterization of the constituent layers of the ancient painting, on the surface and in stratigraphy, were carried out. It depicts a woman carrying a tray, on the background of a garden; the entire surface is characterized by widespread forms of deterioration (chromatic alteration, detachment and fragmentation with lacks, bulges) giving to it a low level of conservation in some points. This maybe depends on the thickness of the surface covering deposited on painting and perhaps only after the archeological discovery. This first layer yellow-brown color, maybe become dark in the time, it is also very altered (for the presence of craquelure and signs of chemical degradation), both on the surface and in section (observations at digital and electronic microscope). Its function might be of protection, since its thickness is almost double at micrometric levels, compared to the painting layer placed below. These studies developed here are the starting point on which base a new characterization research (compositional and morphological) also of the subsequent layers: the path of knowledge performed here, and that will be deepened, will confer an identity as more and more defined at this ancient work, which, although not yet studied, is of great artistic and historical value.

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Best Practice to realize applications for the virtual and interactive fruition of architectural and archeological structural B.I.M. models and design objects

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Abstract
The paper aims to design and to realize 3D software using for architectural and archeological constructions models and 3D interactive environments. Starting from the code design issues to arrive to the 3D graphics creation, to the texture mapping and to the entire workflow project organization in order to integrate into a single production process the several skills needed for its realization. In this paper will be address the structure data (SD) issues to be used to represent information, not only in a consistent 3D data. The information emerge when the data are not only well represented by their SD but especially when they are related and reported in an appropriate way between them.
To create models by using the Building Information Modeling procedure for the cultural and archeological heritage, it will be fundamental a correct preliminary knowledge phase.
This phase assumes the creation of a relationship between data cloud, mesh and structural modeling.
The meshes are chosen as layer information abstraction of the highest level and can be implemented in a SD in which the data are associated with each vertex is not only the location and color but also additional properties like structural deformation information. The B.I.M. methodology will be connect to the informatics field though the use of software able to create a mesh model of cultural heritage integrated to the structural analysis procedure.

Keywords: Building Information Modeling (B.I.M.), structural model, virtual fruition, interactive environment.

1. Introduction

Building information modeling is the procedure on which the different professionals involved in the creation of a conservation project of a building belonging to the cultural heritage or archaeological value, or involved in a new project of buildings or objects of design can simultaneously interact.
Through this methodology and more precisely with the proven B.I.M.[4]S□D methodology, a three-dimensional model of a construction can be achieved. The virtual model is created starting from the data collected during the knowledge phase through the use of non-invasive instrumentation.
The laser scanner equipment, for example, is a great tool to detect the building skin but only through the use of this tool the knowledge is not complete. It is important to integrate data with those derived from other instruments (such as the GPR, the pacometer, a thermal camera a.s.o.).
Starting from the data cloud derived from the scanning points collected to detect for a building belonging to the cultural heritage, it is passed to the creation of mesh capable of creating a surface that surrounds the building.
This paper allows to interact with the design object or building in a virtual and interactive environment.
Even the 3dimensions solid model of the construction useful for structural analysis purposes can be explored virtually.

The paper presents the best practices to realize applications for the virtual and interactive fruition of architectural and archeological structural B.I.M. models and design objects [1].

2. Structural B.I.M. B.I.M.^{4}S D for cultural heritage

The junction moment between the representation and structures scientific disciplines is the ability to model a three-dimensional cultural or archaeological building starting from a Laser Scanner survey and importing it in Autodesk Revit Structure ot Tekla Structures to create 3D model. After that phase it is possible to export the model on computer platform such as the sophisticated structural analysis software Midas/GEN (called BIM^{4}S D procedure as well as defined in previous research).
The first knowledge phase and the investigation with non-invasive instruments lead to the creation of three-dimensional building model. Through the scanning development carried out by using laser scanner is derived the morphological consistency of construction, with a fundamental shift from the model of structural model graphic representation. They identify the only structural parts, shaped by solid finite element in the structural analysis software Midas/GEN. Thanks to the benefits of this innovative procedure, it can proceed to the nonlinear structural analysis of 3D building model.
The data cloud coming out from the scanning points generated by relief with laser scanner has the limit to make known only the "skin" of the building and not the internal consistency of the building that goes to investigate. Thanks to the creations of a measuring spatial average grid suitably chosen and the points of the representative model of the cloud you can go to shape perfectly those that are the real morphologies of the construction. The more detailed three-dimensional structural model and it can analyze in detail the structure and its behavior [2].
The entire operation experienced is numerically game from the pad with a laser scanner of a part of very irregular masonry and forming part of an excavation taken as an example. The structural element thanks to the scans points and the meshing surface has quickly one realistic identity. Reproducing the jersey with solid prismatic connected to each other by means of fixed points and having material characteristics, shape, geometric and mechanical behavior, was obtained three-dimensional model of the structure finite element method (FEM), and it proceeded to structural analysis for any external action (wind, earthquake etc ..).
B.I.M.^{4}S D is a complete process of digital integrated structural modeling, characterized to have a single digital historical document on which to load the data and the operations to be performed (both state representation of the fact that the existing recovery) [3].

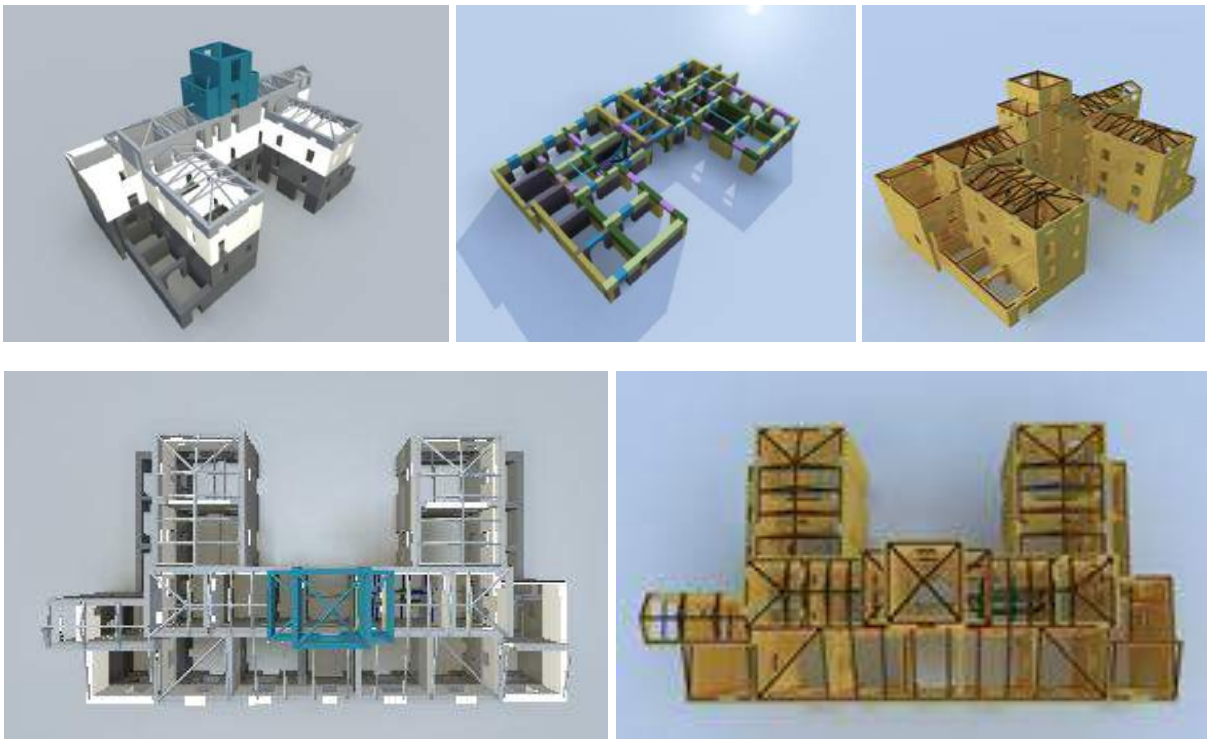

Fig. 1: B.I.M.^{4}S D – Teti Maffuccini Palace in Santa Maria Capua Vetere (CE) – Italy

The context in which it develops is inter-disciplinary.
The need to interactively coordinate a pattern in morphological and functional 3Dimensioni with a structural derives from the need to establish a new method of data exchange. The cross platform of B.I.M.^{4}S□D is made up of construction elements to display parametric participating individually and globally in the apparatus to ensure the safety of the construction.
For existing facilities, the proposed approach provides the opportunity to really assess the security level of the artifacts for both gravitational actions for the seismic event.
Legislation and technical reference standards for this type of analysis are the NTC2008, OPCM 3274 (and subsequent mod.), the guidelines for cultural heritage and Eurocode 6.
Realized the integrated structural model with the use of B.I.M.^{4}S□D methodology., it can perform the finite element analysis (FEM) for the evaluation of the structures vulnerability subjected to static and seismic loads.
The FEM method is flexible and takes into account the heterogeneity and anisotropy of the materials.
The real nature of the methodology by finite element lending itself to a more or less complex computerization intrinsically possesses all the characteristics interfaced with the digital geometric survey.
The stability of a product can not be controlled through the structural model if the first has not become aware of the construction technique with which was made the same artifact.
The first proven methodology allows fast, precise and effective construction (for computerized on) the structural finite element model in three dimensions, using the digital data of the geometric / structural survey. It also allows to make immediate changes to individual structural components, to give it the mechanical properties and to complete the structural modeling with the arrangement of the constraints and loads. Allows, finally, a virtual navigation of the artifact structures or design to investigate the object and view the many aspects of the structural model [4].

3. Workflow and interactive use

The realization of application for the virtual architectural entities use (which are archaeological sites reconstructions or building projects simulations, or design objects), requires not only implement a robust code library for the management of all aspects application, but also create 3D models suitable to be navigated, manipulated, or animated simulation.
These assumptions urge the development at the base of a good way to organize workflow to produce everything necessary to the realization of the application in the more specialized way possible. The application of this paper will achieve the following objectives:

- interactive Navigation on various platforms (from the PC to the web to tablet), in first person or third person of Architectural Entities of any type (navigation on foot or in the air, interacting with objects in the simulation separately fitted with its own programmed behavior),
- visual simulations as, neutral simulation or flocks moving in environments with obstacles, simulations of emerging global behavior from the interaction of individual units with local behaviors (Ex. Simulate the panic to study how environments with emergency exits or escape routes run critical situations, simulation behavior neruali networks, evolutionary programming etc.).

To obtain this application is inevitable integrate, not only different skills but also various work tasks to be carried out sequentially or parallel interleaving the contact points between the different powers and different operating tasks which could both be the domain of a single professional figure, both assigned to more professionals in a team (the architect, the designer, the expert computer graphics for the part of modeling 3D objects, the expert of algorithms and programming for the part of the interactivity of the simulation development, the archaeologist to attribute to historical information interactive artifacts to be invoked during the simulation to the user's request, the expert audio to produce sounds or music which contribute to increasing the of sensory immersion in the simulation, the system administrator for the publication of the application on the web etc..)
Whether there is a single professional or a team of specialists, the work flow identified to produce the best such application can be briefly summarized in the following diagram, that although uses a visual nomenclature similar to UML diagrams is not a proper plot UML, which uses the class (white rectangles) box to describe the objects produced in the various steps of the task, such as point clouds produced by the scans, or mesh generated by processing the point clouds, and use the arrows not to identify relationships inheritance of specialized objects as they would in a UML diagram usual, but to identify an object as you move to the next (not necessarily that these will inherit the characteristics), produced by a specialization of the previous year. The following diagram illustrate so succinctly and visual workflow designed, organized by task (Figure 2).
In the following paragraphs of this report illustrate the methodology to implement each task shown in the diagram.

The work flow is very brief because no explores recursively the individual steps needed to achieve each object represented, but from an idea of the need to work together and how to organize it.
Generating a Mesh Scenario1 and Scenario2
We begin to analyze the task the graphics whose purpose is to produce 3D objects used in the application of simulation, this can be achieved typically consider two viable scenarios, or two ways or two ways to realize one or more polygonal mesh you can use with your software developed.
Computer modeling in Handwriting from scratch of a 3D model using architectural modeling software, mechanical, organic.
Acquisition of the 3D model by scanning an object of the material world (3D scanners, laser scanners, photogrammetry, we will see later in detail some examples and useful products for this purpose).
Obviously, you can unify both point 1 and point 2 is reconstructed to create scenes from scans that with objects designed from scratch
Acquisition of the 3D model through scanning
Whatever the input tool used to capture an object or an entity of the material world, (camera, laser scanner, or 3D scanner), in most cases what is obtained as a result, the first level of the output scan , is an entity computer for data representation, known as point Cloud or point cloud.
This entity is the digital information in 3D "low-level" real object.
In computing, the term "low-level information" is meant to express the concept of "atomic level of information" ie with no abstraction on emergent properties of acquired atomic data, so a mere and accurate description of a structure or entity , we could say "bit by bit". It therefore refers to the quality of information saying it is "low-level" but only to its degree of information abstraction.
In the case of a data cloud, in fact, a real object is represented in digital through a very rudimentary and simple data structure, which contains many atomic data, often redundant, a representation that is very punctual of many features of the object, that in a higher abstraction level could be described in a "conceptual" more elegant, taking up less memory, becoming faster processable and maintaining not only qualitatively the same information but also adding new information, emerging precisely from a high-level representation.
This point cloud so, its level of representation of information is nothing (from an IT standpoint), a simple but huge "list" of "points 3D space" having the following properties.
1) the coordinates x, y, z which represent the local position in the digital scene of single point
2) an r, g, b channel for each point for the color representation of the acquired point
So computationally we might describe as a class that has two arrays, one for points and one for colors where i□esimo point is associated with i□esimo color.
`Public class data Cloud {Vector3 [] points; Vector [] ColorRGB;} Protected class ColorRGB {int r, g, b;.` Leaving out the other details of the class definition, this representation is very interesting and fascinating, but it is too elementary for our purposes, and has no more information than those extrapolated from just disjoint points, and also for many other purposes is not the optimal representation.

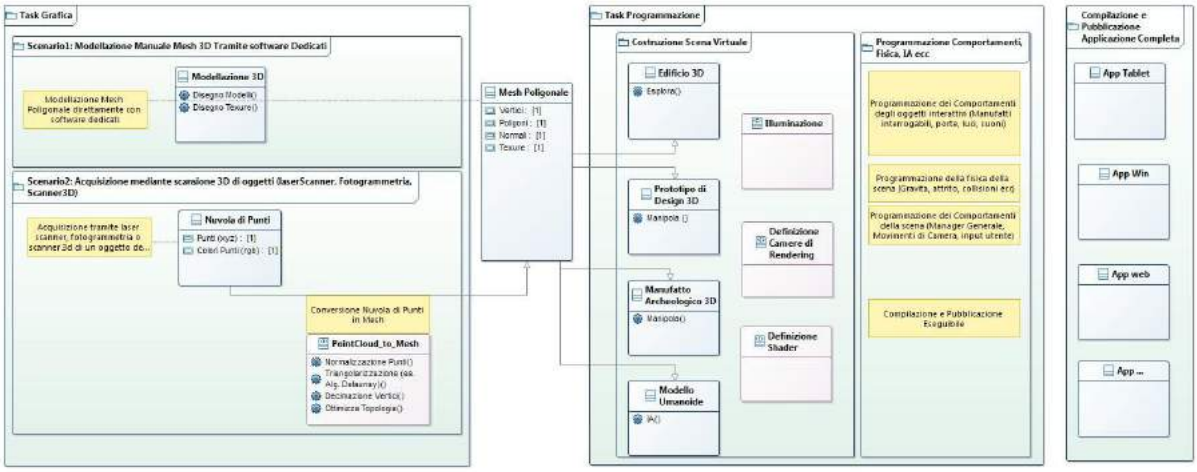

Fig. 2: Workfolw

It is therefore necessary to extrapolate from it a degree of representation of information more high-level, where with this terminology is meant, on the one hand, a lower "atomicity" of the data on the number of 3D points.
Then a reduction in weight of the storage acceleration performance of its elaboration and simultaneously introducing, on the other hand, of a new iT entities highest level who can "describe the most general properties of the object represented, so not only the shape but also specific ' properties' "and that connects data points between them in a suitable way (from now said vertices), producing of the fact of" faces "and the" edges "or a" surface of solid coating "that can interact with rendering algorithms (via code written in said shader design algorithms) to produce closed surfaces with particular characteristics of specularity, reflectivity, transparency, refractive index, and also friction with other objects to simulate physical properties such as strength, elasticity etc..
These aspects just considered should not make us think that the introduction of a structure from the highest level only serves to optimize the graphics, but it can also be used to bring out a further information with respect to those assignable to individual points or even to individual vertices , a piece of information thus distributed over all vertices, so "hidden" from the point of view of the single vertex. Or interconnecting the leaders not only in terms of graphics but also a logical level with appropriate codecs to retrieve from each vertex its "local input" that interacting with "local input" of other leaders in its around can bring out more information that you they can also occur simply in the mesh behavior in a simulation.
To clarify the idea, try to think of a flock of birds. Where it is stored the information of "compactness" of the flock or the "form" of the flock and of his "elasticity." If we think of each bird as a single point of the flock it seems intuitive that such information is not in the single point or bird.
The information is in the way every single point "interacts" with each other based on their characteristics and the internal local rules.
Then use a higher-level data structure not only allows you to assign the top of the basic local characteristics, but also to emerge from the interaction of these summits more information that is, for example, "structural information", "elastic properties", “deformation" information useful ability to program simulations of rigid bodies or soft bodies, fluid, evolutionary programming and IA etc.

4. The mesh

In figure 3 is illustrated in a cloud of points (a), a dense cloud of points with associated RGB values at each point (b), a polygon mesh (c) and a texure mesh (d).
Since this processing that has converted a cloud of points in a polygon mesh as mentioned we get a much more complex data structure and complete from a logical point of view of the information representation and therefore much more winning for the purposes which we aim in the development of our software.
Precise that a cloud of points or a mesh are not the only data structures able to represent 3D objects, there are also entities such as NURBS, or the MetaSfere, or other entities which in any case are not suitable for our purposes are discussed in this article simply because the processing time to handle this is not conducive to the concept of real time which is what it needs a software for interactive navigation where in fact all processing takes place in the time interval that separates the display of one frame to the next (Whereas we are aiming at a frame rate of 24 frames per second).
To implement a data structure such as a mesh or mesh, which is imagined as a frame in iron wire of the model to represent, we identify first of all the following properties that will become members of the class that implements it:
A list of vertices, or points of the space that have coordinates x, y, z.
A list of polygons, ie triangles that connect three adjacent vertices in fact producing a closed surface that plays like a net, or a graph, the 3D model.
A further list of coordinates x, y, z to represent the normal vector associated with each polygon, used by the rendering algorithms (known as Shader) of the single face that it represents.
The normal is not a position vector of the face but a vector of orientation, it has so long one and represents the "to" in the direction which turns the polygon face it refers.
Optionally, you can manage multiple meshes in what I might call a macroMesh, for instance the model of a car or a building with furnishings.
Given the inherent characteristics of the representation of each single mesh it is relatively simple to connect more disjoint meshes between them, relating them junctions (defining constraints and kinematics) and physical rules, such as connecting wheels to a frame or doors in a building which, however, can interact between them dynamically, for example, if the wheels turn and then moving the frame to move.

Later also we will address the topic of inverse kinematics or the technique to bring coherence to the movement of objects connected to each other such as the legs of a rider to the pedals of his bicycle which are the wheels.
In these cases the mesh we can think them disjoint, but nothing forbids us, to optimize the performance of thinking complex structures such as for example a human body as a single deformable mesh in the vicinity of the junctions.
In this case we should provide it with a kind of skeleton, which lays down the seams and a well generated mesh lends itself very well to this type of application that we will see later.
There are two types of Mesh, the structured and unstructured.
The difference lies is that a structured mesh for each vertex has the same number of adjacent vertices of producing four sides faces, the meshes do not have structured for each vertex of a variable number of adjacent vertices, and then typically the faces are triangular and irregular.
The use of one or the other mesh depends on various factors, of course, by the use to which they will do, but also from the topology of the object, by the way with which it is preferred to apply the maps for texture mapping, by the need or less than assign to an underlying skeleton model for animation as happens in the characters of the simulation that should be able to walk and postures.
In this project we will have to do both as mesh structured and unstructured mesh with and in addition we will also have hybrid mesh, not only with unstructured structured parts and parts but also with "density" dynamic polygonal, or with denser number of polygons in areas mesh with greater curvature and detail. As on these images (Figure 3).
Although the data listed strutte first to define and store the mesh entities appear many more than those to define a cloud of points, they actually contain a relatively lesser amount of data than the amount of information they express.
It is recalled that the data are not always information.
The information emerge when the data are not only "well" represented by their respective structures but especially when they are "related and related" in an appropriate manner between their thing in a mesh can be easily [5].
Synthetically then A Mesh consists of triangular faces (which in the case of structured meshes are represented as squares made however by two triangles) arranged in 3D space to create the impression of a solid object when properly "rendered" that is, designed by algorithms often known as "shader".
In an implementation of a Mesh class, a triangle that defines a face is defined by three vertices (if obtained from a cloud of points is not necessarily coincide with the points themselves, for example, each vertex may be obtained by a weighed merge many points), the summits can all be stored in a single array of vettori3D and each triangle is specified using three integers that correspond to the array indexes summits.
The triangles can all be represented in a single array of integers taken in groups of three from the beginning of the array, so the index 0, 1 and 2 define the first triangle, 3, 4 and 5 define the second, and so on. Any vertex may in fact belong to more adjacent triangles and in this way can be reused for all the triangles which belongs without duplicating the data.
Obviously the whole of carriers single variables x, y, z can be represented as a float type, do not recommend the use of double type.

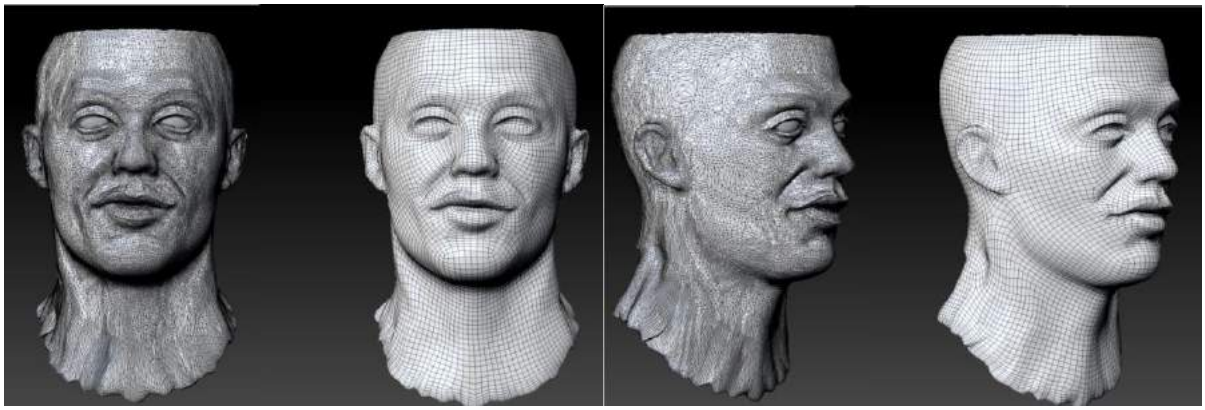

Fig. 3: Data cloud and mesh on historical sculpture

5. Behavioral programming of objects in simulated environment

Now that you have all the mesh that are needed to populate the scene you want to make it interactive, just have to proceed to the next phase of development by using one of the many graphics engines on the market that often offer language to high-level objects such as C □ or the C □□ to program each individual behavior of the simulation elements while fusing a base of objects already implemented as precisely the classes for the management of the physical, or of discrete mathematics to manipulate matrices and vectors, and other classes to intercept the 'I / O of devices such as touch screen, mouse, keyboard etc. From the above it clearly follows that a graphics engine is a software environment that provides programming libraries, classes and algorithms, to develop your application without having to reinvent the wheel from scratch, but simply use these classes to program your application from a high level design.The steps needed to then complete the development of the application after having addressed the issue of design and 3D modeling and have them ready for import into your project are:
stage design by importing and placing 3D elements such as buildings, lights, artefacts and characters, defining the scene as a level. Assign to the solid surfaces of the "collider" or data structures that will make the objects not penetrable with each other, precisely detecting collisions between them (a table collides with the floor and must not permeate despite the gravity), and by executing the code should be written by the programmer to handle a reaction to a particular collision (a rubber ball which collides with the floor must bounce, a crystal goblet must crashing etc).

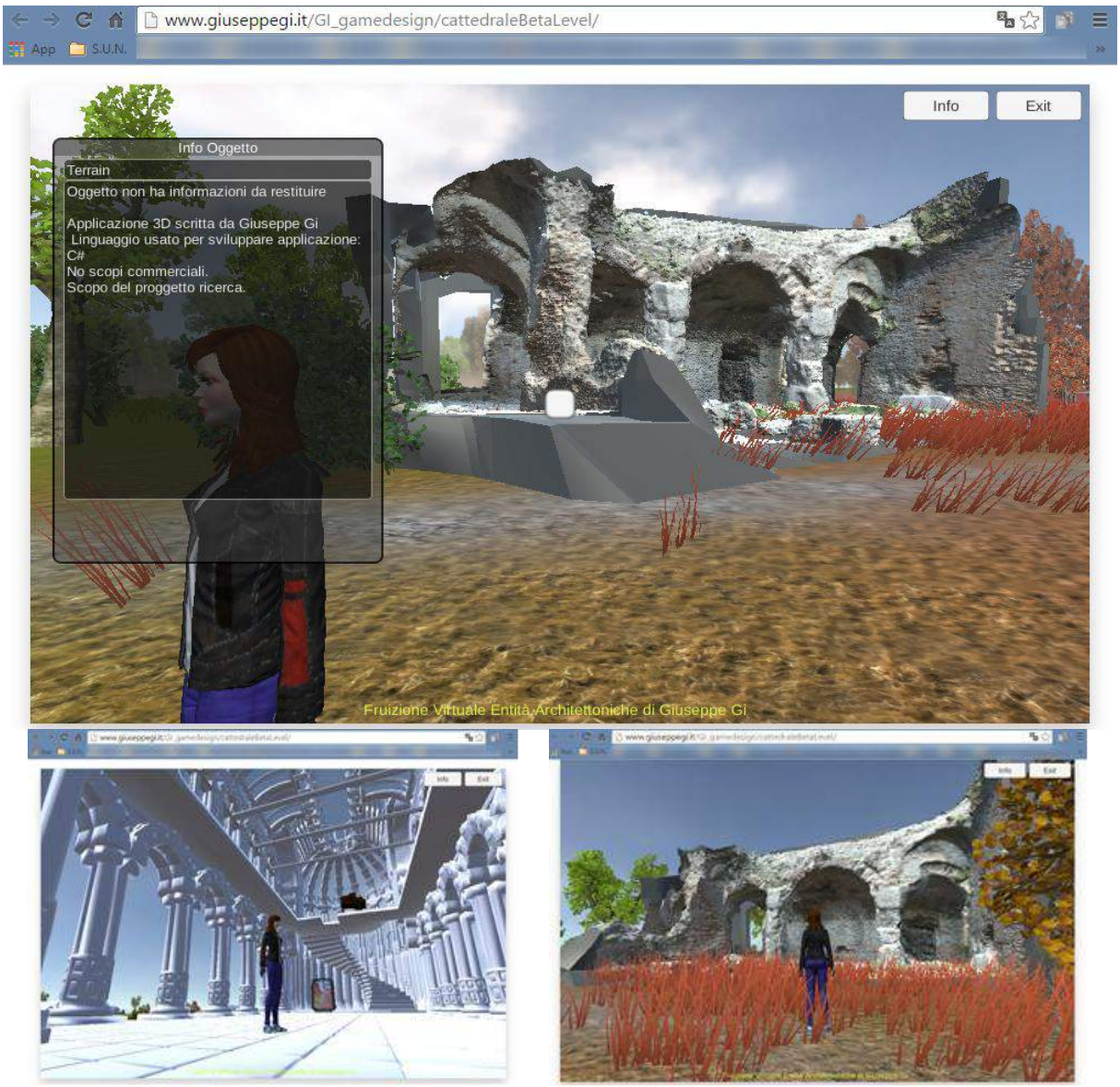

Fig. 4: Application on archeological area

Assign "rigidBody" or "softbody" to simulate the physics of the world on hard objects such as walls or doors, and those soft as curtains or liquids, design ties in the joints of objects connected by many, also developing inverse kinematics behavior or pre-animating objects with motion. These movements must be able to modify the mesh not only in location but also at the level of geometric shape.
Position the rendering rooms assigning them shaders (algorithms that indicate how to draw the scene that the camera captures) programming them from scratch or using those of the Library of the used graphics engine. Place in the same way the lights.
Write for each object in the scene the code in the programming language available to make interactive objects, support the exploration of the environments by reading the input keyboard or touch screen or joystick, to simulate phenomena such as the movement of crowds or individuals in the simulation, enable audio events to the user's passage in certain areas and many other features that may emerge from the case and so on.
In the following example we simulate how a 3D model of the building of the sacred heart of Pompeii's implement a simple interactive navigation in the first person [6].
With the code has already achieved so far can create a basic application of Fruition Virtual 3D tours both locally on a computer but also on the network and accessible from any web browser. In particular in this example visible in the following images I created a virtual world with interactive objects including:
1) The 3D reconstruction of a detail of the amphitheater of Santa Maria obtained by photogrammetry using an inexpensive camera and optimizing the mesh for lightweight keeps track without losing quality and detail in both the model that the texure. In the object is installed a C □program that allows the user to interaggire getting archielogiche information.
2) A fictional entity of a Gothic cathedral that I modeled in 3D too dotada more programs that confer functions and how to recognize you have a behavior.
3) A flock of birds is not scheduled to fly in flock but who have learned to do this using an evolutionary program written in C □and installed in every part of the flock.
4) The 3D model of a follower modeled with special 3D program free.
5) generated statues with photogrammetry techniques and sculptures molded by hand.
6) Doors that are shortcuts to move from one point to another in the 3d world instantly.
The user in this instance of the program can navigate using the arrow key, rotate the camera using your mouse, click each object and get information or behaviors, enable flight mode (Figure 4).

6. Concluisions

The dialogue between computer skills and expertise active in the structural representation field is very important phase.
Those who conduct scientific research related to the structural analysis and seismic safety evaluation of constructions belonging to the archaeological and cultural heritage play a very interesting role.
The B.I.M.^{4}S□D realizes real models in which each solid presents the structural behavior, the material, the mechanical characteristics, and shape identical to reality.
The ability to travel within the building or desing object you get to predict any kind of probable error. In addition, tourist paths in the virtual environment are created for example in archaeological sites with the advantage of making functional solutions, quality but also attentive to the economic aspect.
The computerization of structures belonging to archaeological site or to cultural heritage, by using B.I.M. methodology, allows to increase the sharing, collaboration and exchange of information between different disciplines. To visualize preventively the future recovery or maintenance scenarios of the same work involves the risks reduction and unforeseen events related to the construction site. Through the use of software that verify that there is no interference between operations on the structure, finishing and plants, for example, it also optimizes the management of Good Archaeological and its enjoyment.

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The marine holiday resort in the lucano landscape. The case of Maratea

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Abstract
During the XX Century many marine and mountain holiday resorts were built in the highly natural settings of Basilicata.
A close examination of archival sources shows a little-known realities until now, many of them have been destroyed during the last decades. They are an important element for the knowledge of both historiographical and cultural issues related to the actions taken during the Fascist period, concerning both the urban and architectural aspects. In many cases these buildings characterized the landscape representing a reference for the territory.
The summer camp of Maratea is documented on the Tyrrhenian coast from 1925 and it was mainly made for the care of frail children with specific diseases.

Keywords: documentation, survey, heritages, landscape

1. The marine colonies and the landscape (Enza Tolla)

The history of marine colonies in Italy begins in the mid nineteenth century thanks to a philanthropic movement founded by the Florentine physician Giuseppe Barellai that, aware of the great spread of tuberculosis and its impact on infant mortality, proposed to treat and protect children from contagion leading them to the sea. Dates back to 1841 the first new of some children brought in private homes on the Tyrrhenian coast of the Duchy of Lucca, for therapeutic purposes, but starting from 1853, thanks to the activity of philanthropic companies in major Italian cities, starts the organization of a large-scale program that includes the construction of buildings in seaside resorts called marine hospices. This makes it possible to house the children, treat them and make them stronger thanks to the healthy climate. The first colony was built in Viareggio in 1869, in this, as in other buildings of the time, the type adopted seems to follow that of the schools or barracks but gradually the architecture of marine hospices will be transformed by following directions and therapeutic practices. The type that first meet the insulation requirements and care will be the one adopted in the *Istituto per Scrufolosi Comasco* in Rimini by John Tempioni in the 1907: here the pavilions are arranged along a corridor with dining halls and dormitories overlook the sea, while services that must be isolated appeared on the opposite side. The fascist regime, with the founding of the *Opera Nazionale Balilla*, recovered the experience of marine hospices adapting them to new instances of youth policy. In the design of the new buildings have committed new generations of architects and for these, the colonies were a true laboratory of experimentation of new ethical and aesthetic ideals. The colonies differed according to the resort (sea, mountain, river, lake) and in relation to their type: the 'permanent' where they were treating the chronic diseases such as tuberculosis, the 'temporary' with prophylactic and entertainment character, opened only during holiday periods, the 'day or sun therapy', which did not provide the room and stood in the vicinity of the city, allowing the evening return of children at home. The holiday camps are often the subject of national competitions and exhibitions like the one held in Rome by A. Liera and M. De Rienzi in 1937 on "Summer camps and the 'care'. The architects were able to grasp the expressive potential of the new theme and free from traditional references, they experimented freely with new languages, creating isolated objects in the landscape, with a strong emotional charge and that constituted an important moment of Italian Rationalism.

Fig. 1: The beach in Fiumicello in Maratea (Basilicata) in a historic postcard.

The new projects, therefore, conveyed an image of modernity and dynamism, we can think: the *Colonia Novarese* in Rimini by Joseph Peverelli in 1934; the *Colonia di Rieti* in Lido di Montesilvano by Francesco Leoni in 1937, the *Colonia XXVIII Ottobre per i figli degli Italiani all'ester*o in Cattolica by Clement Busiri Vici in 1934. They are all buildings with a strong symbolic value and of great visual impact on the surrounding areas, so as to create a new architectural landscape, that one of marine colonies, still visible today along the coast of Romagna and Marche and Tuscany, despite the state of abandonment in which the artifacts pay. In the 50s and 60s the construction of buildings intended for marine colonies respond to new needs; defeat tuberculosis, adopted typology is organized according to pedagogical instances conscious psychology of child health rather than appearance. The *Colonia Olivetti* in Marina di Massa by Annibale Fiocchi and Ottavio Cascio of 1958, is one example. In this case the design choices are attentive to the needs of socialization, play and child welfare. The colony is organized in three parallel volumes of two floors, on stilts with wide porches and open the surrounding pine forest. The changing educational needs push adoption of more articulated volumes that often give birth to more similar complexes in small garden city, such as the project of Cologne Body Sulphur in Forest Bulala at Gela by Paola Coppola Pignatelli in 1960 which provides for volumes destined for dormitories and game rooms connected by passages and arcades, with an articulation of the functional elements seen as small neighborhood units. New experiences set up with the surrounding landscape an entirely different relationship, looking for places, in which they are placed, a dialogue and greater integration, and in some cases to blend into the surrounding pine forests. The colony landscape changes, therefore, how they change projects and instances that generate them, from the metaphysical landscape of the great rationalists objects to the landscape of small scale volumes integrated into the territory. An important part of the plays where these artifacts are located, with its geographical features, topography and nature.

1.2 The landscape of coast in Maratea

The landscape system of the Maratea coast is strongly characterized by a set of historical evidence and unique and original landscape features, linked together through a network of functional relationships, morphological and aesthetic. A set and complex consists of the mountainous landscape of the Apennine chain that descends on the Tyrrhenian coast with steep sheer limestone cliffs to the sea or degrade to form small coves. Many are the architectural and historical evidences that connote the pace of the orographic coast, emphasizing creeks and hills. Watch towers that go from rocky ridges dominate the sea like the bows of ships, the small hillside villages: Cersuta and Acquafredda, and the settlements on the sea: Fiumicello, the Port and Marina, the old artifacts related to a tiny economy like the mills and the most modern tourist facilities like hotels and beach resorts. Each of these elements marks the rewriting of a stretch of coast changing the original structure and designing

a new landscape, the balance that has managed to keep within 14 kilometers of Lucania coast is due to the care and attention of the people who do not have in no way altered the beauty and peculiarities and to a careful and timely planning. The environmental landscape of the coastal municipalities of the Tyrrhenian Basilicata that affects the coast of Maratea and which also includes the area of the villages of Trecchina and Rivello, is of 1990 and locates in his perceptive analysis visual areas characterized by some elements: location, margin, visual district, and reference node.
These categories give scope to the elementary studied components a role in the impact of perception. In our case, the site where is located the old colony, in place not immediately overlooking the beach, is cataloged in relation to the pine forest that hides the construction and safeguard information affecting, than the same pine forest, texture construction and the maintenance of volumes of buildings. In the general indications were given in relation to the site to build the marine colonies are: accessibility, be served by the railway and have a shaded area in the immediate vicinity. All indications absolutely respected in the settlement of Fiumicello in Maratea, not being located directly on the beach, had a hut on the beach, meeting of all children, not just the little guests of the colony. The sea coast is therefore not directly affected by the construction in the pine forest, unlike the colonies present in Tuscany, the Marches and along the coast of Romagna, more complex architectures that mark the marine coasts strongly connoting the surrounding landscape and today are mostly large abandoned buildings. For now only the Emilia Romagna, given the massive presence of colonies on its territory and aware of their cultural role has proceeded to a census, has determined the protection. Marine colony of Maratea despite goes back to 1932, establishing with the surrounding landscape a similar relationship to the examples of the '50s and' 60s, covered by pine forest has a near-zero impact on the views of the coastline from the sea and the beach. The buildings now house the barracks and offices of the Police, but retain the potential to be also recovered for recreational and tourist activities designed to childhood experiences as co-housing and service laboratories of marine protected areas.

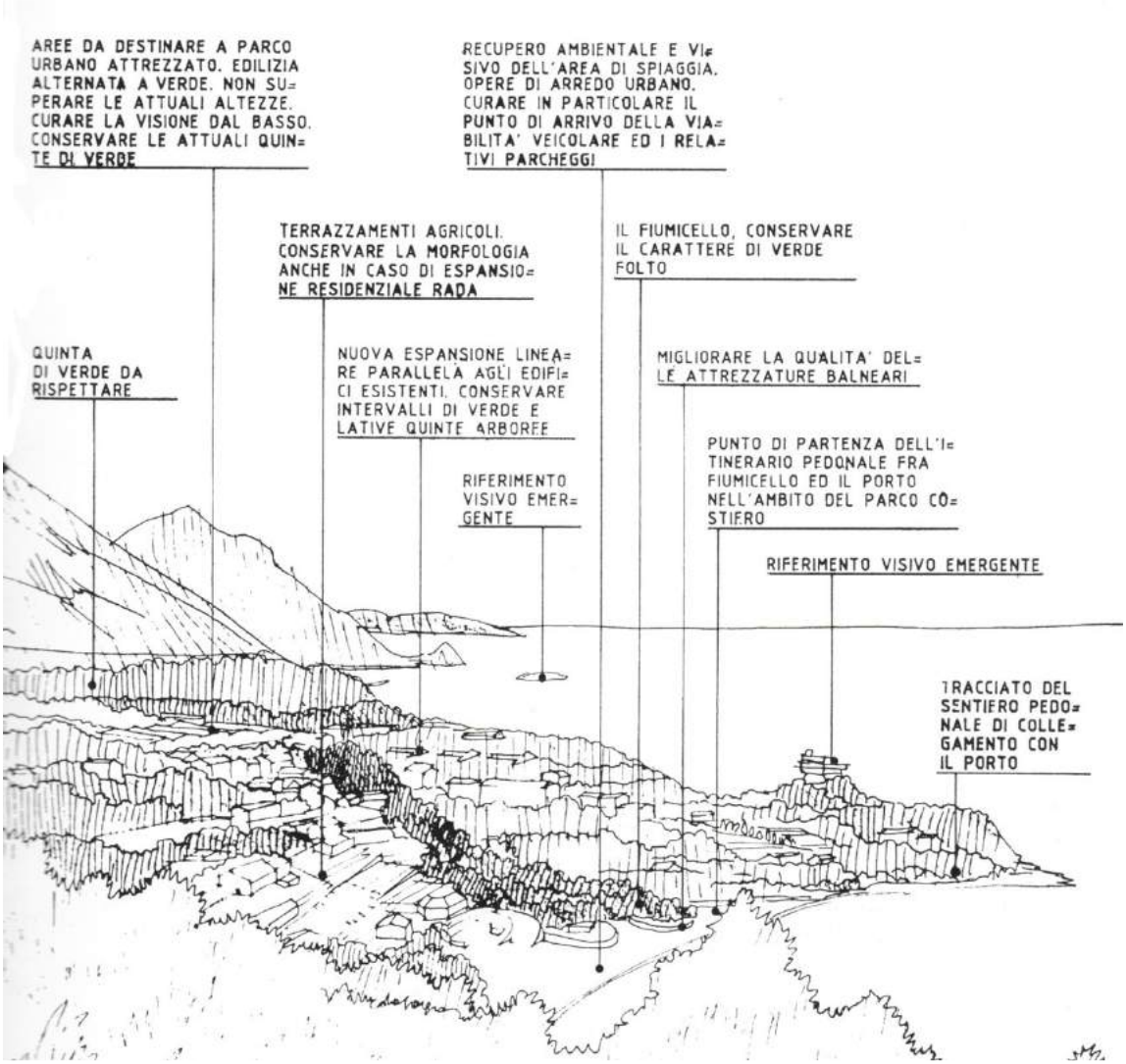

Fig. 2: Fiumicello landscape (from Caputi, Forte, 1993).

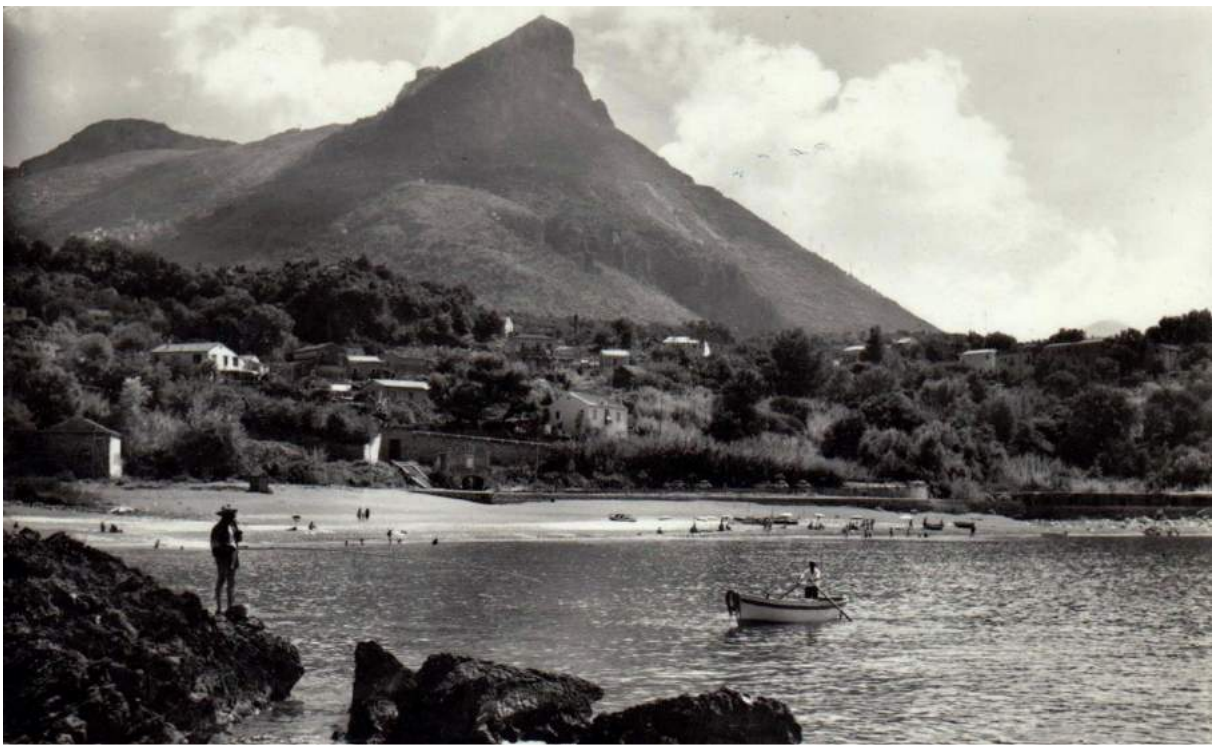

Fig. 3: The beach in Fiumicello in Maratea (Basilicata) in a historic postcard.

2. The twentieth century resort settlements: the case of Maratea (Giuseppe Damone)

Since the twenties of the twentieth century, and throughout the following decade, we see in Basilicata to the gradual spread of colonies for vacationing in mountain and seaside resorts. The organization of such structures is part of the policy of childcare perpetuated by the fascist regime (VIGILANTE, 2004) and, by living in healthy places for children with chronic ills, such as malaria and tuberculosis, or those with diseases arising from poor nutrition and lack of proper physical activity, it is guaranteed the physical well-being of the poor. Numerous are the sea, mountain centers, sun therapy and river that are made throughout the country.

Even Basilicata, as already said, becomes the setting of the spread of colonies for recreation. In particular are the sun therapy colonies, housed in existing buildings or temporary, to have greater spread, while it remains an isolated case the realization of the Maratea summer camp. Lucanian Ionian coast is excluded from the construction of facilities for the recreation of children because, during the Fascist period, it is still a swampy and malarial reality.

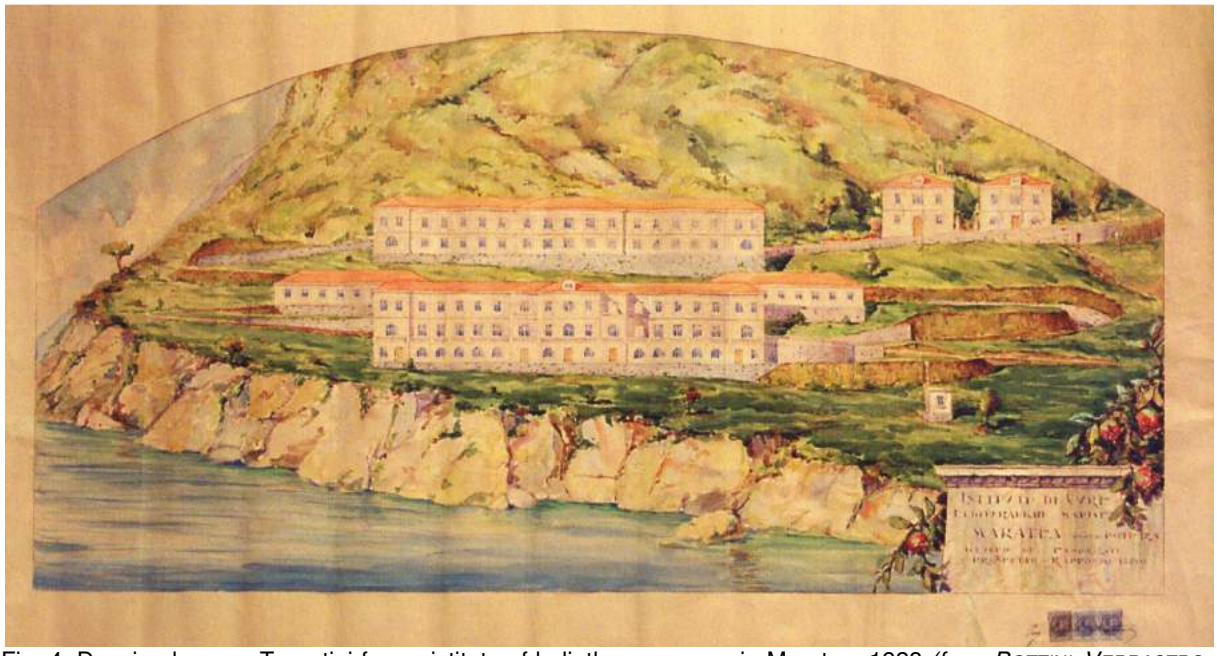

Fig. 4: Drawing by eng. Tarantini for an istitute of heliotherapy cures in Maratea, 1928 *(from BOTTINI, VERRASTRO, 2006).*

Fig. 5: The construction site for the marine colony in Maratea, Fiumicello *(Biagio Calderano's archive).*

Fig. 6: The marine colony in Maratea, Fiumicello *(Biagio Calderano's archive).*

The colony of Maratea is housed in 1925 in a building, taken in rent for the duration of the summer season, located not far from the beach. It is of a provisional first solution; In fact, from the start, it has manifested the will to achieve an ex novo building meets the functional characteristics necessary for this type of structures.

Simultaneously with the creation of the first Lucan Sea Colony it is also advanced the idea, because of the increase of TB patients to establish a permanent Seehospitz inside a building to be constructed differently from that of the children of the colony for prophylactic reasons (PIEROTTI, 1926).
Dates from 23 June 1928 the project signed by the engineer Raffaele Tarantini of «Institute of Marine heliotherapy» (BOTTINI, VERRASTRO, 2006) from having to carry on Maratea style cliff, in a little man-made site, where for suffering from tuberculosis would have been You can take advantage of beneficial marine treatment. This project, which was characterized by having a strong impact on the landscape redrawing the coastline, remain disregarded, while a few years later is realized, by the fascist provincial federation, a new facility to house the colony of children «Oasis of peace and greenery», which will be inaugurated on July 18, 1932. Built in three hundred meters from the beach at Fiumicello, the building is in one of the most beautiful coastal scenery of Basilicata facing the sea and behind him «the green hills of the wonderful vegetation, on which reign the majestic mountains that form of Lucania, a wild beauty» (Giornale di Lucania, July 1933).
It thus chose a highly steep site in the countryside of Maratea which is 'keep it' little man-made until quite recently. At the time of construction of the colony it is documented, in fact, the presence of only a few houses almost imperceptible in the landscape. It was in the fifties of the twentieth century that the village of Fiumicello will star in a tourism development and, therefore, also a human settlement of its territory.
The colony consists of three large wings - the two side of the length of fifty meters and the central thirty meters - planimetrically arranged in a horseshoe and used as dormitory, with a total capacity of one hundred and ninety beds. Immediately behind the main wing of the building is situated to the infirmary in three rooms - for medical visits, for the isolation of the sick and for the security staff - and on the right there is the building of the management. Completing the outdoor dining hall of the colony complex with adjoining kitchen, sites between the dorm and the direction, and a field for the practice of sport.
Local newspapers also give great visibility, with the publication of in-depth articles and propaganda, the action on the construction of the political regime and the management of these facilities for vacationing. About the marine colony of Maratea, for example, one year after its inauguration, the «Giornale di Lucania» writes:
«The guests have visited the beautiful and aereggiate dormitories, an infirmary equipped with modern medical equipment, offices, warehouses and the headquarters of the" Command-in-Chief "prejudice admired for what has been raised up in no time, the firm will Federal Secretary. Has spent time on the beautiful roof terrace, where Giuseppe Lacava told trustees that he will carry for the coming year, the large square - on one side of which bloom the beautiful ornamental plants donated in the name of Fasci, by each Political Secretary - it will be surrounded by other flowers and other plants that offer the Podesta of the province» (Giornale di Lucania, August 1933). After World War II the summer colony, affected by works of modernization and redefinition of spaces, will continue to be used with its original function until fairly recently when, ended the practice in the colony vacation, it will ridestinata as a military garrison.

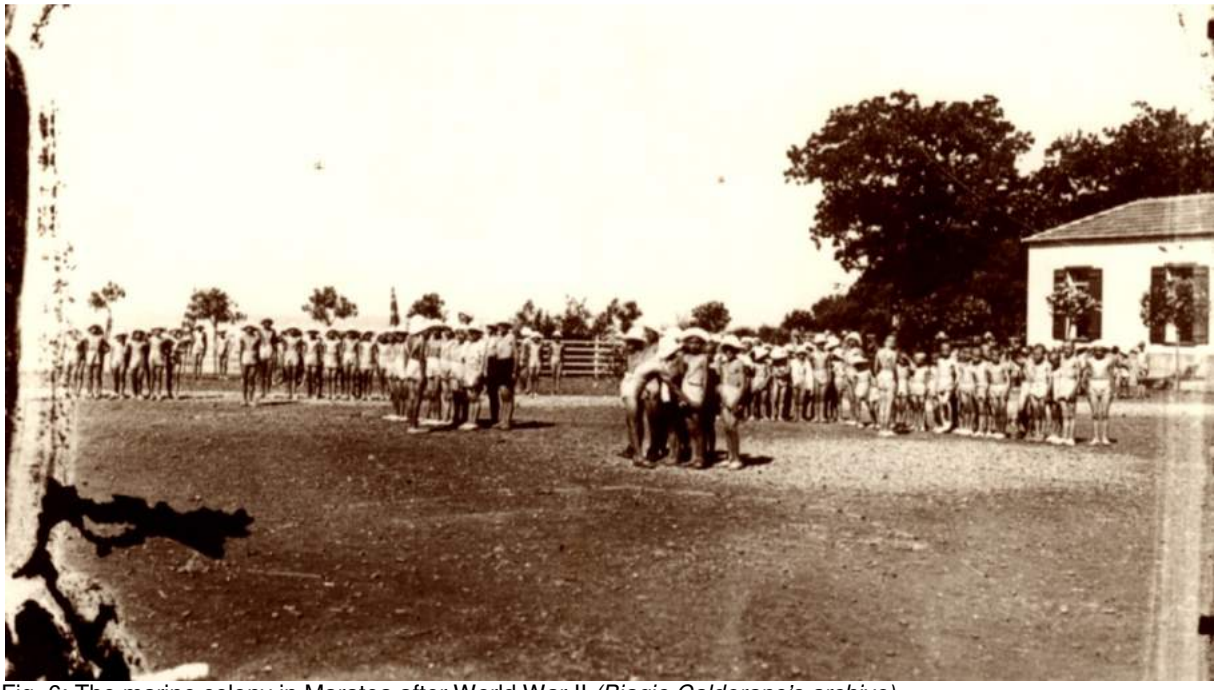

Fig. 6: The marine colony in Maratea after World War II *(Biagio Calderano's archive).*

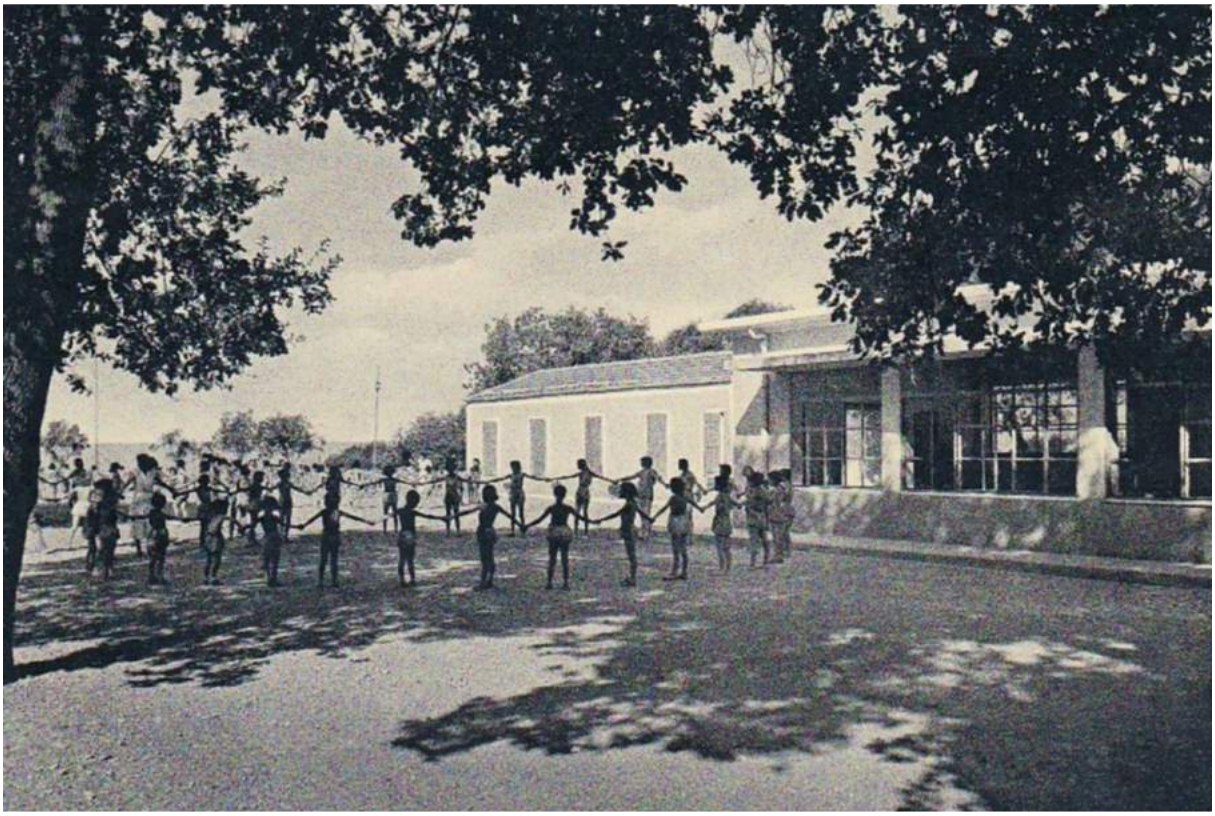

Fig. 7: The marine colony in Maratea after World War II *(Biagio Calderano's archive).*

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BIM application for the reuse of the Modern Heritage: The Galfa Tower

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1. Abstract

The reuse of historical building is one of the complex theme for the real estate. Owners, architectural, structural and mechanical designers need to work in an integrated process to reduce the design time and to produce affordable executive drawings and economic evaluations. The difficulty starts from the material and geometric survey, the integrated design where structures, architecture, energy analysis and mechanical component, need to be included in the same model to avoid errors or interferences. The Galfa Tower is a 60 years old high-rise building in Milan, representing one of its landmarks, and it is actually interested to a radical restoration. The owners need to transform the tower from office use to residential and Hotel, while adapting, at the same time, the building for structural and energetic aspects to the new standard requirements. In this way, an integrated model was developed where the survey of the as built tower meets the architectural solution, mechanical layout and structural analysis. The process starts from the comparison of different BIM guides; after that was enveloped the BEP which help to create the models. The process, the model and the results, together with their limits and peculiarities, will be addressed in the paper.

2. Description of the building and the project

Galfa Tower is an historical tall building in Milan (Italy), designed by the architect M. Bega in 1956 and built in 1959. The name “Galfa” comes from the location of the building, which is placed at the intersection of Galvani street and Fara street (the name is the acronym made of the first syllable of the two streets). The tower is 102.5 m height (from the ground level to the 31st floor) and its typical floor has a rectangular plan (dimensions: 37.5 □ 15.75 m). The underground floors reach 10 m below the ground level. Around the tower, there are lower buildings characterized by two aboveground levels and two underground levels.

UNIPOL SAI, the actual property, is in aim to reuse the historical building from offices to luxury Hotel and private residences. In lower levels the business retail center will replace the parking areas.

The process to design the reuse of the building need a detailed geometrical and material survey, MEP and energy analysis, structural analysis, not less an instrument for the facility management during the use.

3. BIM application for the reuse of the Modern Heritage: The Galfa Tower

3.1 The BIM application from the survey to the facility management

The BIM application proposed to the owner is a typical process where there is a project for reuse of existing buildings.
In this typologies of project, we have an existing building where the model must represent it's geometry the information of material construction and all information of the proposed solution for the reuse, not less a valid instrument for the facility management.
A model may be enveloped in different ways and so from the first steps needs to know what is the owner request, which are the models and analysis may be produced and which LOD (Level Of Detail) for each aspect.
In brief in this typical project the model may represent:

- The geometrical and material survey;
- Architectural solution for the reuse;
- Energy efficiency of the building;
- MEP solutions;
- Structural dynamic analysis;
- Activity of construction;
- Facility management during life cycle of the building.

3.2 The integrated BIM model and the BIM Project Execution Plan

To successfully implement Building Information Modeling (BIM) on a project, the project team needs a detailed BIM Project Execution Plan. The BIM Project Execution Plan defines uses for BIM on the project (e.g. design authoring, cost estimating, and design coordination), along with a detailed design of the process for executing BIM throughout the project lifecycle. Our BEP was enveloped after the comparison of the most famous BIM Guides, for example, the DDC BIM Guide from New ork, COBIM, AEC (UK) BIM Protocol. After that, the BEP is tested with a simplified model, optimized and applied to the case history.

In the BEP we improve the BIM method to the following items:

1. Processes
2. People
3. Software

And coordination for specific fields like :

1. Architectural
2. Structural
3. Plants
4. Energy management
5. Construction site
6. Facility management

Fixed the BIM Goals and Objectives, the BEP, describes the characteristics of the models, the work group, the process to envelope the integrated models, the design authoring Level and the Process Overview Map.
In the Process Overview Map is represented the process, the models objective and results. In the Design Authoring map, is represented for all models the level of LOD and data sharing.
In the BEP is described the parameters and the processes to generate the families as described on Figure 4.
The software used in this BIM application are:

1. REVIT, where we envelope the architectural, the structural, the MEP and energy model;
2. Green Building Studio, for preliminary analysis;
3. Midas, for the structural analysis;
4. Naviswork, for the Clash Detection.
5. Primavera, for planning.

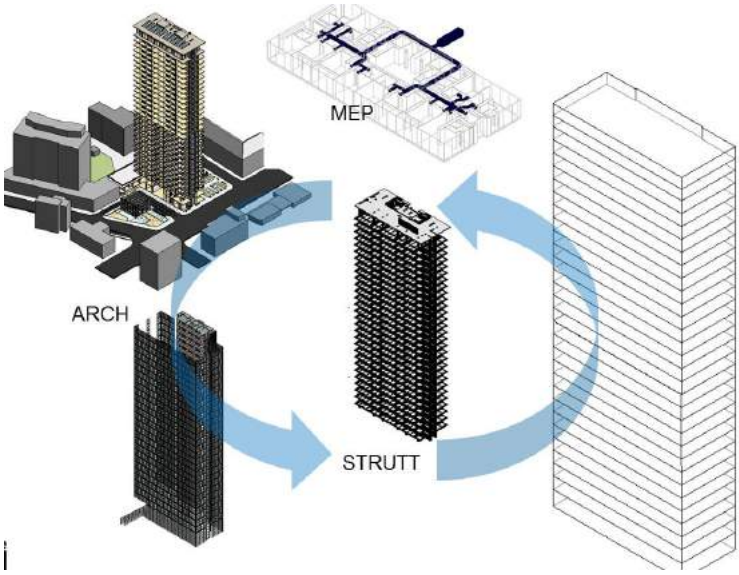


Fig. 1: The integrated BIM Execution plan help to create an integrated model and the process for the Clash Detection.

The BEP includes:

SECTION A: BIM PROJECT EXECUTION PLAN OVERVIEW
SECTION B: PROJECT INFORMATION
SECTION C: KE□ PROJECT CONTACTS
SECTION D: PROJECT GOALS / BIM USES
SECTION E: ORGANIZATIONAL ROLES / STAFFING
SECTION F: BIM PROCESS DESIGN
SECTION G: BIM INFORMATION EXCHANGES
SECTION I: COLLABORATION PROCEDURES
SECTION J: QUALIT□ CONTROL
SECTION K: TECHNOLOGICAL INFRASTRUCTURE NEEDS
SECTION L: MODEL STRUCTURE
SECTION M: PROJECT DELIVERABLES

GOAL DESCRIPTION	POTENTIAL BIM USES
To have a model with all the necessary data for the facility management	Record modelling
To have a computation with all the relative prices for the client for all life cycle project	Cost estimation
Understanding of the project development from all the actor and anticipation of all the critical activities and clash on site	Phase planning (4D modelling)
Reduce and control any problems on site	3D coordination (construction)
Reduce and control any problems on design activities	3D coordination (design)
Efficient design solution to achieve the optimum for the structural and energy consumption	Energy and structural analysis
To check the specific codes of all the items of the project	Code validation
The project will be molded by Revit for the architectural, structural and plant parts	Design authoring
An efficient and accurate program in space and time have to be used to avoid delay and any clash	Programming
A preliminary studies have to be done for the initial settings of the model	Site existing conditions
To achieve the GOLD level	Sustainability (LEED) evaluation

TABLE 1: MAJOR BIM GOALS / OBJECTIVES.

X	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
x	PROGRAMMING	x	DESIGN AUTHORING		SITE UTILIZATION PLANNING		BUILDING MAINTENANCE SCHEDULING
x	SITE ANALYSIS		DESIGN REVIEWS		CONSTRUCTION SYSTEM DESIGN		BUILDING SYSTEM ANALYSIS
		x	3D COORDINATION	x	3D COORDINATION		ASSET MANAGEMENT
		x	STRUCTURAL ANALYSIS		DIGITAL FABRICATION		SPACE MANAGEMENT / TRACKING
			LIGHTING ANALYSIS		3D CONTROL AND PLANNING		DISASTER PLANNING
		x	ENERGY ANALYSIS	x	RECORD MODELING		RECORD MODELING
			MECHANICAL ANALYSIS				
			OTHER ENG. ANALYSIS				
		x	SUSTAINABLITY (LEED) EVALUATION				
		x	CODE VALIDATION				
x	PHASE PLANNING (4D MODELING)	x	PHASE PLANNING (4D MODELING)	x	PHASE PLANNING (4D MODELING)	x	PHASE PLANNING (4D MODELING)
x	COST ESTIMATION	x	COST ESTIMATION	x	COST ESTIMATION	x	COST ESTIMATION
x	EXISTING CONDITIONS MODELING	x	EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING

TABLE 2: BIM Uses.

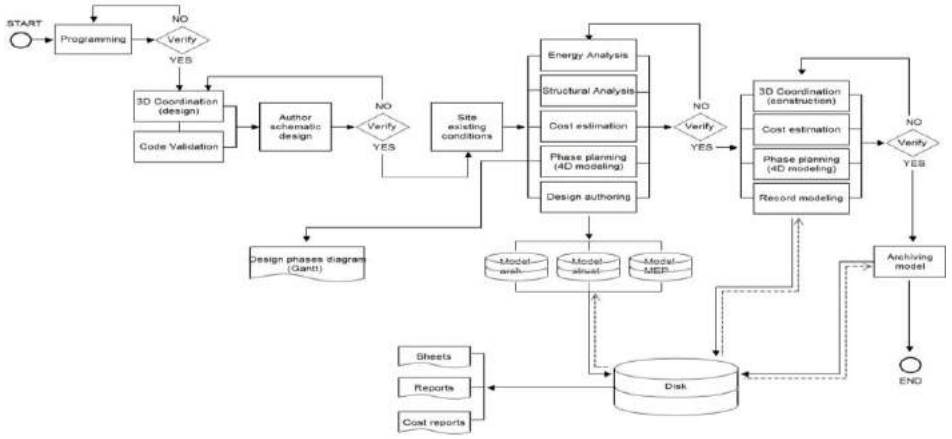


Fig. 2: Process Overview Map.

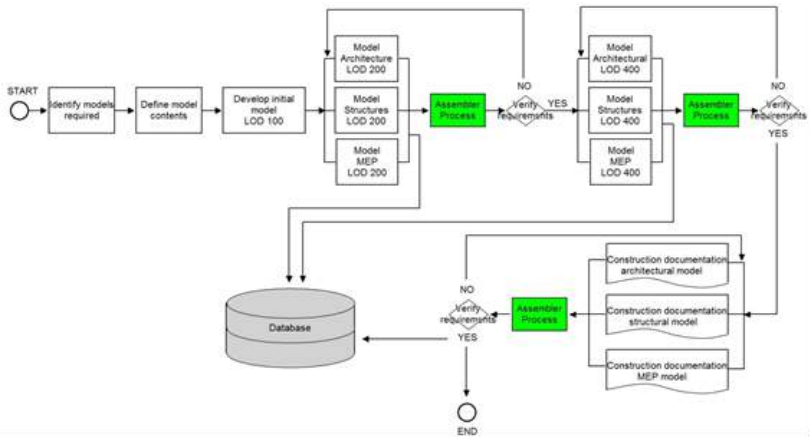
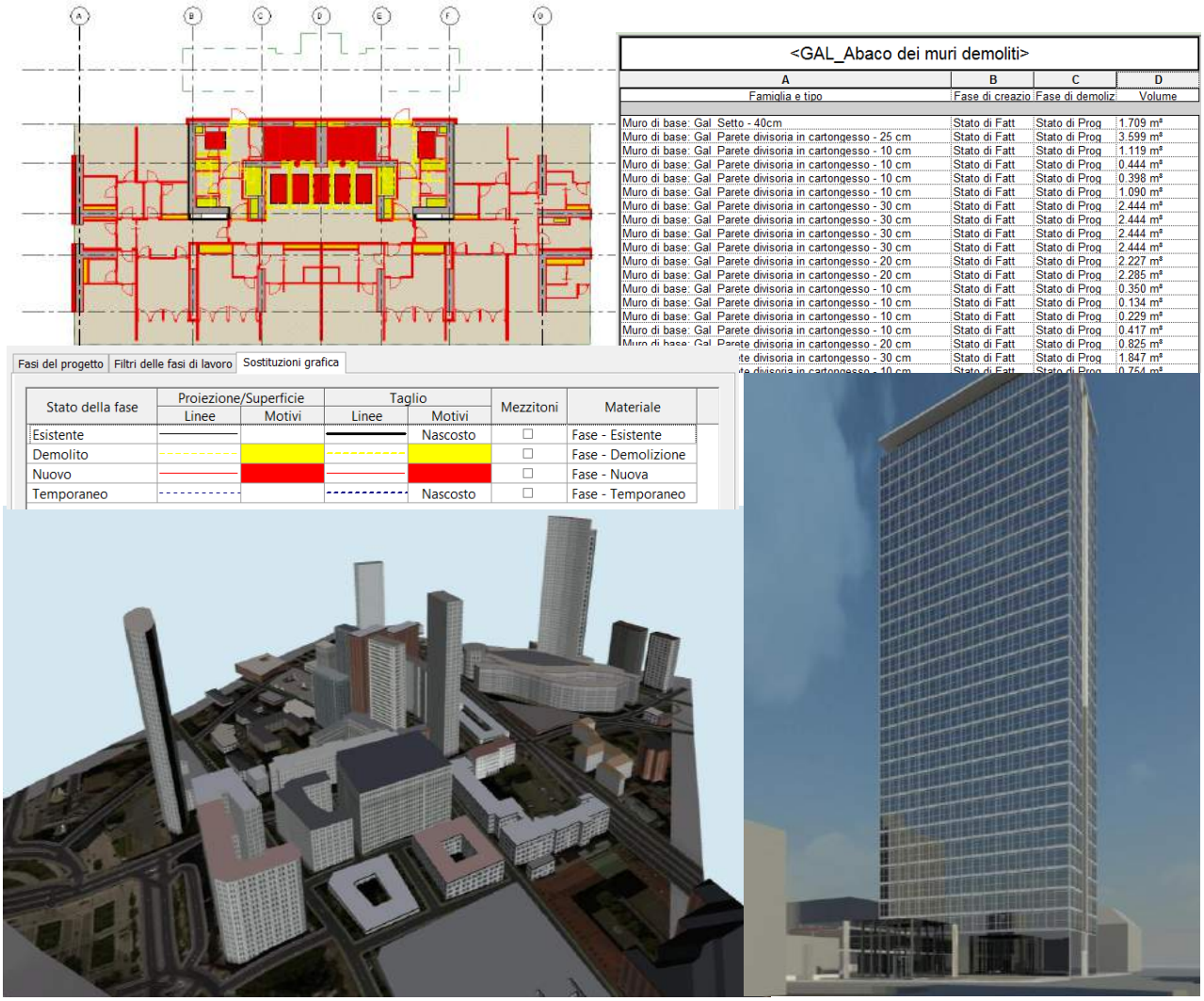


Fig. 3: Design Authoring Map.

Fig. 4: The families generated for structural and architectural walls (left) and for components like the precast bathrooms (right).

3.3 The integrated BIM model for the survey and the architectural project

The objective of the model, is to create an instrument which help to envelope the material and the geometrical survey and in the same time, help the architect to envelope the project. For example, as described on the Figures 4 and 5, in the plan is described in yellow the demolition and in red the reconstruction. With the use of the abacus we have the list of the demolition and reconstruction with the quantities. Starting from the hard copy, the model can represent not only renders, but the phases, and the cost of construction.



<GAL_Abaco dei muri demoliti>

A	B	C	D
Famiglia e tipo	Fase di creazio	Fase di demoliz	Volume
Muro di base: Gal_Setto - 40cm	Stato di Fatt	Stato di Prog	1.709 m³
Muro di base: Gal_Parete divisoria in cartongesso - 25 cm	Stato di Fatt	Stato di Prog	3.599 m³
Muro di base: Gal_Parete divisoria in cartongesso - 10 cm	Stato di Fatt	Stato di Prog	1.119 m³
Muro di base: Gal_Parete divisoria in cartongesso - 10 cm	Stato di Fatt	Stato di Prog	0.444 m³
Muro di base: Gal_Parete divisoria in cartongesso - 10 cm	Stato di Fatt	Stato di Prog	0.398 m³
Muro di base: Gal_Parete divisoria in cartongesso - 10 cm	Stato di Fatt	Stato di Prog	1.090 m³
Muro di base: Gal_Parete divisoria in cartongesso - 30 cm	Stato di Fatt	Stato di Prog	2.444 m³
Muro di base: Gal_Parete divisoria in cartongesso - 30 cm	Stato di Fatt	Stato di Prog	2.444 m³
Muro di base: Gal_Parete divisoria in cartongesso - 30 cm	Stato di Fatt	Stato di Prog	2.444 m³
Muro di base: Gal_Parete divisoria in cartongesso - 30 cm	Stato di Fatt	Stato di Prog	2.444 m³
Muro di base: Gal_Parete divisoria in cartongesso - 20 cm	Stato di Fatt	Stato di Prog	2.227 m³
Muro di base: Gal_Parete divisoria in cartongesso - 20 cm	Stato di Fatt	Stato di Prog	2.285 m³
Muro di base: Gal_Parete divisoria in cartongesso - 10 cm	Stato di Fatt	Stato di Prog	0.350 m³
Muro di base: Gal_Parete divisoria in cartongesso - 10 cm	Stato di Fatt	Stato di Prog	0.134 m³
Muro di base: Gal_Parete divisoria in cartongesso - 10 cm	Stato di Fatt	Stato di Prog	0.229 m³
Muro di base: Gal_Parete divisoria in cartongesso - 10 cm	Stato di Fatt	Stato di Prog	0.417 m³
Muro di base: Gal_Parete divisoria in cartongesso - 20 cm	Stato di Fatt	Stato di Prog	0.825 m³
te divisoria in cartongesso - 30 cm	Stato di Fatt	Stato di Prog	1.847 m³
te divisoria in cartongesso - 10 cm	Stato di Fatt	Stato di Prog	0.754 m³

Fasi del progetto | Filtri delle fasi di lavoro | Sostituzioni grafica

Stato della fase	Proiezione/Superficie		Taglio		Mezzitoni	Materiale
	Linee	Motivi	Linee	Motivi		
Esistente				Nascosto	☐	Fase - Esistente
Demolito					☐	Fase - Demolizione
Nuovo					☐	Fase - Nuova
Temporaneo				Nascosto	☐	Fase - Temporaneo

Fig. 5: Demolitions and reconstructions phases and architectural and renders are in the same model

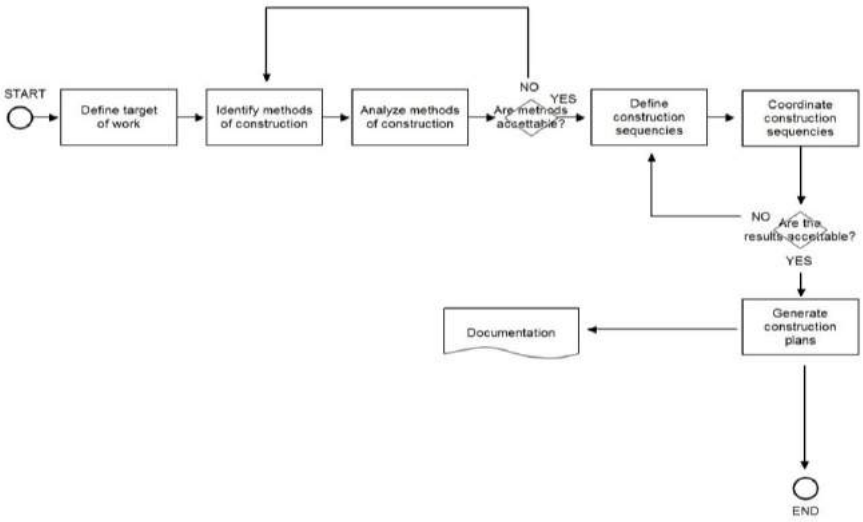
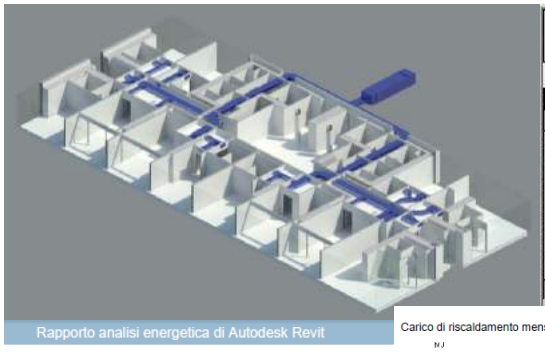


Fig. 6**: The process map for architectural aspects**

3.4 The integrated BIM model for the energy analysis and MEP

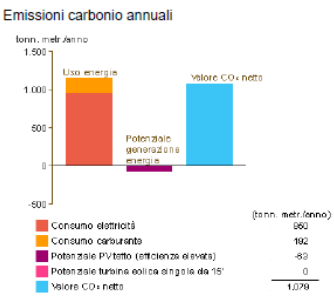
The MEP model is enveloped using REVIT, and the mechanical components are inserted on the architectural model. Using the function of the application, we have the list of components and the evaluation of interferences, not less the preliminary evaluation of the pressure loads.

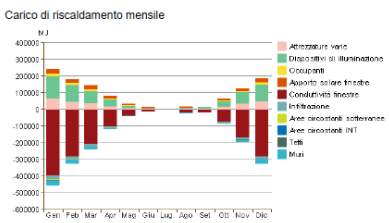
For the preliminary analysis we choose to use green building studio, by which we compare different solution of curtains walls and the installation of removable energy on the rooftop.

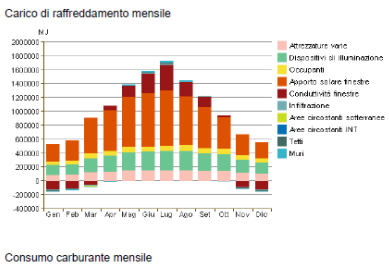


<Abaco dei condotti>

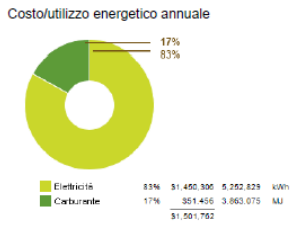
A	B	C	D
Conteggio	Dimensioni	Famiglia e tipo	Lunghezza
8	300x300	Condotto rett	9.25
1	500x300	Condotto rett	0.27
21	300x300	Condotto rett	11.72
2	300x325	Condotto rett	1.49
3	500x300	Condotto rett	0.73
16	600x300	Condotto rett	42.92
1	1100x950	Condotto rett	0.40
52			66.79

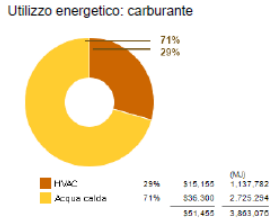






Consumo carburante mensile





Utilizzo energetico: elettricità

Fig. 7: MEP modelling and energy analysis.

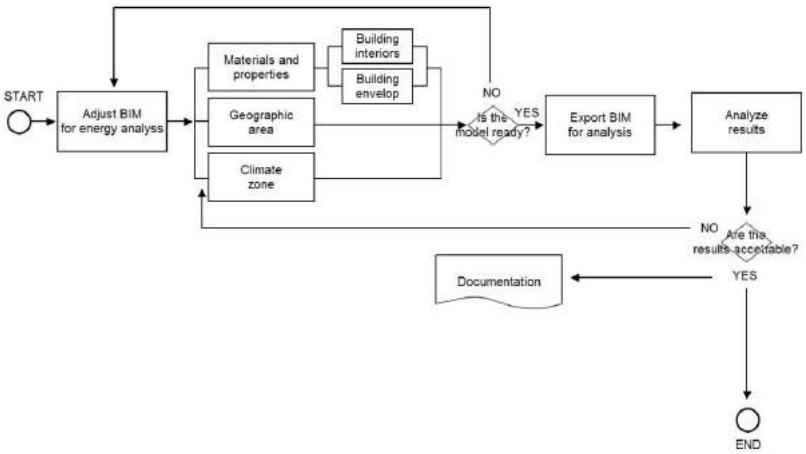


Fig. 8: MEP modelling and energy analysis process map.

3.5 The integrated BIM model for the structural analysis

The structural model is enveloped in Revit and is exported on MIDAS GEN.
On REVIT there is the possibility to see the phases demolition/reconstruction, the steel rebar which are survived during the first phases, the assigning of loads and the model which is exported on Midas.
On Midas can be exported using MIDAS LINK or using DXF format.
After the knowledge of geometries and the materials characteristics, some FEMs have been implemented to perform the seismic and the wind structure analysis (referred to the Italian Structural Code, NTC 2008). In the n.4 implemented FEMs the influence of the CB (like mentioned, the lower construction close the Tower) and the interaction of the structure with the soil are analysed like it is explained in the following cases noted 1a) , 1b), 2a) and 2b).
case 1a), Tower (fixed at the ground floor) with CB;
case 1b), Tower (with soil deformations at the ground floor) without CB;
case 2a), Tower (fixed at the base; the base is two level underground) without CB;
case 2b), Tower (with soil deformations at the base; the base is at two levels underground) without CB.
In the cases 1a) and 2a), the deformable soil is represented by Winkler springs having the coefficient k 180.000 kN/m^3.

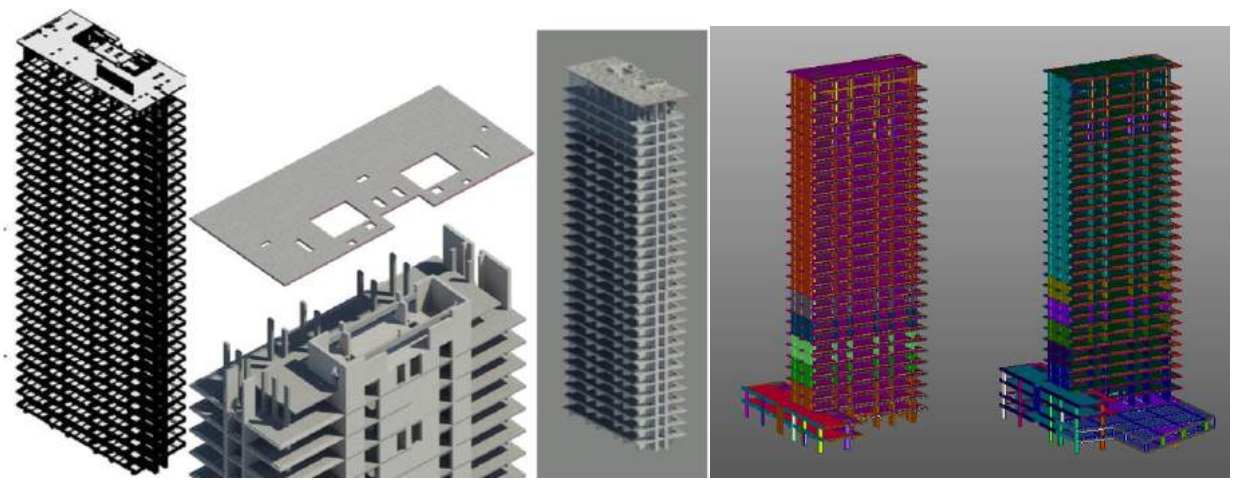


Fig. 9: Revit structural model (left) and FEMs of the Galfa Tower (right).

Starting from the drawing in DXF of the geometric survey, the new drawing, cleansed of superfluous elements for the purposes of structural modelling has been obtained. It was then imported into MidasGen, forming the basis for the modelling of the structural elements.
An adequate knowledge level of an existing building is necessary in order to evaluate the structural safety of the building and to perform the structural analysis under earthquake and wind loads. The knowledge level of the building is based on the awareness of its history (by means of an historical analysis), its

geometry (from survey of the structural elements in the “as built” configuration) and its materials (through mechanical tests).
An adequate knowledge level of an existing building is necessary in order to evaluate the structural safety of the building and to perform the structural analysis under earthquake and wind loads. The knowledge level of the building is based on the awareness of its history (by means of an historical analysis), its geometry (from survey of the structural elements in the “as built” configuration) and its materials (through mechanical tests).

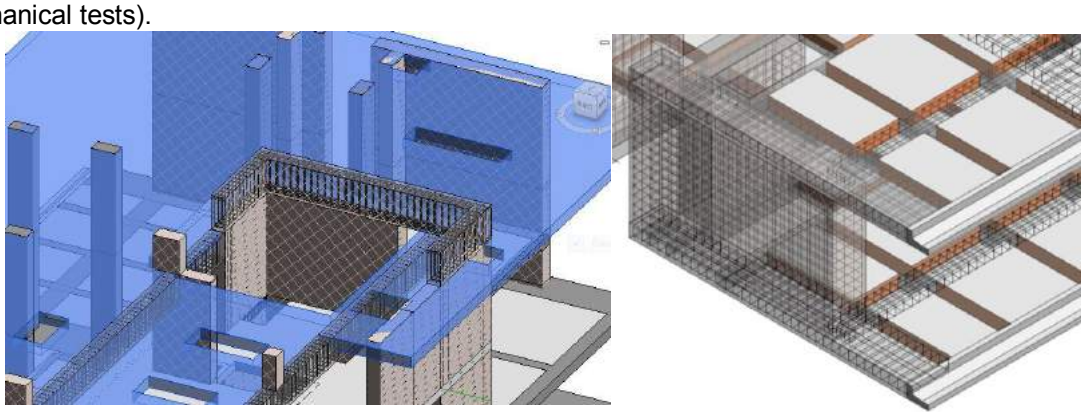


Fig. 10: Steel rebar can be insert in the model after the survey and after the structural analysis

3.6 The integrated BIM model for 4D, 5D, 6D, 7D

The Phase Planning (4D Modeling) is enveloped with the use of PRIMAVERA. The REVIT Building Information model can be linked with the project planning. The 4D model include planning data, time histories and can be created the simulation of the construction. The clash detection can find eventual interferences.
The parametric BIM model can be used for 7D, the facility management, to check the cost for energy consumption (preview in the energy analysis 6D) or to maintenance of the building using the abacus linked on the architectural or structural model where the damaged component may be replaced with ones compatible to the original. Our model can be linked to future models for example for the manage and design of one retail space for example. About the Mechanical system, using Autodesk 360□if there are problems in plumbing using simply a tablet the technician can find the position and replace the damaged component.
The software illustrated in this paper are in continue evolution, and consequentially the BEP can be upgraded and so we thinks in few years the BIM method evolve the design process.

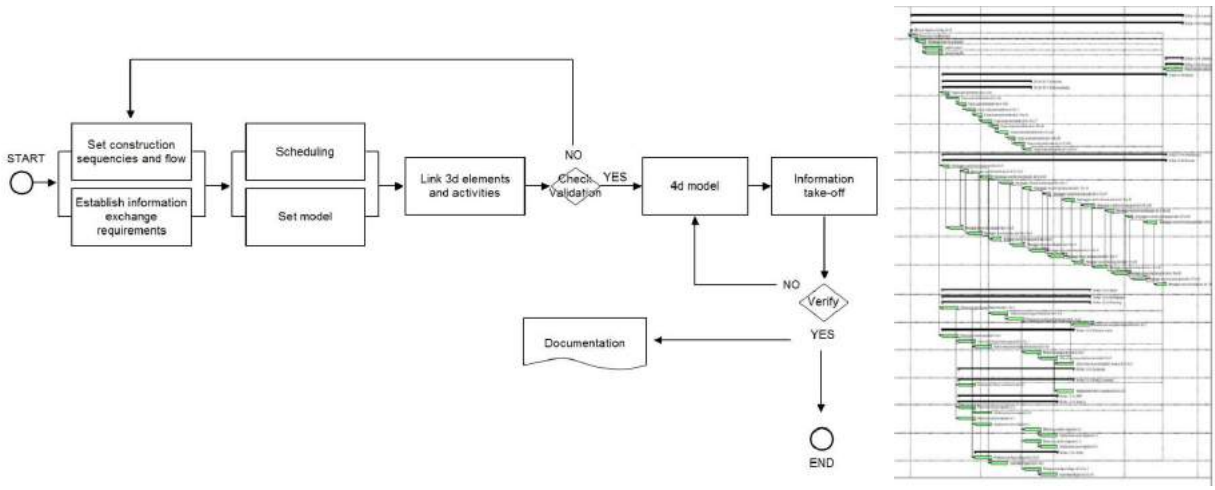
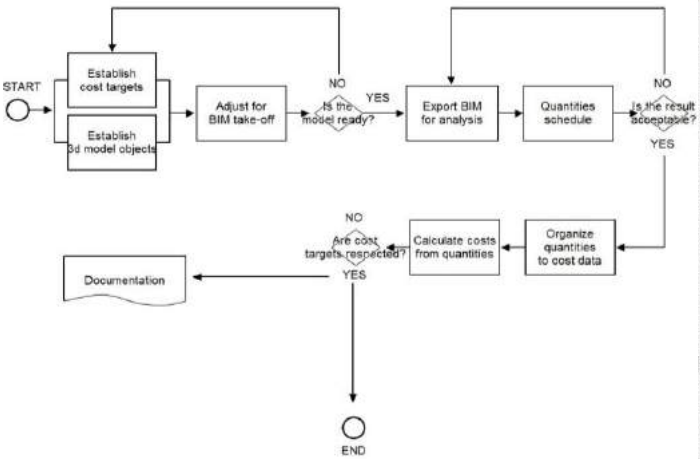


Fig.11: Planning process map and gantt.



<Facilities: Quantità Costi Arredi>

A	B	C	D	E
Categoria	Famiglia e tipo	Livello	Conteggio	Costo
Arredi	Armadio - Ante Scorrevoli: 1400 x 2200 mm	03	12	9600.00
Apparecchi idraulici	Bidet - Vitreous china bidet-Meridian-357244xx0: 357244000 WM	03	12	1800.00
Apparecchi per illuminazion	cm1021-ceiling fixture-visa lighting_16357-cm1021-ceiling fixture-	03	62	6820.00
Porte	Finestra Facciata: FF	03	22	0.00
Pilastri strutturali	Flangia larga ad H-Pilastro: HE300M	03	8	0.00
Apparecchi per illuminazion	Lampada da tavolo: Lampada da tavolo (3)	03	22	1100.00
Arredi	Letto King Size: Queen Size	03	12	14400.00
Porte	Porta - jeld-wen: 886 x 2089 mm	03	4	1000.00
Porte	Porta - jeld-wen: 900 x 2000 mm	03	2	700.00
Porte	Porta - jeld-wen: 900 x 2100 mm	03	4	1400.00
Porte	Porta - jeld-wen: 986 x 2049 mm	03	1	350.00
Porte	Porta - jeld-wen: 1000 x 2100 mm	03	13	4680.00
Porte	Porta - jeld: 1400 x 2000 mm	03	1	350.00
Porte	Porta - jeld: 1600 x 2100 mm	03	1	370.00
Porte	Porta - jeld: 1800 x 2100 mm	03	1	400.00
Porte	Scorrevole Semplice: 75 x 210 cm	03	21	6300.00
Arredi	Scrivania angolare: 1800 x 1010 mm	03	10	1000.00
Arredi	Sedia studio - Media: Sedia studio - Media	03	10	600.00
Pilastri strutturali	Sezioni circolari cave-Pilastro: pilastro cavo 40x2.5 Z	03	4	0.00
Arredi	Tavolo - Comodino: 0610 x 0610 x 0762mm	03	21	2940.00
Pannelli di facciata continua	Vetro1: F_V_1	03	56	11200.00
Pannelli di facciata continua	Vetro2: F_V_2	03	32	4800.00
Pannelli di facciata continua	Vetro3: F_V_3	03	75	22500.00
Pannelli di facciata continua	Vetro4: F_V_4	03	67	10050.00
Pannelli di facciata continua	Vetro5: F_V_5	03	7	1050.00
Pannelli di facciata continua	Vetro6: F_V_6	03	2	300.00
Apparecchi idraulici	Wall-hung vitreous china basin-Access-327230xx0: 327230000	03	12	960.00
Apparecchi idraulici	WC -Back to wall vitreous china close-coupled WC with dual nut	03	12	1800.00
500				106470.00

<Abaco Facility 29 piano Luci>

A	B	C	D	E
Categoria	Famiglia e tipo	Livello	Conteggio	Costo
Apparecchi per illuminazio	cm1021-ceiling fixture-visa lighting_16357-cm10	29	33	110.00
Apparecchi per illuminazio	Lampada da pavimento - Arco: Standard	29	3	200.00
Apparecchi per illuminazio	Lampada da tavolo: Lampada da tavolo (3)	29	3	50.00

Fig.12: Cost analysis process map and an abstract of the abacus.

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Planning the safeguard of hidden heritage: Standards and compromises for the physical preservation of "minor" archives of Contemporary Architecture

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Abstract
Contemporary architectural archives are a peculiar kind of "borderline" heritage, oscillating between the collection and the deposit status. This ambivalence raises questions about their protection and enhancement: the architectural drawings exposure and consultation are designed and managed according to Standards relating to the archival sector, in the strict sense; however, such a specific approach will not be sufficient if the documents include design drawings, characterized by different formats, techniques and supports. The balance between external environment, conservation spaces and drawings is maintainable if preventive conservation methodologies are applied to limit the chemical, physical and biological degradation through active and passive systems of environmental control. The protection strategies are explained in Standards and Guidelines, often made accessible by national and international bodies and often taken on, at the institutional level, with different results, since every archive proves to be an organism on its own. This paper proposes the analysis and comparison of the regulations, produced in Italy and abroad, on the preventive conservation and the methodologies of the architectural documents exhibition, highlighting how much the values of environmental parameters are not as important, if they are considered in end of themselves, as the investigation of other factors, ranging from the materials chemistry and physics at the past history of each archive, up to its fruition.

Keywords: architectural archives, standards, preventive conservation, degradation, environmental control

1. Introduction
The contemporary architectural archives constitute a cultural, historic and documentary heritage recently recognized. They are characterized by a heterogeneous stratification of materials, derived by the creator's design practice. The graphic heritage of the architectural archives is considered a privileged tool, many aspects about the "making" architecture could be investigated thanks to, inflecting it depending on the research purposes (historiography, study of technical solutions, restoration, etc.). This approach, which reinforces the importance of the archival drawings such as irreplaceable sources of research [1], however could be symptomatic of a more focused perspective on the centrality of the graphic message delivered by these drawings, at the detriment of their material components, equally relevant in the field of enhancement and safeguard.
The documents constituiting the support and the product of the designers' activities (architects and engineers) can find different locations: the State Archives, the architectural archives/museums, university and research centers and private institutions. This complexity of structures and materials has to be considered at the time that the right microclimate for the storage locations have to be set in order to preserve the documents and drawings from the degradation. This paper would like to investigate the principles of the preventive conservation referring to the legislation in force in the Italian and international territory, focusing on the control of temperature, relative humidity, light and air

quality, highlighting those useful expedients for the preservation and exhibit of design drawings kept in "minor" archives, as the proof of the little-known designers' work.

2. Architectural documents and degradation

The contemporary architectural archives are different from the most popular and accessible institutions engaged in the safeguard and enhancement of cultural heritage (museums, galleries and libraries), especially in the Italian territory. The archive is placed in fact in the "borderline" position between deposit and museum, inventory and collection of design drawings, due to the multiplicity of informational data constituting it, both for its "designing intention, which almost always tends to project the size of the document in the most heroic of the monument" [2]. It is a peculiar cultural heritage which needs dedicated strategies of conservation and enhancement, not only because of the difficult access to the documentary sources. Architectural archives hold a great historical and cultural potential of complex understanding and communication if the hidden relationships between individual documents, between documents and monuments, between documents and archival funds are not well presumed and enucleated. The architectural drawing may have its own independent artistic nature of course, but it poses often several problems of interpretation related to its own visual document character, being first of all "a document that speaks only when considered as a serial element, that is, part, together with other drawings, of a chain of design solutions" [3].

If the proposals about the architectural documentary heritage enhancement, then focused on the graphic message communication, are developed exploiting more and more the potential offered by the ICT (virtual and augmented reality, web 2.0 for the hypermedia, the sources access and sharing), the protection of the documents requires different physical preservative methods according to the materials, the storage locations and exhibit.

The objects collected in a contemporary architectural archive should be identified and recognized in their material matrix, in their past history and in their current state of conservation, in order to speculate their correct storage and appropriate consultation. The three variables (nature of materials, environment and conservation status) are also the causes of the degradation, which can be pointed out as a "natural, nonlinear and irreversible process of chemical and physical transformation, which necessarily leads to a deterioration of the original features under the conservative profile" [4].

The analysis of the degradation follows a logical path including the causes, mechanisms, effects and actions, different for each type of material, locations of preservation and conservation status.

A contemporary architectural archive could collect drawings on different supports on which graphic techniques and/or reproduction techniques have been applied. These elements, in the conservative phase, are influenced by each other at the single document level: all supports and techniques have indeed a specific physical and chemical nature influenced by each other, conditioned in turn by the environment they are located in.

The execution techniques of architectural drawings are sometimes common to other fields of art; others are typical of the architectural discipline and derived from the need of technical accuracy in the execution and reproducibility, due also to the increase in administrative practices, industrialization and the fragmentation of the works in the contemporary construction sites. In an architectural archive, photographic and audio-visual material, scale models, or painted works can be found, as well as drawings and other paper documents.

The paper materials are made up of cellulose, hemicellulose and lignin in different percentage. In particular the high percentage of cellulose determines the best quality of the support in terms of resistance and insolubility in water; on the contrary the lignin and hemicellulose, called "encrusting substances" and made up of shorter polymer chains, are responsible of the little resistance and yellowing. Other substances are added in the dough or on the surface of the paper: the filling substances are necessary to stuff the paper pores, improving the degree of whiteness, the opacity, the smoothness of the surface and therefore the printability; the adhesives confer resistance to penetration and spreading of the inks and other aqueous solutions; finally, other additives are coloring and bleaching agents [5]. The tracing paper is the most used support in the technical drawing, as it allows the reproduction of drawings and graphics. This kind of support, previously considered of poor quality compared to other types of paper, has only recently become the subject of study in the field of conservation. Its peculiarity lies in the transparency, so that the support presents both sides (front and back) which must always remain readable.

Other kinds of supports have been added to the traditional and tracing paper of various weights and manufacturing, such as plastic films (acetate and polyester) employed to draft the same drawings or for the photographic negatives; also the photographic plates, the magnetic and optical supports for audio and video documents are widespread in contemporary design archives; these components also have different conservation problems, still under investigation by the institutions appointed to the safeguard.

The most commonly chosen graphic techniques are the graphite, pastels, watercolors and various kinds of inks. Such more traditional techniques have been juxtaposed by the airbrush, widely used

since the seventies in place to the watercolor, and later supplanted by the appearance of the Computer-Aided Design, which allows plotting uniformly large fields of color. The collage is another technique, used mainly for expressive purposes. The transferable and the screens are specific materials of the technical drawing, consisting of colored and adhesive letters, lines and symbols, printed on a matrix, which can be transferred with pressure on the back of the drawing.
Drawings can also be represented in the form of copies, realized according to different ways. The reproduction processes, derived from the development and progress of photographic techniques, are differentiated into the cyanotypes, ectography, heliography and xerography, still in use. The preservation of such media is still the subject of study, because the degradation mechanisms and, accordingly, the conservative operations have not been in depth investigated yet [6].

2.1 Causes of degradation

The degradation, originating from more or less visible alterations, is determined, as already stated, by the nature of the documents and by other agents.
Materials differently interact with each other: the cellulosic hygroscopic substances, for example, are subjected to mechanical stress because of the relative humidity, in a different way from the hydrophobic supports, such as some plastic films. In the case in which such materials are assembled, their different hygroscopicity causes tensions and ruptures. In addition to these endogenous factors, linked to the intrinsic nature of the constituent materials, degradation also occurs because of exogenous factors, originating from the storage conditions. This category includes:

- environmental causes, i.e. the values of relative humidity and temperature and their gradients in time, the lighting quality, the air quality (pollutants and dust);
- biological agents, including attacks by animals, insects and micro-organisms;
- human agents, happening as the result of illicit displacements, not suitable manipulation;
- mechanical agents, i.e. vibrations of the building structure, incorrect resting conditions.

Such causes are interconnected: for example, an excessive relative humidity can trigger biological attacks.
Biological agents are responsible for the bio-deterioration. It is originated therefore by cellulolytic organisms, belonging to both bacterial and fungal species, spread by the airborne and the particulate matter. The microorganisms' action on paper is revealed as maculatures and inks discoloration, as well as in perforation and embrittlement processes of the support. The damage produced has different origins: it may be caused by the organism's nutritional activity, which disintegrates the support with its metabolization implemented by the activity of the lytic enzymes, or by the mechanical capacity of the fungal hyphae altering the structure of the support, penetrating in the subtle texture of the cellulose fibers. Even the products of metabolism deposited in the area of infection, such as the production of substances at different pH, or the production of colored pigments that may spread or remain delimited on the support in an indelible way, give origin to a macular damage. The biological attack is determined also by insects and rodents; the first category includes many species of roaches, coleoptera (including woodworms), termites, moths, lice of books and silverfish.
Another cause of the materials alteration is pollution, whose components (atmospheric particles, polluting gases, etc.), combining themselves with the oxygen and water present in the storage spaces, form acidic substances, promoting the degradation reactions of the paper and the fading of inks.
Each material also interacts differently with the microclimate of the storage spaces. Sudden excursions in humidity and temperature, inadequate exposure to light of various nature, cause variations in the paper in its dimensional aspects, corrugations, yellowing and general embrittlement.

2.2 Effects of degradation

The combination of multiple causes, present or past, produces synergistic effects. The degradation is a process involving the number and the intensity of the individual forcing events; it takes place in a progressive manner, with the aging of the material constituting the object and the alteration of its chemical-physical characteristics, accelerated by any environmental perturbations. Therefore, the previous history of each object has to be considered, because the previous environmental conditions have led to a settling of the material, in response to its physical-chemical characteristics and the external environmental sources.
In fact, the ambient conditions, either alone or with other factors, hold a key role in the degradation processes the drawings undergo: the heat and mass exchanges cause processes of internal stress, with irreversible and cumulative effects, reducing the material tolerance limits over time.
Paper undergoes degradation processes due to the impurities and the physical and chemical agents present in the ambient, through the mechanisms of:

- acidic and basic hydrolysis;
- oxidation;
- photo-degradation.

The hydrolysis is a mechanism of chemical degradation, the paper undergoes, due to the high relative humidity. Since the paper is hygroscopic, it tends to absorb or release water molecules according to the degree of the environmental relative humidity. The hydrolysis consists in the breakage of the chemical bonds between the different glucose units forming the cellulose chains, due to the insertion of water molecules. It follows the formation of smaller fragments that lower the polymerization degree of the chain and, consequently, the weakening of the sheet. The cellulose hydrolysis phenomena are catalyzed by the presence of acids (i.e. substances with pH minor than 7) or bases (pH greater than 7). These substances may already be in the paper (such as cellulose bleaching, adhesive substances like alum and rosin, inks), or may come from the external ambient (the anhydrides which easily turn into acids, and the derivatives of ammonia).
The causes and the mechanisms of the cellulose oxidation are more complex to isolate. Oxidation is a chemical reaction that does not change the length of the polymer chain, but involves the transformation of some elements, that become chemically unstable and altered. An obvious discoloration of the paper (yellowing, browning) follows the cellulose oxidation. The presence of heterogeneous compounds on the material (i.e. metals) and/or the exposure to light causes the oxidation of the cellulosic substrate, leading to the formation of acidic substances (carboxyls). In synergy with the hydrolysis, these acidic substances form volatile products of low molecular weight (VOCs, Volatile Organic Compounds), immediately recognizable from the smell found in many archives and library material deposits. The VOCs also does not disperse easily in the environment, remaining largely trapped between the paper fibers within folders closed for years, especially if the ambient is moist. The photo-oxidation is induced by the exposure of paper to the electromagnetic radiation (especially UV) and pollutants, such as ozone and oxidizing chemicals introduced in the support (for example hypochlorite used for bleaching).
The degradation effects are not always immediately recognizable, since they may manifest on the long term and be cumulative.
Light, infrared and ultraviolet rays are for example the largest energy sources and interact both physically and chemically with archival materials (photodegradation). The lighting, both natural and artificial, can:

- accelerate the deterioration, acting as a catalyst in the oxidation reactions;
- facilitate the lowering of the level of the cellulose fragility;
- discolor, fade and stain the paper;
- alter the pigments;
- increase the surface temperature of objects.

The degradation of the architectural drawings on paper is evidently associated, at the chemical level, to the supports acidity, which occurs both as effect of other processes (oxidation and photo-oxidation, the presence of anhydrides derived from pollulants), both as a triggering cause of other types of alteration, occurring especially at the optical and aesthetic level (yellowing).
The polyester (PET), used for the heliography (radex), is stabler than the cellulose and, if properly preserved, has a life expectancy of a few hundred years. The most important way of degradation at the ambient temperature is the hydrolysis, accelerated by temperature, relative humidity, acids, bases and catalysts. The hydrolysis generates carboxylic acids, producing auto-acceleration effects, intrinsic viscosity and tensile strength loss.
The paper could become acidic after the exposure to internal or external polluting agents, in particular sulfur dioxide from the industrial air pollution of the nineteenth and twentieth century. In addition to the Sulfur dioxide (SO_2) there are other substances (the VOCs Volatile Organic Compounds, the carbon monoxide CO, the NO_X nitrogen oxides, the respirable dust PM_{10} and the total suspended dust) related to the air emissions from the antropic activities. The sulfur dioxide, water-soluble, is transformed into sulfur dioxide which causes yellowing and discoloration in contact with paper materials; instead it determines sulfidation and micro spots in contact with photographic materials.

3. The preventive conservation of contemporary architectural archives

A preventive conservation plan has to be identified, after analyzing the state of conservation of the objects and the conditions under which they are kept, in order to limit and prevent those damages that would require a real restoration. The restoration, in addition to being expensive, is sometimes too invasive and potentially destructive; therefore, a good practice is trying to minimize the direct interventions on drawings, investing the economical resources in the implementation of preventive conservation strategies. Briefly:

- the preventive conservation directly affects the causes of degradation;
- the restoration directly acts on the effects of degradation.

The concept of preventive conservation is based on appropriate policies based on the adoption of behaviors and technical precautions, applicable with continuity and aimed to prevent, or slow, the degradation phenomena, reducing them to the lowest intensity.

A preventive conservation plan starts from the analysis of the state of conservation of the drawings and the ambient they are collected in, through the inspection of the site and data collection. This "survey" of the *status uo*, therefore, takes into account:

- the types and nature of the archival material heritage;
- the consistency and importance of the fund;
- the storage conditions;
- the previous history of the archival collection, where the ambient conditions may have led to a specific arrangement of the materials.

The storage conditions are often the result of a compromise choice, especially for the preservation of archives constituted by mixed materials, therefore with different conservation needs, which must be placed in the same spaces for organizational and management issues, with the same environmental conditions.

Another subject to examine in depht is the relationship between drawings and building and the balance established between them, analyzing:

- the general conditions of the building structure (degree of protection with respect to the external climatic conditions), the plant equipment for the ambient control and the structures and systems maintenance procedures;
- the parameters that allow to describe the ambient conditions (temperature, relative humidity, lighting, air quality) to be monitored, in order to identify the critical issues and propose solutions for the improvement;
- the archival spaces designed for the storage, also called ambient of conservation;
- the handling and transport of the drawings.

Many of the problems of conservation are in fact more evident considering that the drawing lives and gradually changes in an ambient it inevitably and continuously interacts with.

Generally an archive, from the spatial and organizational point of view, consists of places having a preservative function, including:

- the storage area, in which the graphic documents are usually kept;
- the consultation reading and exhibition area, in which the graphic documents are consulted and/or temporarily exposed;
- the photocopying and restoration area;
- the access and service area, or other spaces in which the graphic documents can only pass through.

The knowledge of the state of conservation of the artifacts, their location and the relationships between indoor ambient (especially the exhibition rooms and deposits) and exterior rooms, is essential to program the safeguard and enhancement interventions. The preventive conservation measures must be established case by case, based on the real conservation needs of the archival collection in question, with the primary goal of creating safe ambients and optimal storage conditions. Some examples of preventive conservation interventions focus on:

- the preparation of the monitoring systems of the parameters describing the ambient conditions in order to assess the risks for the preservation of documents;
- the interventions on the building elements and systems;
- the identification of the most critical areas to the preservation and development of climate control strategies;
- the identification of improvement solutions with regard to the technologies for the microclimate control and the air quality monitoring;
- the shielding of the transparent portions of the building envelope for the control of natural radiation and choice of suitable artificial lighting systems.

3.1 Conservative format

The Architectural Archives belong, as already mentioned, to a cultural sphere in which the identification of a univocal type of material and object is difficult, so that many factors, very often ignored or not respected necessary from the conservative point of view, have to be analyzed. The balance between the single documents, between documents and archive, between the external environment and archive, are interdependent factors that need to be put in relation to locate the best conditions for preserving the drawings state of conservation.

In order to identify and clarify the various factors contributing to a safe preservation of the archives, a conservative format must be made, aimed at the systematic organization of technical and scientific knowledge relating to the constituent materials, executive procedures and state of preservation of the artifacts. Such organization aspired to the conservation and restoration planning, to the proper management of the manipulation, to the artifacts exhibit and storage. Since the enormous amount of documents in an architectural archive, a condition report for each drawing is difficult to write up: the state of conservation evaluation should be made "taking a sample" of drawings, identifying their

supports and graphic techniques, estimating their consistency in relation of the entire archive, to detect the more common degradation types.

4. International Standards and Guidelines

Architectural archives, as already pointed out, have a very different documentary heritage, both for the great diversity of materials, both for the use of multiple graphic techniques, which can be associated with the contemporary reproduction techniques. For this reason, each type of material needs suitable values of temperature, relative humidity, light and pollulants exposure for conservation, established and recommended by International Standards and guidelines drawn up by the institutions responsible for the safeguard of the architectural archives, identifying diversified conservative strategies for each archival collection, in accordance with its uniqueness condition (documents amount and composition and the building context) and with the availability of resources.

In the Italian background, the technical legislation has sought to address the need to provide Standards for the conservation of the architectural archives materials: paper drawings, heliocopies on paper and synthetic supports (radex), photographs, pastels, watercolors. The reference technical standards are:

- UNI 10586: 1997 Documentation - Climatic conditions for the storage spaces of graphic documents and characteristics of the boxes;
- UNI 10829: 1999 Historical and artistic heritage - Environmental conservation - Measurement and analysis;
- UNI 10969: 2002 Cultural heritage - General principles for the selection and management of microclimate for the conservation;
- UNI EN 15757: 2010 - Specifications concerning the temperature and the relative humidity to limit the mechanical damage caused by the climate to the hygroscopic organic materials.

The D.M. May 10th, 2001 – Guiding Act on the technical and scientific criteria and on standards of operation and development of museums - has also to be mentioned. Despite it is referred specifically to the museum field, it provides, in the VI part, the “Regulations for the conservation and restoration, including the exhibit and handling” of objects, indicating the methodology for conceiving a valid preventive plan, starting from the drafting of the conservation status format and monitoring the environmental parameters.

Other technical standards, internationally recognized, are provided by:

- the British Standards Institution (BSI), with “Recommendation for the Storage and Display of Archival Documents” dating back to the mid-eighties, (BS 5454: 2000, subsequently revised with PD 5454: 2012);
- the NISO (National Information Standards Organization), a nonprofit association accredited by the American National Standards Institute;
- the ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers), among whose rules there is the “Applications 2003 - Museums, Libraries and Archives”;
- the ISO (International Organization for Standardization), with the “ISO 11799: 2015 - Information and documentation - Document storage requirements for archive and library materials”, written in 2015. It specifies the characteristics of deposits, where materials on paper and mixed supports coexist. It does not preclude the establishment of separate areas or compartments within individual deposits, so that the ambient can be controlled to create the right conditions for the needs of specific archival materials. Another standard is the “ISO: 16245: 2009 (revised in 2015) - Information and documentation - Boxes, file covers and other enclosures, made from cellulosic materials, for storage of paper and parchment documents” which specifies the requirements for boxes and covers, made up of cellulose, used for long-term conservation of paper or parchment documents.

Even the establishments dedicated to the enhancement of the architectural archival heritage, along with the conservation and restoration centers, provide their contribution on the rules of drawings maintenance, also reporting the reference values of environmental parameters, as a result of researches about monitoring in archives, museums and libraries collecting documents on paper, photographs, prints, etc.

In Italy, a key role for research on conservation and restoration of archival materials - macro category including, as noted, digital and photographic materials, bindings, drawings on paper, parchment and plastic - is covered by the Istituto Centrale per il Catalogo e la Documentazione (ICCD) and the Istituto Centrale per il Restauro e la Conservazione del Patrimonio Archivistico e Librario (ICRCPAL). Among the most relevant publications by ICCD in the field of preventive conservation, the microclimate monitoring report is of considerable interest, carried out in the same institute archives, by a working group for “the methodological approach in the context of the conservation disciplines in ICCD’s photographic collections”, dating back to September 2013 [7]. This contribution has been taken into account as it provides a recent example of monitoring and control of temperature and humidity parameters in the different spaces of the photographic archive: despite the survey affected only this

particular type of material, it could be considered useful to compare the work methodology applied with the results of similar researches published by other institutions.
At the international level, between the institutions drawing up guidelines on preventive conservation, sometimes made online available, there are:

- in England: The Museums, Libraries and Archives Council (MLA), an English organization absorbed by the International Federation of Arts Councils and Culture Agencies (IFACCA) in 2012; The Preservation Advisory Centre, active in the preservation of library and archival materials, merged into the British Library Collection Care in 2014; the Museaums Galleries Scotland, even if they arefocused on the museum field, provides guidance on the conservation and protection of collections on paper; the Institute of Conservation (ICON), formed in 2005 from the merger of several organizations (The Care of Collections Forum, The Institute of Paper Conservation, The Photographic Materials Conservation Group, The Scottish Society for Conservation and Restoration, and The United Kingdom Institute for Conservation of Historic and Artistic Works), which provides several brief guidelines on the preservation, very active in the field of the communication of research; the National Preservation Office (NPO), which published “Preservation Guidelines for Libraries and Archives Collections” in 2003.
- In France: the Direction des Musées de France, which has published the rules called “MuseoFiches” on preventive conservation.
- In the United States: The Northeast Document Conservation Center (NEDCC), born in 1973 as the first independent laboratory for the conservation of works on paper; the Getty Conservation Institute (GCI) of the Paul Getty Museum, which works to promote conservation practices in the visual arts (artifacts, collections and architectural sites) through scientific research, education, training and the wide dissemination of results; the National Park Service (NPS), with technical bulletins called “Conserve O Gram”; the American group of the International Institution of Conservation (ICC), which has established guidelines since 1964 in the “Murray Pease Repor”, not related to any specific case studies, talking about the responsibilities of the conservation keepers in the maintenance and protection of cultural heritage; an online platform refers to this Institution, called Conservation Online (CoOL).
- In Canada: the Canadian Conservation Institute (CCI), born in 1972, which provides technical bulletins for the thermohygrometric control in archives, for example the “Guidelines for Humidity and Temperature for Canadian Archives” [8]; even the Canadian Council of Archives (CCA) has published a specific guide for archives conservation, dating back to 2003 (Basic Conservation of Archival Materials) [9].
- In Australia: the Australian Institute for the Conservation of Cultural Material (AICCM) which has published “Re-Collections: caring for Colletions across Australia”, six volumes on the conservation, maintenance, exhibition and storage of a wide range of materials, realized by Artlab and Australian Conservators for the Heritage Collections Council.

The technical bulletins and guidelines of these institutions hava been examined in order to make a critical comparison between the Italian and the international situation in the context of monitoring and values to be adopted for the preventive conservation. Other standards, published by international institutions, have also been taken into account, such as:

- UNESCO, with the document, drawn up in 1987 along with the IFLA, ICA and a group of international research, "Preservation and conservation of library and archival documents: a Unesco / IFLA / ICA inquiry into the current state of the world’s patrimony, "which provides not only a survey of archives and libraries conservative state on an international scale, but also recommendations for an appropriate protection strategy [10].
- The International Federation of Library Associations and Institutions (IFLA) is the international body representing the interests of library services, but it also realizes studies within the conservation field since 1984, when the Strategic Programme on Preservation and Conservation (PAC) was created, with the important goal of ensuring that the librarian and archival materials, published and unpublished, in all formats, are preserved in an accessible form for as long as possible. Besides the two guidelines “Principles for the Care and Handling of Library Material” [11] and “Care, Handling and Storage of Photographs” [12], IFLA makes online available international publications on the sector.
- The International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM). One of the contributions analyzed is “Standards in Preventive Conservation: meanings and application” [13], in which the use of the standards applied to cultural heritage is told from a historical point of view. Another important essay is “The role of architecture in preventive conservation” [14], in which the impact of a building, defined sustainable, and of environment are examined for the conservation of artefacts in archives and museums.

5. Conclusion: methodologies of environmental control

The light quality and intensity may cause damage to the paper, which is undoubtedly the most widespread support in the archives. The most destructive action for paper is caused by the UV rays,

whose high frequency is able to break the bonds between the cellulose chains, producing fragility on the mechanical and aesthetic level, arising as paper yellowing. In fact anti-UV filters have to be adopted protect the drawings from the sunlight and the artificial lighting systems. The archival documents, whether they are pencil drawings, watercolors, on paper and acetate, or reproductions, are highly light sensitive materials, for which a maximum illuminance is recommend at 50 lx and the annual dose of light at 150000 lx per hour/year [fig. 1].

Artifacts, historic and artistic value	**T_0**	**ΔT_{max}**	**UR_0**	**ΔUR_{max}**	**E_{max}**	**UV_{max}**	**LO_{max}**
Organic Materials							
Artifacts on paper, tracing paper	18-22	1.5	40-55	6	50	75	0.2
Drawings, watercolours, pastels	19-24	1.5	45-60	2	50	75	0.2
Archival documents on paper, parchment, books, manuscripts	13-18	-	50-60	5	150	75	-
Mi□ed ob□ects							
Film, black and white photographs	0-15	-	30-45	-	150	75	0.2
Film, colour photographies	0-15	-	30-45	-	50	75	0.2
Plastic materials	19-24	-	30-50	-	□300	75	-

Fig. 1: Reference values recommended in stable climat, to the design of air conditioning plant for spaces collecting artifacts on paper (UNI 10829). T_0: temperature (□C); ΔT_{max}: maximum of temperature fluctuations (□C); UR_0: relative humidity(□); ΔUR_{max}: maximum of relative humidity fluctuations (□); E_{max}: maximum illuminance (lx) UV_{max}: maximun quantity of ultraviolet radiation (□W/lm); LO_{max}: maximum of annual light dose (Mlx • h/year)

The direct sunlight is not recommend, while the artificial lighting must be guaranteed only by certain types of lamps, shading and filtering devices of ultraviolet components have to be applied to. The lighting systems should preferably be fluorescence, with filters able to eliminate the radiation with a wavelength minor 400 nm and superior 760 nm. The lighting of the storage rooms must be minor 75 lx as the daytime average, and in any case minor 150 lx during the periods of the access to the storage rooms. In the consultation spaces, however, the lighting system must provide a lighting not superior 150 lx for the reading and not superior 50 lx for the exhibit.
Both the changes in temperature and moisture cause mechanical damage difficult to control. While the inorganic materials (such as metal, stone, painting, and wood) respond to changes in temperature expanding themselves with the heat and contracting with the cold, the hygroscopic organic materials respond to changes in relative humidity, contracting themselves when it decreases and dilating when it increases. If the humidity of equilibrium content and the resulting dimensional change of hygroscopic materials are influenced much more by the relative humidity changes than by temperature changes, the relative humity should be maintained as close as possible to the historical climate levels. The aim of preventive conservation measures is to prevent fluctuations and cycles in the short term and reduce high and/or frequent temperature and relative humidity variations that involve physical damage to drawings. An analysis of data on the external environment conditions should be also carried out in parallel to a regular indoor ambient monitoring, in order to identify the influence that changes in external conditions, due to seasonal and the daytime variations and the extreme weather conditions, could have on the indoor situation. Stable relative humidity values can be obtained through several expedients:

- If the humidity content in the air is constant, the temperature has to be kept as constant as possible;
- If the humidity content in the air is variable, the temperature has to be changed to maintain constant the relative humidity (if the temperature changes do not have a significant impact on drawings);
- If the humidity content in the air is variable, humidity should be added or removed from the air without changing the temperature (if the relative humidity changes do not have a significant impact on drawings);
- If the humidity content in the air is variable, the two previous modes can be combined.

The temperature control in an archive raises questions of human comfort, energy costs, environmental impact and sustainability. In such a moment haracterized by a great concern for the rational use of energy resources, those conditions can not be ignored.
In connection with the thermo-hygrometric parameters, the Standards and Guidelines stipulate that the storage spaces must be constantly maintained at a temperature between 14□and 20□C; the relative humidity must be constantly maintained at a value comprised between 50-60□ (its safe-limit value, usually quoted for archival materials to prevent the formation of mold, is 65□). The tolerance ranges

of such values are □2□C for temperature and □5□ for the relative humidity, this in relation to the different points within the rooms and to the possible diurnal and seasonal fluctuations [figg. 2 - 3].

Category of light sensivity	Materials, techniques	Maximum illuminance
Very low	Artifacts relatively insensitive to light: metal, stone materials, ceramics, glass, jewelry and fossils	□**300** lx
Mid	Artifacts moderately sensitive to light: oil paintings, tempera paintings, bone horn, ivory, wood	**150**
High	Artifacts highly sensitive to light: textiles, tapestries, paintings and gouaches not varnished, mixed media, watercolors, markers, prints, books, leather, organic artifacts	**50**
Very high	Artifacts extremely sensitive to light: silk, inks, dyes and pigments such as lacquers	**50**

Fig. 2: Sensivity of light according to materials and techniques of Cultural Heritage. D.M 10 maggio 2001 – "Atto di indirizzo sui criteri tecnico-scientifici e sugli standard di funzionamento e sviluppo dei musei"

In the consultation spaces, the temperature should be between 18□ and 23□C and the relative humidity between 50□ and 65□. If the difference between the values present in these spaces and in the deposit is superior of 4□C for the temperature and 5□ for the relative humidity, the graphic documents must be gradually acclimated. The achieviment of the correct environmental conditions must necessarily be obtained by ventilation and air conditioning systems, completely avoiding the opening of doors and windows to make the air changes. The air conditioning and ventilation system should continuously provide from 5 to 7 air recirculation per hour in storage spaces. Because the air movement within an environment can accelerate deposition processes of gas and aerosol present or released into the ambient, the terminal elements of the plant should be placed as far as possible away from the exhibited drawings.
To avoid undisered oscillations of the environmental parameters, both in function of the time and the archival spaces, several remedies can be applied:
- the passive remedies are based on the application of materials or ambient control systems without energy absorption, aimed at reducing the energy flows (heat, light) and/or mass flows (steam, pollutants) between the ambient under control and the external environment.
- the active remedies are based on the application of ambient control systems with energy absorption, aimed at the surface control of energy flows (heat, light) and/or mass flows (steam, pollutants) between the ambient under control and the external environment [15].

UNI 10586	Deposit spaces	Consultation spaces
Temperature □C□	14 □T□20	18 □T□23
	Fluctuation tolerance: □2□C	Gradual acclimatization if the range in deposit and consultation room is □4 □C
Relative Humidity □□	50 □UR□60	50 □UR□65
	Fluctuation tolerance: □5□	Gradual acclimatization if the hike in deposit and consultation room is □5□
Illuminance □lx□	Illuminance with fluorescent lamps (UV filters) □75 lx (one-day average) □150 lx during the access	For reading: □150 lx For exhibition: □50 lx

Fig. 3: Environmental conditions for the preservation of graphic documents (UNI 10586)

Passive remedies should be mainly apply, including the thermal insulation, the use of materials and systems with high thermal and hygrometric inertia, the limitation of the uncontrolled heat and steam exchange, the filtering of the solar radiation, the replacement of the lightning sources. On the contrary,

the active systems must be contained to the minimum necessary and aim to eliminate the daily fluctuations and to reduce further the seasonal ones.
These parameters have to be reevaluated if the architectural drawings are shown at exhibitions, for which some precautions can be identified:

- the use copies instead of the original drawings (if possible);
- the drawings should not be permanently exposed and exhibited;
- the lowest possible levels of light should be maintained;
- the minimization of the exposure to ultraviolet light thanks to appropriate filters;
- closing of windows and the frames should be ensured and they should be made up of materials that do not harm drawings and documents.

Light can be a serious problem for the drawings exhibition because the paper is a highly sensitive support to light, ultraviolet and infrared radiation. The lighting during an exhibition must therefore be well assessed and designed, to ensure the correct visibility even to the moderate levels recommended of light (50 lx). Since every radiation is potentially harmful to the paper and the every damage cumulative, any exposure is detrimental. A limit of 50000 lux for hour has been suggested by the guidelines for high light-sensitive materials. The relative humidity for the ambient exhibit has been fixed to a value between 35 and 50□, with a maximum variation of 5□. The exposure of the environment temperature is fixed at a value not superior than 21□C, with a maximum variation of 3□C. Temperature and relative humidity should be kept as stable as possible during the course of 24 hours, with no perturbations or fluctuations, and as uniform as possible in space.

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[12] http://www.ifla.org/files/assets/pac/ipi/ipi5.pdf in inglese

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Study of historical grouts through microscopic analysis SEM□ED□: the case study of the former Jesuit college of Amantea □Cs□

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Abstract
A key moment of the diagnostic phase, prior to the restoration project, is the morphological and chemical characterization of historical grouts. This analysis is essential when it's necessary carry brickwork's restoration actions of conservative nature on an architectural work.
The current trend, relating to the choice of the grouts to be applied during restoration operations, is more and more one which the designers rely on the commercial products presented as "suitable" for different applications on historical structures, as well as able to guarantee specific performances for all eventualities. Today, therefore, the designers unlikely deepen the study of grouts to adopt and this doesn't make them fully aware of their characteristics, their chemical compositions as well as the level of compatibility with the historical material on which they will apply and with which they will interact. And this shallowness often leads to situations of premature structural deteriorations due to the application of not suitable products for the native materials or for the environmental conditions to which they are exposed. In this case it's suggested a study on the characterization of historical grouts through the SEM/EDX microscopic analysis to characterize the former Jesuit college of Amantea (Cs). The characterization of the grouts carried out on this structure, stands as an essential moment of the restoration process underway on this important architecture.

Keywords: Cultural heritage, historical architecture, architectural survey, SEM/EDX analysis.

1. Introduction
The former religious Jesuit complex of Amantea presents precarious conditions as to its structural features. There are common crack patterns that accompany mechanisms caused by the following factors: overloads act on the bearing structures arranged vertically along the ground floor; excessive horizontal thrust, due both to the covering structure (now collapsed) which cause the overturning of the perimeter walls of the building [1]. For the kinematic mechanisms in place must be added the damage closely related to the lack: of the roofing structure; of the layers of plaster on the outer surfaces of the perimeter walls. The lack of such protective elements, with time, have facilitated the action of the chemical-biological agents as well as of the atmospheric ones which have produced a marked physical degradation of the masonry and a noticeable decay of its load-bearing capacity. Here, then, that the masonry bodies are frequently affected by delamination, and disruptive phenomena, as well as deep and widespread crack patterns.
The poor condition suggests the design of a comprehensive system of measures aimed at structural consolidation of the former college. To this end, an accurate phase of materials characterization, often, however, the design in the field of structural consolidation is addressed in response to a campaign of tests, to be performed on site, aimed at the single mechanical characterization of the masonry. In this case, this kind of characterization is commonly obtained by performing tests with flat jacks, through which it performs the evaluation of deformation parameters and strength of masonry, as well as the tensional states of

exercise and breaking [2]. Unlikely, instead, we enter the merits of the morphological and chemical characterization of the elements constituting the masonry itself, or the resistant elements (natural or artificial) and the mortar binder. et, precisely because of the lack of attention to this second delicate aspect of the characterization, there are problems of incompatibility between the traditional material and the materials put in place to run the structural consolidation measures. These problems occur especially when metal reinforcing elements come in contact with the historical mortars which, because of their chemical composition, often produce oxidation of the metals; and this proves to be a common and serious problem which involves a series of detrimental effects for the wall structures [3]. With this study, having framed the former college of the Jesuits Amantea through a careful phase of advanced highly multidisciplinary diagnosis we want to deepen the problem of incompatibility of matter based on the composition of the historic mortars characterizing the building structures constituting the architectural emergency explored. In particular, this study will be performed investigating with the SEM/EDX microscope ,the composition and morphology of the historic mortars characterizing the former college.

2. Territorial organization and history of the former Jesuit college Cs

Amantea Amantea is a village situated to the south of the Tyrrhenian coast in the province of Cosenza, in the mountain range called ''The Coast Range'' or ''Paolana Mountain chain''. Both promontories are placed to the north and south ends,together with the sea to the west, delimit the municipal area that is so elongated. Within this large areawe can easily recognize the old center ,located on the slopes of of a rocky outcrop characterized by a spontaneous urban language,and the new town located on flat land below. The ancient center, located on the steep sides of the rock mass, is made up of the districts : Catocastro and Paraporto, north and south, which are traversed by the old route of Via Independence that unites them (Fig. 1). On the big plateau of ancient kastron is the castle which, located in the far south, strategically controls the underlying Civita. Other two short shelves carved into the rock house in sequence the old convent of St. Francis of Assisi and the College of the Society of Jesus. The former Jesuit complex is located in the emerging location at the northern end of the town, on the natural buttress that rises from Catocastro creek. The two natural edge (the rock to the east and the precipice toward the north creek) are added the dense buildings that characterize the western front of the complex, overlooking small access roads (Fig. 2). The Only moment of "expansion" of the urban fabric inside the Catocastro district is represented by the church square featuring the entrance to the Church of St. Elias, built in the eighteenth century, during the redevelopment work in front of the sacred building; During these works some buildings existing there were demolished [4].

Fig. 1

Fig. 2

Fig. 1 Perspective from top of the historical center of the city of Amantea.
Fig. 2 Excerpt planivolumetric of the urban surroundings of the former Jesuit college.

The College of the Jesuits of Amantea was built in the second half of the seventeenth century and it was completed at the end of the same century [5] due to the considerable legacy of doctor Fulvio Verdiano (from Amantea) [6]. At that time in the small Calabrian urban realities reigned a widespread immorality, and this led the Church to entrust the work of correction of ''the Company of Jesus'' which began to found several monasteries scattered around the country with the aim of contributing to the socio-cultural evolution of the younger generation [7]. The project of the new religious complex Amantea was drawn up by architect Carlo Quercia [4]. The presence of the Jesuits in the city lasted until the suppression of the religious order that took place in 1767 [5]. After this event the religious structure headed inexorably towards a long decline, becoming

the first place of welcome for the poor and later prison facility by mid-nineteenth century until the sixties of the twentieth [8].
The former religious factory, after a period of abandon lasted over half a century,became the subject of Community funding in 2010,the fundings were used to preserve the structure now in danger. In a first phase of work it was done the emptying of what in the local had been accumulated for decades, as well as to its safety. At the moment, the building is being totally wrapped by an imposing metal scaffolding (provisional work) that ensures the structural safety (Fig. 3,4) pending further financing necessary to final consolidation of the stable and, consequently, to its functional recovery.

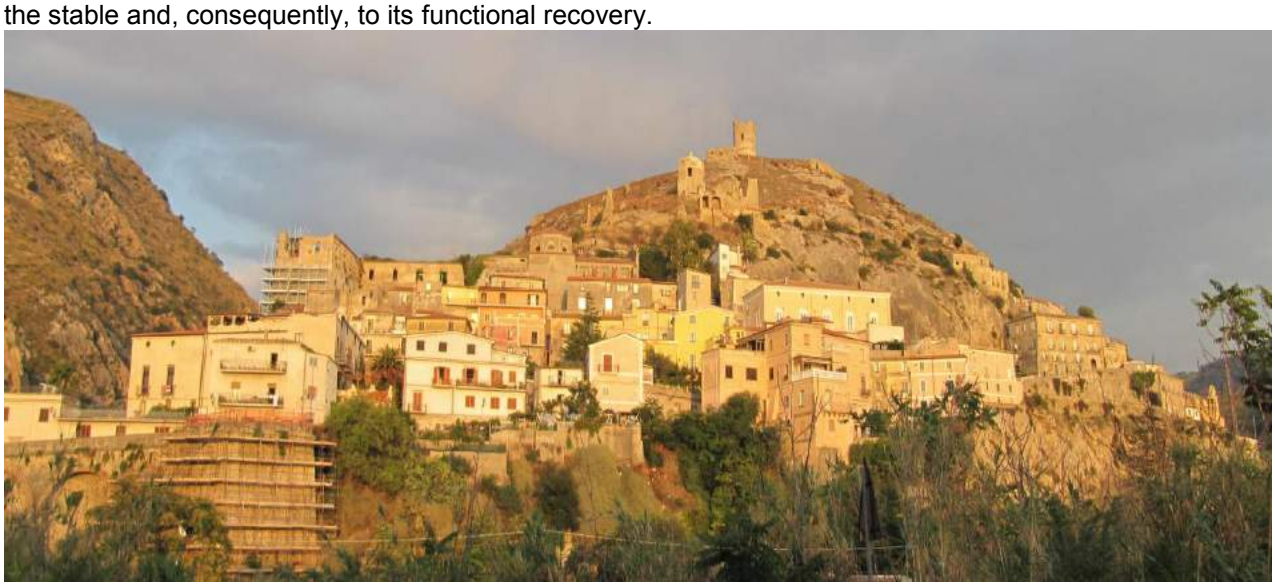

Fig. 3 The old town of Amantea, built on a sandstone outcrop.

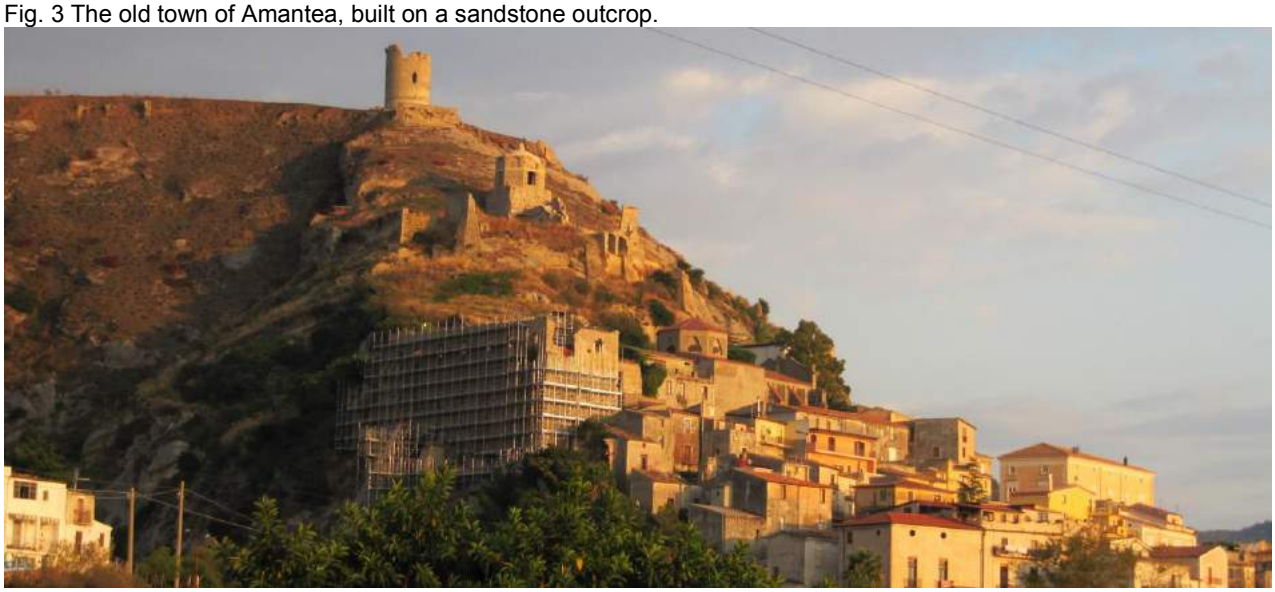

Fig. 4 The Catocastro neighborhood in the historic center of Amantea and the former Jesuit college.

3. Type of Jesuit architecture. Design principles and functional distribution

The Society of Jesus was founded in 1534 by the Spaniard Ignatius Loyola in the middle Counter-period and became one of the most important religious orders for the socio-cultural work carried out in the communities in which they settled [9]. The Jesuit order is distinguished for its constructive activities that involved the construction of two different kind of buildings: the church, which began to model the Roman ecclesiae of Jesus (1568), St. Ignatius of Loyola (1626) and Saint Andrew at Quirinale (1658-1661); one of the colleges, where the Jesuits lived, devoted themselves to their humanities as well as the teaching of young people. The religious order he adopted a definite settlement logic, in fact its complex were always built in the heart of the existing urban fabric, and this involved the demolition of old buildings for new construction, as well as the acquisition of new areas. The choice of the site it came after numerous inspections following the approval by the Roman headquarters, as well as a function of distance from important buildings of other religious orders and the planimetric scheme of the city established [10]. In systems Jesuit great importance was covered by

the colleges. These were used for the education and instruction of youth and clergy, as well as structured in two functional areas: the first was devoted to religious communities; a second was made up of real schools. These functional areas were received within simple massing, almost always volumes parallelepipeds with a square or rectangular plan, depending on the availability of land. The colleges were not only training centers for young people, but also places of apostolate in favor of the city in which they were; next to schools for schoolchildren, in fact, the colleges provide for the congregations entertaining spaces both "noble" that the "professions" [7]. The invariant recognizable characters within most of the colleges, made exceptions for those affected by particular orographic characteristics of the site (such Amantea), are: local spread over several floors and articulated around courtyards or gardens; presence of short defined by simple geometric shapes (square or rectangle) lined with covered arcades; public area and private distinct from each other (*collegii area and scholarum area*); church off center to the college places but easily accessible to all (parents, students and externals) [11]. Regarding the Jesuit churches, they adopted a system to classroom represented by a large area without columns and a spacious presbytery raised by steps. The plant originally planimetric provided a longitudinal development with a single nave Latin cross [12], with a sequence of side chapels no communication between them. Starting in the early seventeenth century, however, the classic longitudinal shape approached other forms of plant, such as that of the central circular base (or oval) or that of a Greek cross [13]. The transept appeared slightly protruding, preferably inscribed in the base perimeter, and was divided into a shallow rectangular choir, while its zone hosted terminals almost always chapels with large altars. The sacristy was to communicate with the nave but not directly with the presbytery, while the roof of the church, initially flat, then became almost always a barrel vault (Fig. 5). The volumetric intersections were underlined by the presence of domes (Fig. 6), while for the inputs were preferred architraved ports [10] (fig. 7). In this floor plan, simple and practical, it would add a modest decorations and austere, characterized by the mere presence of the architectural orders of the facades of the first facilities churches, facades that still had to look out on the streets or squares.

Fig. 5

Fig. 6

Fig. 7

Fig. 5 Nave with a barrel vault lunetted, the church of St. Elias of Amantea.
Fig. 6 Intrados of the hemispherical dome of the Church of St. Elias the complex Jesuit Amantea.
Fig. 7 Entrance portal of the St. Elias church.

4. Architectural analysis and detection campaign of the former College of the Jesuits

The former Jesuit college is composed of two rectangular bodies that in plan gives life to a L-shape (Fig. 8); the longer of the two volumes, which would be placed in the north-south direction, is characterized in the ends from the junction with the sacristy of the Church of St. Elias. The former college accesses are distributed along the western front, while the church opens its door to the south. The distinctive urban fabric around the former religious complex consists of buildings with different policies: some are well preserved and still inhabited, while others are dropped and now reduced to ruins. In general, the urban surroundings of the former college conveys a feeling of abandonment amplified by the poor conservation of architectural emergency conditions in question. The premises of the old Jesuit college is accessed via the raised entrance, served by a modern staircase made of reinforced concrete, on the first floor, a second input is the ground while the entrance to the church opens the doors of a small church square which lies along a stairway. The Jesuit complex looks like an imposing box (Fig. 9a, b) by the thick walls and the horizontal structures between floors consisting of barrel vaults, groin vaults and cloister vaults. Today the building structure completely lacks coverage and is strongly affected by various disturbances underway, deteriorated and/or collapsed parts and various forms of material decay detectable (Fig. 10.a, b).

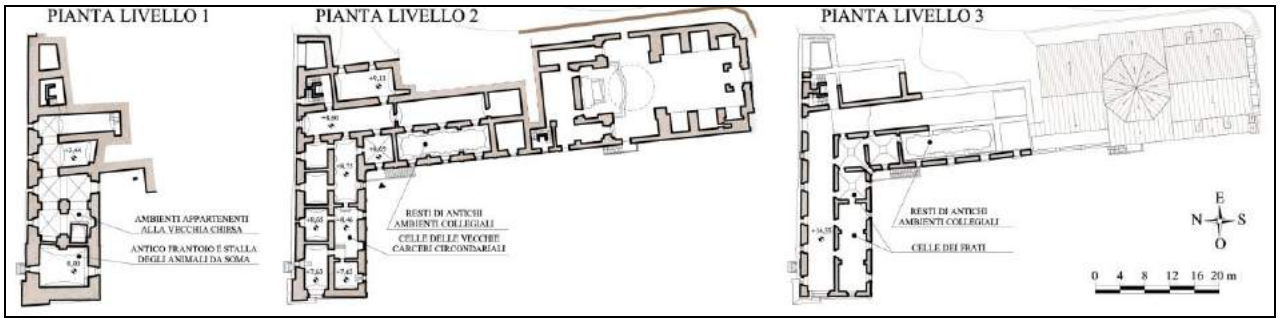

Fig. 8: Planimetrie dell'ex complesso dei Gesuiti di Amantea, con indicazione delle aree funzionali dell'ex collegio.

Fig. 9.a

Fig. 9.b

Fig. 10.a

Fig. 10.b

Fig. 9a, b Views of the northern front of the former school.
Fig. 10 Structural damage characterizing the environments of former college: a) deep and widespread crack pattern; b) depression of a pavilion vault.

A survey campaign, which lasted several months and in several stages (planimetric surveys, elevation, often, of damage and of the forms of degradation), has requested the acquisition of measurements through successive steps. Initially it was carried out the planimetric detection necessary to define the plants of the entire complex. It was, therefore, used the technique of trilateration that exploits the characteristics of non-deformability of the triangle as elementary geometrical figure [14]. Therefore, traced a basic line (straight line parallel to the northern wall of the former boarding school), known coordinate points have been detected ,thanks to a network of triangles having vertices coincide with the corners of the various rooms. Contextually, the measurements of the four sides and the two diagonals of each environment (so as to define a deformable quadrilateral) were performed. Afterwards, by relating environment identified as follows, it was possible to trace the ground plan. This laborious procedure has also permitted to indirectly detect the

thickness of the walls and the imperfect linearity of the same. Following this operation for all the premises of the complex, thanks to CAD computer software used: AutoCAD and Rhinoceros, is the assembly phase of the planimetric measurements was performed, to obtain the floor plans of the rooms inside the building. These transactions were mainly carried out by means of laser distance meter Leica DISTO X310 and supplemented by direct measurements performed using a meter stick and a second tape measure.
About the altimetry detection of indoor environments, the measures taken have been detected almost vertically in an indirect way, given the conspicuous storey height, using laser rangefinder. Once floorplans and elevations has been tracked with Rhinoceros, it was finally realized the 3D model of the Jesuit complex, (Fig. 11 a) compared to the urban complex of Catocastro around the entire neighborhood. Obtained the three-dimensional model, it was possible to easily draw sections (Fig. 11 b), axonometric (Fig. 11 c), perspectives and prospects (Fig. 11 d,s) of the architecture in question, using different scales of representation.

Fig. 11.a

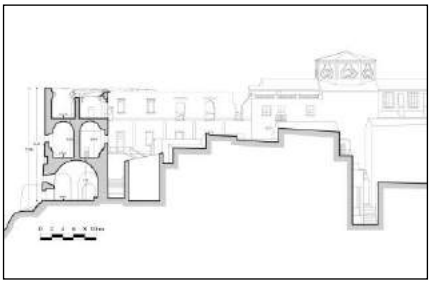

Fig. 11.b

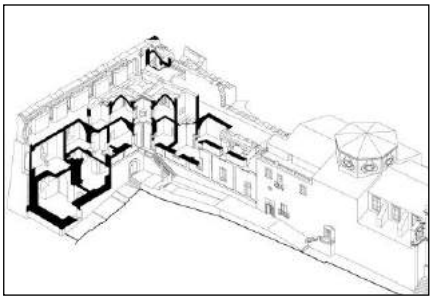

Fig. 11.c

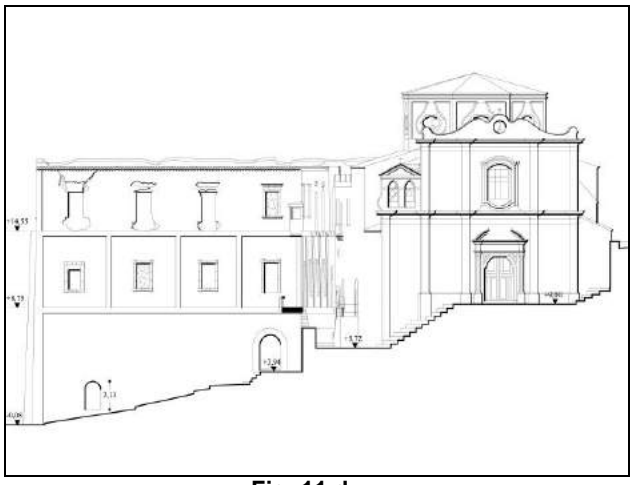

Fig. 11.d

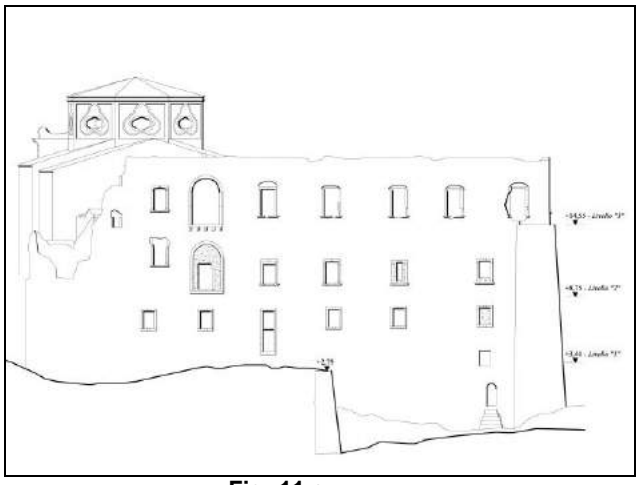

Fig. 11.e

Fig. 11 Processed obtained following the detection campaign: a) 3D model of the entire building complex, realized in Rhinoceros environment; b) cross-section volume north of the former Jesuit college; c) cross-section isometric of the former Jesuit college; d) the statement of the former college southern front; e) the statement of the former college northern front.

5. SEM□ED□ analysis of historic mortar characterizing the masonry structure

To characterize morphologically and chemically the plaster used to build the walls of the former Jesuit college in Amantea, two samples were taken: the sample C.d.G1 by a septal wall of the level of the structure; the C.d.G2 sample from a second wall erected along the II level At digital macroscopic acquisition (Dino-Lite Pro series), the two samples are very similar because both consist of a mixed and porous matrix, composed

of crystals of various shape, probably of sedimentary origin (quartz, feldspar) (Fig. 12 a, b). The samples were placed on aluminum stubs, provided with graphite double sided adhesive disc, and metallized with Au and Pd to the observations by SEM / EDS microscope (Scanning Electron Microscope / Energy Dispersive X-Ray Sectrometry, or EDX). The microscope used is the Nova NanoSem 450, FEI equipped with EDS detector (or EDX), Bruker.

Fig. 12.a **Fig. 12.b**

Fig. 12 Digital photo (Dino Lite) of the samples C.d.G1 (a) and C.d.G2 (b).

5.1. Morphological and chemical analysis – Sample C.d.G1

The sample was examined a portion of the interface between different morphologies; in fact, as is observed from Fig.13a it is possible to recognize on the top the granular matrix constituted by elongated oval crystals (b), that somehow holds together the two clasts, of different morphology and alteration level, observable especially between 1500-1600x (c,d). Among the particles which form the porous matrix we find grass blades and roots structures belonging to higher plants (e, f).

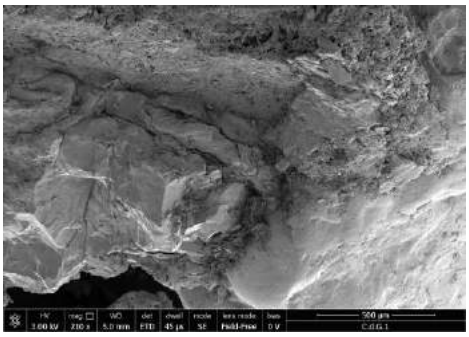

Fig. 13 a

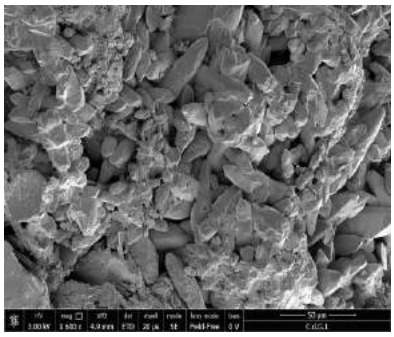

Fig. 13.b

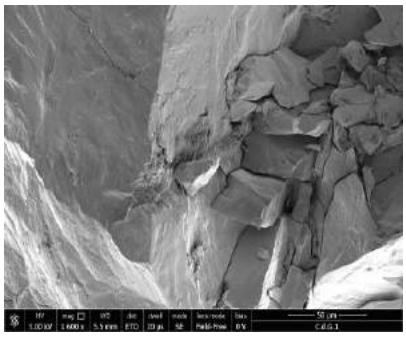

Fig. 13.c

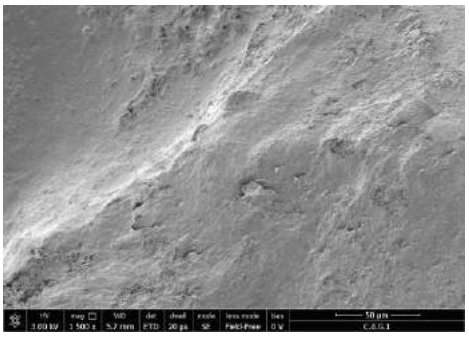

Fig. 13.d

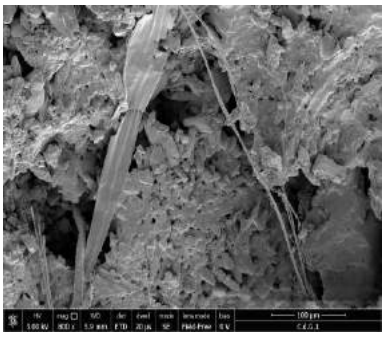

Fig. 13.e

Fig. 13.f

Fig. 13 General view (a) of C.d.G1 sample (500 pm); b) details of the matrix with oval crystals; c) clast crumbled into slabs; d) clast much altered; e, f) blade of grass and root apparatus.

At the interface between matrix and clasts the mult-ielement map and the relative EDS spectra were performed (Fig. 14.a). From the spectra the matrix has a carbonate nature (Fig. 14.b), while the clast composition has predominantly silica (Fig. 14.c).

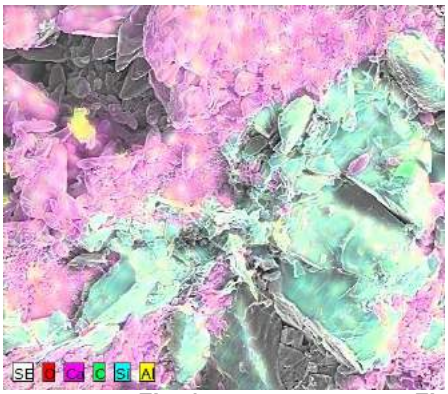

Fig. 14.a

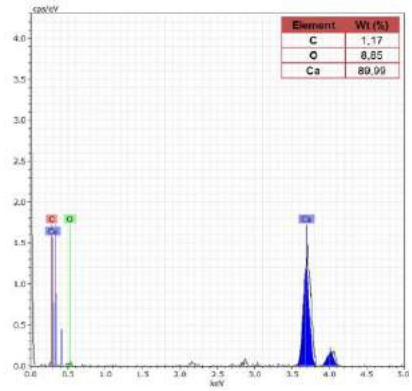

Fig. 14.b

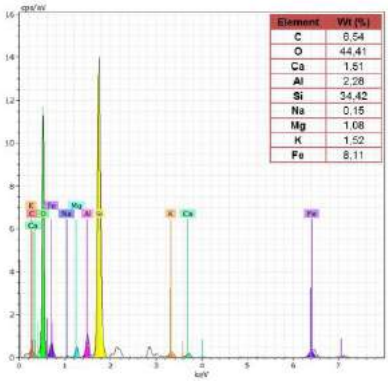

Fig. 14.c

Fig. 14 Multi-element Map of the interface analysed (a); b) EDS spectrum of a portion of the matrix; c) EDS spectrum of the sharp clast.

5.2. Morphological and chemical analysis - Sample C.d.G2

Following the same strategy of analysis, also in the sample C.d.G2 a portion of the interface between different morphologies was examined. As can be seen from the Fig. 15 a, the fragment is a mixture of clasts of different size, morphology and alteration level, bound by a matrix identical to the previous, therefore grainy and constituted by elongated oval crystals (Fig. 15 b). Also in this case are identify other kind of crystals constituting the porous matrix (Fig. 15 c, d) and biological degradation traces represented by fungal ramifications (5-20 □m) (Fig. 15. It, f) that invaded completely the surface of the crystals.

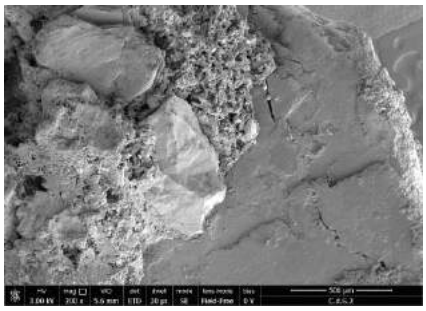

Fig. 15.a

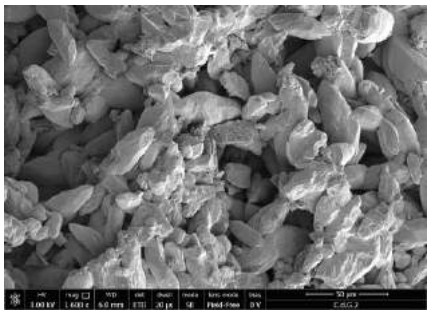

Fig. 15.b

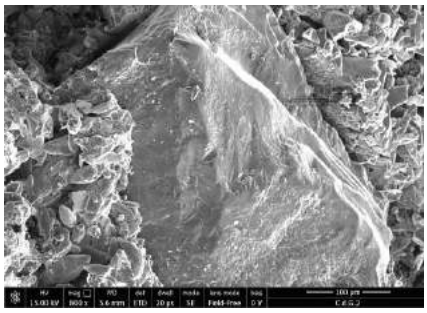

Fig. 15.c

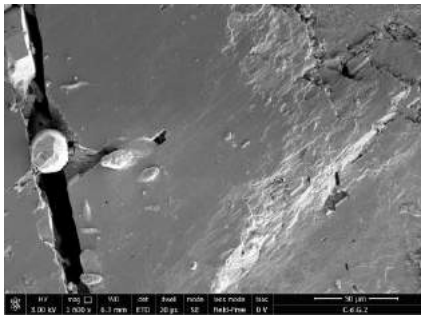

Fig. 15.d

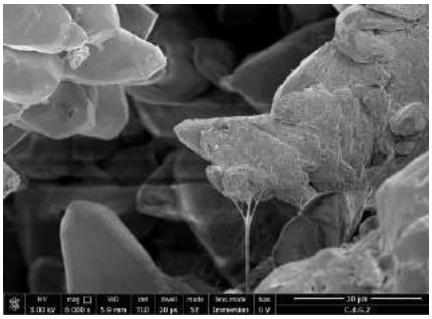

Fig. 15.e

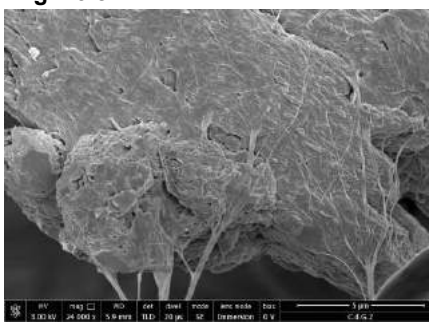

Fig. 15.f

Fig. 15 General view (a) of the sample C.d.G2 (500 □m); b) details of the matrix with oval crystals (50 □m); c, d) details of the matrix and 50 to 100 □m; and, f) fungal ramifications that degrade the matrix crystals (20 and 5 □m).

Also here the multi-element map and the relative EDS spectra, performed in the interface, shows a matrix of carbonate nature (Fig. 16.b) with a different contents of Al and Si for the clasts: the clast fractured, larger in size, is probably an aluminum K silicate (fig. 16.c), while the smaller, embedded in the matrix, has a predominantly siliceous composition (Fig. 16.d).

Fig. 16.a

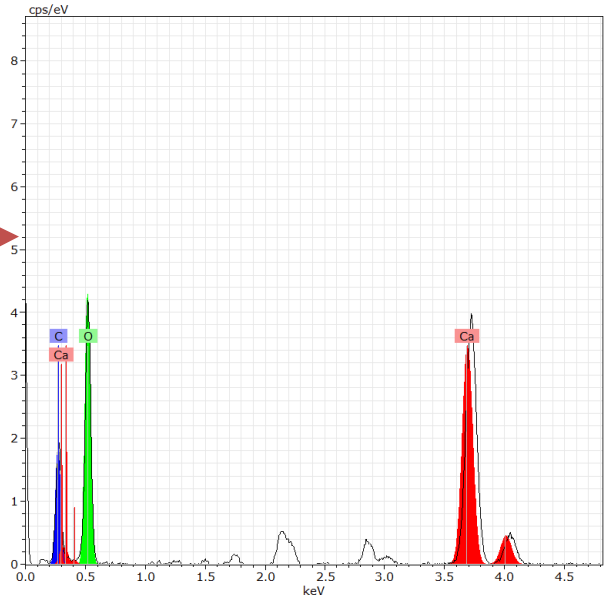

Fig. 16.b

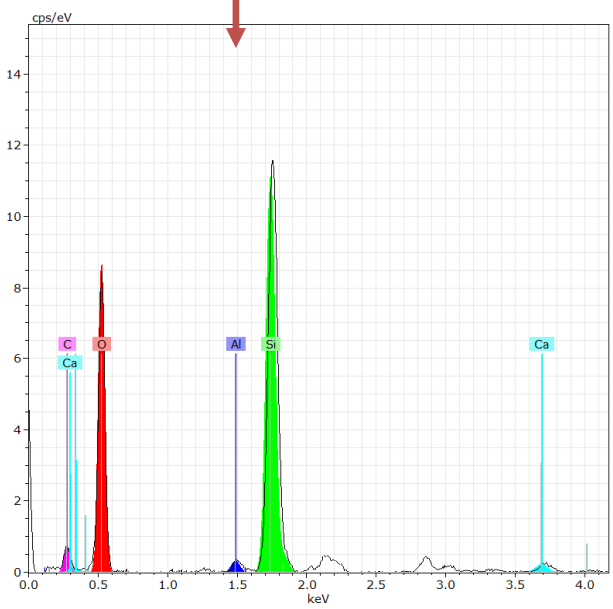

Fig. 16.c

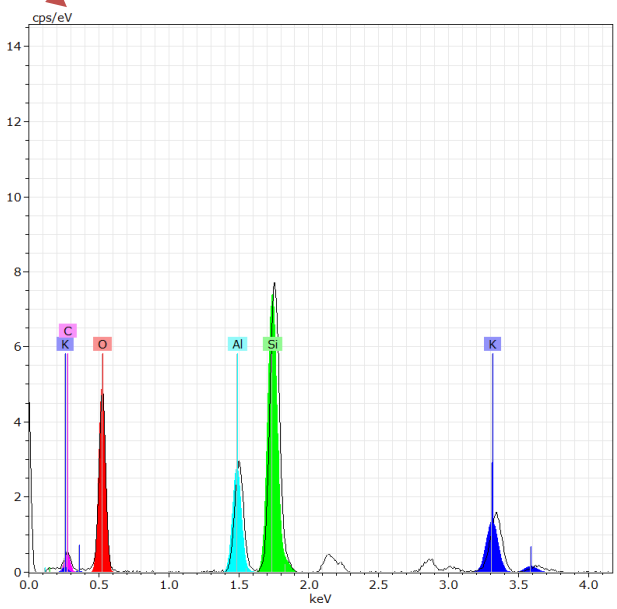

Fig. 16.d

Fig.16 Multi-element Map analyzed at the interface a); EDS spectrum of the matrix b); EDS spectrum of the larger clast shattered c); EDS spectrum of the smallest clast embedded in the matrix d).

6. Conclusions

From the results obtained through the morphological and chemical characterization SEM/EDS of plasters taken from the historical architecture considered, the most interesting data is the choice of materials to be used: during a future phase of structural consolidation could be certainly the carbonate nature of the plaster wall. In fact, the high presence of Ca is certainly a factor to take into consideration if you put it in relation to environmental conditions characterizing the complex. In fact, the constituent the masonry shell architectural, is strongly conditioned by the presence of rising water also facilitated by the high porosity of its walls (humid environments favor also the formation of communities of different kind of organisms that can destroy the materials moving between the particles). The damp environment and the chemical and morphological characteristics of the investigated historical mortars would threaten the stability of the structure, causing corrosion problems, with negative effects on the walls. This problem could be solved adopting in the future the reinforcing elements of the metallic type (rods, electrowelded meshes, metal chains, etc ...).

By virtue of the features of the investigated historical mortars, the nature of the masonry and of the conditions of implementation shall be investigated, in order to recover the structure of the former Jesuit college, where possible, using appropriate materials for structural strengthening for not to be affected by the corrosive phenomena and, more generally, of the environmental conditions. Among the materials adoptable are mentioned the fiber reinforced polymers FRP materials, which are composite materials consisting of a polymeric matrix of an organic nature and continuous reinforcement fibers, of various nature, with high mechanical properties. The FRP materials have as their main physical characteristics: the extreme light weight, high mechanical strength, high corrosion resistance, high thermal insulation and high dielectric properties and non-magnetic. Since the two-phase composite materials, the FRP have an anisotropic behavior and heterogeneous, as well as in mechanical terms have the advantage of maintaining a linear elastic behavior until failure [15]. Using the FRP, it exploit the enormous tensile strength of the reinforcing fibers, which represent the resistant elements of the composite. FRP composites are, therefore, employed with the purpose of counteracting the axial tensile stresses, are easily absorbed by the fibers and lend themselves optimally to be applied in aggressive environments.

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Identifying the Sustainable Development by Fuzzy Set Theory: Evidence from Italy

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Abstract
The measurement of regional sustainability is always of great significance, since it is essential for governments to set targets and track progress. It is found that many regional unsustainable issues are caused by imbalanced development of the economy, society and the environment. Based on this, the use of the individual components of development can be misleading; as a consequence, their coordinated use is of greater interest since the economic, social, and environmental subsystems are organized in a synergistic way and together they effectively develop and maximize sustainable development.
The aim of this paper is to calculate, by using fuzzy analysis, an indicator of sustainability which incorporates the three components of sustainable development (economic, social, environmental), in order to have a measure of sustainability resulting from the combined action of these three components. The analysis is conducted on data from the 20 Italian regions. The results of the investigation show that regions in northern Italy have a higher degree of sustainability compared with those in the south.

Keywords: sustainable development; multi-dimensional concept; fuzzy set theory.

1. Introduction
The report proposed by the "Stiglitz Commission" (Stiglitz et al., 2009) contains twelve recommendations to follow in order to improve the measurement of well-being. Although it does not result in the construction of an alternative GDP indicator, it stresses the idea that well-being is multidimensional. As a consequence, it is necessary to integrate the measurement of market activities with those most closely related to the material standard of living of people and issues of sustainability and social cohesion.
Sustainability is increasingly being understood as critical in the wider field of Development Studies. This stands to reason in contemporary global society, given the environmental, social and economic pressures on people and places of the world. While many of these pressures have persisted for centuries, others are new and pose particular challenges for those interested in development.
From the above, it is apparent that indicators to measure the sustainable development and the policy options to improve citizens' quality of life need to be studied more thoroughly. In this perspective, in the present paper we calculate by using fuzzy analysis an indicator of sustainability which incorporates the three components of sustainable development: economic development, social development and environmental development. The analysis will be conducted on Italian regional data.
The paper is organized as follows. Section 2 presents implementation of Totally Fuzzy Analysis, Section 3 illustrates the data used, while Section 4 shows the results. Finally, Section 5 concludes.

2. Method: Totally Fuzzy Analysis
As components of human well-being, Sustainable Development is a multidimensional and somewhat vague concept. Fuzzy set theory, conceptualized by Zadeh (1965) and developed by Dubois (1980), is a suitable

mathematical tool able to analyze phenomena which are hard to place in a set. In his seminal paper, Zadeh (1965) defined fuzzy sets as "a class of objects with a continuum of grades of membership". While the early applications of fuzzy analysis were in science and engineering (namely biology and artificial intelligence), fuzzy set theory has more recently been increasingly applied to many issues in various social science and business fields. The use of this methodology in economics is quite new and the best-known studies based on fuzzy set theory are multidimensional analysis of poverty (see Cerioli and Zani, 1990; Cheli and Lemmi, 1995; Chiappero Martinetti, 2000).
Our composite index using a fuzzy set approach is constructed in two stages. The first involves the definition of the membership function of a given set associated with each region and indicator; the second stage concerns the calculation of the weights required for the aggregation of the membership functions. The function can take several forms but we consider Totally Fuzzy Analysis (TFA), as defined by Cerioli and Zani (1990). Among the steps to construct a composite index, there is the definition of the weights to be assigned to each component of the index, and finally of their aggregation.
Below we list the steps of the analysis.

Assume *i ∈[1,N]* regions, *j ∈[1,M]* indicators of Sustainable Development (SD). Consider *Xj = {xj: j = 1, … ,M}* vector of components respectively of SD. Variable x_j^i is the value taken by indicator *j* for the *ith* region.
When ranking values of *j* by increasing order (the lower the value of a given indicator, the higher the deprivation), function $\mu_j(i)$ is defined as:

$$\mu_j(i) = \begin{cases} 1 & if\ x_j^i \leq x_j^{min} \\ \dfrac{x_j^{max} - x_j^i}{x_j^{max} - x_j^{min}} & if\ x_j^{min} < x_j^i < x_j^{max} \\ 0 & if\ x_j^i \geq x_j^{max} \end{cases}$$

with $x_j^{min} = Min_i(x_j^i)$ and $x_j^{max} = Max_i(x_j^i)$.
Function $\mu_j(i)$ provides the deprivation degree of the *ith* region relative to indicator j.
Inversely, if indicators are rearranged by decreasing value, function $\mu_j(i)$ is defined as:

$$\mu_j(i) = \begin{cases} 1 & if\ x_j^i \geq x_j^{max} \\ \dfrac{x_j^i - x_j^{min}}{x_j^{max} - x_j^{min}} & if\ x_j^{min} < x_j^i < x_j^{max} \\ 0 & if\ x_j^i \leq x_j^{min} \end{cases}$$

These functions are increasing linearly between zero and one according to the degree of deprivation.

2.1 Definition of the weights

Following Cerioli and Zani (1990), the composite index is defined by taking the weighted arithmetical mean of the membership function according to the component M indicators:

$$\mu_{SD}(i) = \sum_{j=1}^{M} \omega_j \mu_j(i)$$

with $\omega_j \geq 0$ and $\sum_{j=1}^{M} \omega_j = 1$, where ω_j is the weight attributed to indicator j.
Following Chiappero Martinetti (1996) the function must have a value between maximum and minimum and must allow interaction between the indicators.
The weights are defined as:

$$\omega_j = \frac{ln\left(\frac{1}{\bar{\mu}_j}\right)}{\sum_{j=1}^{M} n\left(\frac{1}{\bar{\mu}_j}\right)} \quad \text{with} \quad \bar{\mu}_j = \frac{1}{N}\sum_{i=1}^{N} \mu_j(i)$$

The weight ω_j is an inverse function of the mean deprivation level relative to the indicator *j*. The logarithmic curve function introduced into the weighting system shows that sustainable development does not vary in a linear way.

3. Data

The analysis focuses on the Italian regions, which correspond to the EU NUTS-2, and it covers the year 2012. The data are provided by ISTAT (Italian National Institute of Statistics).
In order to construct the indicator, we consider one variable for each component of sustainable development. The number of treatment plants is used as a proxy of the environmental component, life expectancy as a proxy for the social component and GDP per capita as a proxy for the economic component. The use of only

three variables is bound to the non-availability of other relevant variables. In Table 1 we report some descriptive statistics of the three variables used.

variables	number of treatment plants	life expectancy	GDP per capita
mean	1788.75	82.2472	24997.165
standard deviation	3851.297	0.611121	6074.538596
min	174	80.547	16368.6
max	18162	83.2545	34464.7

Table1: Descriptive statistics. Source: Our calculations based on ISTAT data.

4. Results

In this section we report the results of the environmental sustainability index. We considered indicators rearranged for decreasing values: high values of the indicator imply high environmental sustainability. This index ranges from zero (no sustainability) to one (maximum sustainability).

Table 2 shows the results of the environmental sustainability index. In particular, we show that regions in central and northern Italy have a higher than average degree of sustainability (0.24); the regions in southern Italy show a low degree of sustainability with values below average. Furthermore, we observe that the region ranked last appears to be Campania. These results highlight the presence of a sort of dualism as far as sustainability is concerned. In terms of policy, ad hoc interventions are necessary that take account of socio-economic and environmental differences in the various Italian regions.

Macro-Areas	Regions	Environmental Sustainability Index
Northern Italy	Piedmont	0.874
Northern Italy	Valle d'Aosta	0.417
Northern Italy	Liguria	0.196
Northern Italy	Lombardy	0.313
Northern Italy	Trentino Alto Adige	0.372
Northern Italy	Veneto	0.257
Northern Italy	Friuli-Venezia Giulia	0.257
Northern Italy	Emilia-Romagna	0.301
Central Italy	Tuscany	0.311
Central Italy	Umbria	0.225
Central Italy	Marche	0.251
Central Italy	Lazio	0.230
South Italy	Abruzzo	0.167
South Italy	Molise	0.161
South Italy	Campania	0.001
South Italy	Puglia	0.109
South Italy	Basilicata	0.092
South Italy	Calabria	0.065
South Italy	Sicily	0.047
South Italy	Sardinia	0.120
Mean		0.24
standard deviation		0.18
min		0.00
max		0.87

** In shaded boxes we show values exceeding the average value.*

Table 2: Environmental Sustainability Index, year 2012. Source: our calculations based on ISTAT data

5. Conclusions

Since 2000, various studies have focused on indicators and indices of sustainable development. International and regional organizations (The United Nations, 2004,2007; World Bank, 2013, 20104; European Commission, 2003) have composed a list of regional sustainability indicators, which have been used as references for many countries and communities to develop their own sustainable urbanization indicator systems. However, most of the sustainability indices, which are widely used in the sustainable development debate, only use the form of the arithmetic mean or geometric mean for the aggregation of sustainable development indicators. It is necessary to find a more scientific method to perform such research.

In light of the above considerations, we assessed sustainable development in Italy through a multidimensional indicator of sustainability by using fuzzy analysis. The results of the investigation show that there are substantial differences among the Italian regions in terms of sustainability. Consequently, different policy recommendations are required in order to achieve similar levels of sustainable development throughout Italy. Since such recommendations need to consider the socio-economic and environmental differences of the Italian regions, what is needed is a set of appropriate region-specific policies.

Future research goals will include the calculation of a richer indicator which also considers other aspects of sustainability. Further, it might be interesting to investigate environmental sustainability at a finer administrative level, focusing on provinces and municipalities.

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Architects and Slums in Recife (Brazil): a forgotten agenda?

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Abstract
Taking into account that the city of Recife in the begining of the last century was called *the cit of mocambos* (small communities of runaway slaves); that the *local politics*, favored this agenda since the 1930s; that this topic was important for local *artistic production* and that architects, before the inauguration of an independent architecture school, in 1959, studied along with these artists (painters, sculptors) at the School of Fine Arts in Recife; one could assume that the issue of slums was present in their agenda since the first debates and that - given the current relevance of this social problem in the city - it would never be forgotten by local architects.
However, as we will see, reality is not quite like that and the issue of slums not only appears late among architects as it seems to lose importance - or even be disregarded - nowadays.
The paradox goes on, since this agenda is consolidated among architects in the seventies as a result of the demands for *public policies* related to it whereas it was totally absent of the university *classroom*. Inversely, this theme is currently *studied* at the universities, but it has disappeared as a *professional* possibility, losing the strength and core value it once had for *public policies*.
The text seeks to retrace the major initiatives and projects of this debate, their gaps, and, above all, reflect upon these paradoxes.

Key words: Architects and slums; low-income housing; history of the profession of architect; social function of architects

1. Recife, “city of the mocambos"[1].
The issue of mocambos or slums was in the agenda of the city of Recife in the early decades of the last century. The political, intellectual and administrative debate in the 1920s and 1930s focused on this type of housing primarily for revealing a serious social and public health problem. In this sense, groups supporting the development of studies to improve life conditions of this population as well as those that simply advocated the eradication of the mocambos converged to the same point. Such debate had its heyday in the 1940s with the creation of the Serviço Social Contra o Mucambo (Social Service Against the Mucambo) - SSCM.
Despite its socioeconomic origin, the problem of Mocambos, strongly impacted the city's territory, making it also an spacial problem. In the begining of the last century, the city of Recife was indeed called *cit of the mocambos*, due to the massive presence of this kind of precarious housing, which was estimated in the 1930s as more that 20,000 mocambos, equivalent to 50 of the existing dwellings. Such precariousness was the result of the rapid populational growth - from 1900 to 1950 there was a 350 increase in the number of inhabitants of the city - and also because it was hard for the local economy to place this amount of people into the formal labor market. Thus, in a short period of 10 years, between 1940 and 1950, there was an increase of 50 in the population of the city, going from 300,000 to over 500,000 inhabitants. As for dwellings, in 1950, according to municipal records, only 27 out of

70,000 homes were made of mansonry, which means that 73□ of them were made up of precarious materials such as wood, cardboard, - in coastal areas, coconut straw - and even mud, something common in rural areas of the state of Pernambuco.[2]
The precariousness of these dwellings was not only related to the materials and construction techniques. It was defined by the virtually total absence of sanitation, sanitary facilities, electricity and tap water.
This scenario of social, economical and spacial insecurity, would also be reflected in local artistic production where sculptors and painters started portraying mocambos and their dwellers, workers from the so called informal labor market - as the hawkers - as well as children and homeless people.

2. YEARS 1950: a profession in search of artistic recognition.

Having said that, we pose the following question: how could the architects of Recife, whose profession was consolidated in the 1950s, with the creation of the departamento pernambucano do Instituto de Arquitetos do Brasil (Pernambuco department of the Institute of Architects of Brazil) [3], in 1951, and the innauguration of a school that would be the first independent school of architects, the School of Architecture of the University of Recife, in 1959, be absent, at first, from the debate over mocambos□
The first explanation is due to the fact that this debate, in the first half of the 20th century, falls within the actions on urbanism, sanitation and city expansion. The engineers Domingos Ferreira, José Estelita, Saturnino de Brito, Jo□o Cleophas de Oliveira and others led the debate.[4]
The same occured in the school of architecture, once, during that period, the major contributions on the theme came from the professor and engineer Antonio Bezerra Baltar, in charge of the urbanism course. So it makes us assume that part of the inactivity of architects was due to the fact that the profession felt represented by the important contribution of this professor form the school of architecture or even by individual actions, as seen later with the case of architect Gildo Guerra at the Social Service Against the Mocambo - SSCM.
What we mean is that, notwithstanding individual engagements, we cannot say that, by that time, the issue of mocambos would mobilize the professionals in general. Dearer to the architects was not the debate on precarious housing, but instead, it was the projects related to the rich downtown area of the neighborhoods of Santo Ant□nio and Boa Vista, with various urban reordering and beautification plans - though such plans reflected upon the problems related to the city's expansion. However, also in this field and as the profession was in a fragile position back then, the works were led by architects that were more active in the south of the country, such as Nestor de Figueiredo, Fernando Almeida, At□lio Corr□a Lima and Ulh□a Cintra - and even by the attempt to bring the French architect Agache.[5]
If in the beginning, and while the education of architecs took place inside the School of Fine Arts of Pernambuco, between 1932 and 1959, this gap was eclipsed by the virtual non-existence of architects graduated in Recife (classes were usually made up of 5 students, the faculty belonged to different programs and some professors became architects through practical experience and not because they held a degree in Architecture[6]) - and the true reasons for this gap would become clear in the second half of the 20th century when the profession is finally consolidated and Brazilian architecture achieves international recognition very rapidly.

3. YEARS 1960-70: from activism to urban planning agencies.

In the 1960s the profession of architect seemed perfectly consolidated in Recife. One contributing factor to it, in the field of education, was the regular demand of students to the architecture program of the then Architecture School of Recife along with the begining of a recruitment process of professors among former students who graduated at that institution[7]. In the field of professional practice there is a growing demand for the work of architects specially due to the setting of an educated middle class and the consolidation of an increasingly vertical building-oriented real state market.
The city was growing fast. In a 10-year period, between 1940 and 1950, the city's population went from 300,000 to over 500,000 inhabitants, a 50□ increase[8]. This scenario exacerbated in the following decades, especially with the intensification of a migration flow from the countryside to the city, which boosted new slums through the occupation of flooded areas, idle and vacant land and even public spaces.
As a result, in the following decades and until 1970s, we see an increasing precariousness in urban housing and an important change in the way the city's territory was occupied, once the intermediate spaces separating some neighborhoods were occupied, bringing to the city that distinguishing dense and compact blotch of a metropolis for the first time [9]. In 1960, the city had over 700,000 inhabitants and 60□ lived in substandard housing. In 1970s, the population reached 1 million inhabitants [10].
However, notwithstanding the scenario of increasinly precarious housing conditions, the formal city enters a clear metropolization and verticalization phenomenon, opening up a vast field of work for

architects. Along with that strong demand for architecture services comes the positive reputation that Brazilian architecture achieved back then, with Oscar Niemeyer as its greatest icon, especially after the construction of Bras□lia, the new capital of the country, in 1960.
It seems that, in the field of education and professional practice, we find a solid representation of the architect's activities as being independent and based in private offices that aim to create projects with supreme artistic value - leaving aside, during those times, the manifestation of low-income architecture and its vernacular or regional calling [11].
It is also worthy noticing that both in the field of education as as in the professional practice we cannot find a professional profile with clear social concerns, like architects and professors Demétrio Ribeiro, in Rio Grande do Sul state and Vilanova Artigas, in S□o Paulo - both honored and invited to be patrons of graduating classes on several occasions. In Recife, the role of systematizing a professional mindset would be performed by men with a more practical profile who worked mainly in offices, such as architects and professors Delfim Amorim and Ac□cio Gil Borsoi, but, moreover by professor Evaldo Bezerra Coutinho, bachelor of Laws who used to reflect upon the philosophy of art, and that for many years was the director of the school of architecture and also patron of graduating classes.
In short, whether it is true that architecture is consolidated because of its artistic features, here in Recife such a trait seems to be even more evident, once it is based in the absence of a more in-depth debate on the social role of architecture and even on the techincal properties of materials and the technological grounds of buildings.
That is an interesting diagnosis as we see in Brazil and particularly in the Northeast in the 1960s a broad political and cultural debate about popular culture, such as the Movimento Cultura Popular (Popular Culture Movement) - MCP that used to bring togheter various professionals and intelectuals from Recife and also because back then the paitings and sculptures produced in Recife - mainly through the so-called Atelier Coletivo (Collective Workshop), founded in 1952 - portrayed a clear social concern, focusing on the misery of the workers and residents of the city.

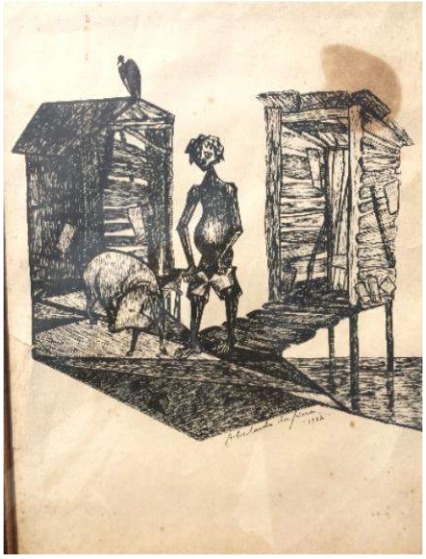

Fig 1. Engraving by Abelardo da Hora.
1962. SOURCE: Collection and photo by the author

Fig 2. Engraving by Abelardo da Hora.
1962. SOURCE: Collection and photo by the author

Fig 3. Oil on wood painting by José Cl□udio.
1971. SOURCE: Collection and photo by the author

Once again, it seems to us that there are individual cases of engagement - especially with a political focus - related to slums and low-income housing but it is not really a debate that characterizes a socially-oriented trajectory of the architects of Recife. This profile of social engagement will be formed little by little, as architects - including professor-architects - move to the field of urban planning once the demand would grow sharply because of the creation of large public planning agencies, such as the Superintend□ncia para o Desenvolvimento do Nordeste (Superintendency for the Development of the Northeast) - SUDENE (1959) and the Fundaç□o de Desenvolvimento da Regi□o Metropolitana do Recife (Foundation for the Development of the Metropolitan Area of Recife) - FIDEM (1974).

That is the moment when, in the field of practice, we see a clear profile of the urban planner and also a political activism about low-income housing. In the field of education, we find a socioeconomic reflexion strengthened by the creation of the Master's Degree Program in Urban Development at UFPE in 1972-75. Anyway, the project-related education at the undergraduate program of architecture continues to prioritise the monumental architecture related to a style as is the case with modern architecture.

Thus, in the field of practice, from this period on, we see a great amout of research and then architecture projects - coming from public requests and financing - that seek to characterize vernacular low-income housing as architecture with unique technical merit and artistic value. This is the case of a research conduted through a partnership between UFPE and SUDENE entitled "Traditional Construction Methods of the Northeast"[12] and also the "S□o Bento Project"[13]. This latter received an award from the Institute of Architects of Brazil - IAB in 1975.

Fig 4. Low-income house in the Northeast.
SOURCE: Architect Neide Mota. SUDENE (1978)

Fig 5. Low-income in the Northeast.
SOURCE: Architect Neide Mota. SUDENE (1978)

Fig 6. S□o Bento Project. Architect Liana Mesquista.
SOURCE: MESQUITA (1972)

Fig 7. S□o Bento Project. Architect Liana Mesquista
SOURCE: MESQUITA (1972)

These works express an important change in the mindset of architects on vernacular low-income housing, as they contribute to turn what was once seen as a territory of precariousness and poverty into a field of constant invention and creativity. Through these studies, we realize that the territories of poverty gradually assume an undeniable aesthetic quality, though they start losing their capacity of political transformation, conquered especially in the 1960s.

The paradox of this transformation in the mindset and in the professional practice of architects, is that it starts because of a strong state demand and in the very same moment of the military coup from 1964, which interrupts social and political mobilizations so typical of 1960s. Thus, despite the field of political activism be violently restricted, low-income housing projects seemed to multiply due to the strong economic growth and the creation of important planning agencies and financing facilities as the Serviço Federal de Habitaç□o e Urbanismo (Federal Housing and Urbanism Service) and the Banco Nacional de Habitaç□o (National Housing Bank) - BNH.

The consolidation of this field of action made room to northeastern architects who claim to have some sort of expertise on the technical and aesthetic aspects of local low-income housing, as well as a particular knowledge on the living habits of the northeastern people and therefore differentiating them from the competing architects from the south of the country.

However, it is important to notice that the professionals in general kept on working in their private architecture firms - strongly stimulated by very high rates of economic growth in the country - and, also, that those new experiences in low-income housing did not alter the routine of undergraduate programs in architecture, specially the project workshops. Such movement takes place in the field of professional practice, specially those activities related to state requests, including research in graduation programs.

4. Years 1980-1990: redemocratization and urbanization of slums

The marked economic growth in the 1970s, brought also a sharp increase in social inequalities that can be seen spacially in the increasing number of slums in Recife: between 1970 and 1990 the population of Recife goes from 1 million to 1.3 million inhabitants where 64□ lived in substandard housing units [14].

However, the end of the military dictatorship - introduced in 1964 - and the consolidation of the democracy in the early 1980s, made room for a redefinition of public policies related to underprivileged areas, opening up a field of work for architects.

This field of work gets consolidated through pioneering actions of the Comiss□o de Justiça e Paz (Justice and Peace Commission) of the Archidiocese of Olinda e Recife, at the time of Dom Hélder C□mara, where many professionals including lawyers and social workers would work in underserved areas of the city.

The well-known movement of the Non-Governamental Organizations - NGOs dates back to those times and they would help urban social movements, mainly those including the inhabitants of slum areas, that from 1980 on were called Zonas Especiais de Interesse Social (Special Areas of Social Interest) - ZEIS. This movement would count on the participation of various architects who, for the first time, would have an institutional space - the NGOs - working out of public planning agencies and private firms, to consolidate their professional work related to underprivileged areas [15].

The first emblematic experience in this sense came through the so-called Teimosinho Project that proposed a zoning plan for the ZEIS area of Bras□lia Teimosa. Then came several other experiences of urbanization of slums as the Entra-à-Pulso Slum coordinated by the ARRUAR NGO's architects.

Fig 8. Project for Entra à Pulso Slum. Architect Luiz Muriel Carneiro
SOURCE: CARNEIRO (1993).

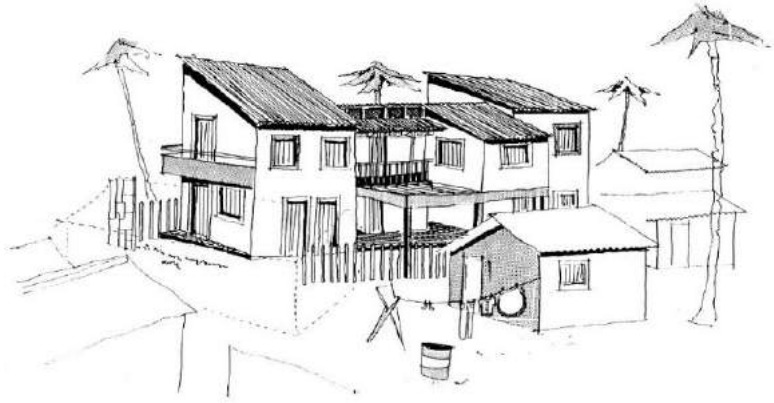

Fig 9. Project for Entra à Pulso Slum. Architect Luiz Muriel Carneiro
SOURCE: CARNEIRO (1993).

In fact, such experiences tried to create a professional profile in Recife similar to that of architect Carlos Nelson Ferreira dos Santos, from Rio de Janeiro and they consolidated a debate around the value of the irregular and organic delineation and aesthetic of slums. As the deconstruction of the image of poverty and precariousness normally associated to construction techniques and northeast housing began in the 1970s, in the 1990s the housing environment of urban slums became the object of appraising interpretations.
However, even though during this period there was a favorable environment for pratical work in underserved areas, in the field of education in architecture, specially in project workshops, the debate still clinged to official architecture with modernist inspiration.

5. Current debate: slums, a forgotten agenda?

In the year 2000 the population of Recife reaches 1.4 million inhabitants and nearly 50 of them still live in slums or ZEIS [16]. However and paradoxically, although the proportion of people living in slums was still significant there is a decrease in the importance of the issue of slums in the city's public policies and in the debates among architects.
The crisis in the leftist thinking at the turn of the century contributes to such transformation, once these groups were the ones at the forefront of the discussions related to slum urbanization. Moreover, such fact takes place right after the coming to power of left-wing groups to Recife's Administration, in 2003, which makes us state that the change in the approach seems to indicate that the issue of slums appears to be directly associated to political groups in *search of* spaces of power. So, as soon as the strategy

becomes the *continuit*□in power, which implies spreading the political foundation grounds, it seems that there is a displacement of the focus on the debate on *poor communities* towards *all individuals* in the city. That is how at the turn of the century we see a shift in the debate on the *portions of territor*□- as is the case of slums - to a broader discourse that speaks on behalf of *the entire territor*□of the *cit*□.
Besides, if in the 1990s the issue of slums underwent a major reconceptualization that acknowledged its *aesthetic* qualities, the debate at the turn of the century seems to send it back to its condition of *substandard areas*, thus suggesting a more *technical* than *aesthetic* or *political* approach.
This more *technical* approach to the problem of slums, appears, for example, in the self-construction programs, once they abandon traditional practices of *communit*□*-based* □*oint* efforts to *on-site* construction training programs that aim to prepare unemployed workers to join the labor market, in a clear strategy of professional reintegration.
The professional associations also follow these transformations, like the program Construa Certo (Build it Right) from the Pernambuco department of the Institute of Architects of Brazil - IAB-PE. In 2003, they attempted to train architects to provide technical advice at the social housing on-site construction training programs of the Municipality of Recife, or even to slum dwellers.
These initiatives could have consolidated a new field of professional work for architects if they were not simply ephemeral and transitory experiences. Notwithstanding the slum areas being nowadays mostly protected by the Regulatory Plan of Special Areas of Social Interest - PREZEIS, created in 1987, the political novelty in social housing in Recife comes with the creation of housing projects by real state companies within the Minha Casa Minha Vida (My House My Life) Program, created in 2009 where all construction works follow traditional methods and do not contemplate the restoration or urbanization of slums.

In fact, and as we have already mentioned, the debate among architects on the urbanization of slums in this century has been overshadowed by the privilege given to the emergence of a broader debate focused in the city. This happens not only in the field of the architect's professional practice, but also in civil society movements and the academia.
In that sense, even if we see a debate about the city that contemplates the vernacular low-income architecture in the field of education, the institutional possibilities for consolidating a professional practice for the slum areas in the city seem quite remote when we compare them to the 1960s and 1990s.
With that, a social representation that still seems far from fostering a social function for architects to work with underserved populations in the city of Recife is renewed.

Fig 10. Slum on stilts. 2003.
SOURCE: Photo by the author.

Fig11.On-site construction training for low-income housing.
SOURCE: Photo by the author.

6. Conclusion

For these reasons, although the issue of slums emerges in the political, intellectual and artistic mindset in the first decades of last century, it is only incorporated into the local architectural debate - notwithstanding individual engagements - in the 1970s because of the demands from public planning agencies. Even after that time, despite seeing this subject in academic research of the Master's Program in Urban Development of the UFPE, we can state that it remains absent from undergraduate courses, especially those oriented to project workshops.
This situation remained the same even during the bustle of the 1960s, when the matter of low-income housing invaded the political and intelectual discourse in order to change the country.
This issue only appears more bluntly among architects when the country resumes its democratization process and with the emergence of the discourse of poor communities taking part into the municipal administration. This condition got stronger with the phenomenon of popular assistance provided by Non-Governamental Organizations - NGOs, once they ensured institutional grounds where architects tried to establish a professional practice linked to urban social movements and slum areas.
The turn of the century closed a series of paradoxes on the theme: the emergence of the thinking about the city seems to overshadow the debate on the territories of slums, though, in the project workshops at the universities an important debate about renovation of low-income housing and vernacular architecture arised. Thus, slums start occupying architecture students' clipboards at the very moment the institutional conditions disappear - in public planning agencies and in private offices - and no longer ensure a real integration of these professionals in slum urbanization practices as seen in the 1970s or 1990s with the NGOs' phenomenon.

Notes

[1] This term comes from the title of the work of the historian Zélia GOMINHO (1998) entitled "Veneza americana x mucambopolis: o Estado Novo na cidade do Recife." ("American Venice x mucambopolis: the Vargas Era in the city of Recife")

[2] Statistical data from the Municipal Records of Recife, mentioned by BALTAR (1956).

[3] See MOTTA (2002).

[4] On this subject, see LIRA (1996).

[5] See OUTTES (1991).

[6] On the Architecture Program at the School of Fine Arts, please see MARQUES (1983).

[7] See MOTTA (2009).

[8] Statistical data from the Municipal Records of Recife, mentioned by BALTAR (1956).

[9] See PONTUAL (2001)

[10] Statistical data from POLIS Institute. www.polis.org.br

[11] See MOTTA (2009).

[12] Research coordinated by architect Neide Mota. See SUDENE/UFPE/CNPQ (1978)

[13] Project from architect Liana MESQUITA. See MESQUITA (1972)

[14] Statistical data from POLIS Institute. www.polis.org.br

[15] See MOTTA (1991) and MOTTA (1993)

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Three-dimensional integrated survey and BIM GIS management platform in the case study of House for War Wounded in Forl

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Abstract

The structured development of 7D BIM systems in relationship with softwares to manage GIS data is the challenge that led the DIAPReM center of the University of Ferrara to find a solution to merge this two worlds.
The case study of the House for War Wounded in Forlì, designed by Cesare Bazzani in 1931, now hosting the ANMIG Association, allowed to structure a multidisciplinary research in this direction. The research starts from the 3D high-density survey for metrology and diagnostic study, shaped on H-BIM platform, for conservation project based on GBC Historic Building rating system. The BIM/GIS management platform collects data about the technical plants which need a periodical inspection (fire extinguishers, emergency signals) and sends alerts to the owner of the building, improving management and maintenance. The platform also collects the environmental monitoring data: temperature, humidity, VOC, CO_2, lighting, integrating with the security system: cameras, displacement and sensors. The personnel and security operators will manage the platform through a user-friendly interface, which offers a customized selection of data.

Keywords: House for War Wounded, 3D Survey, BIM, GBC Historic Building, Web-Gis Platform

1 The House for War Wounded in Forl: historical fundamentals

Built in order to care for the war wounded and invalids, the “House for War Wounded” represents the architectural fascist period which stands out in the monumentality and the use of politically motivated symbolism. The thesis presents a case study of the House for War Wounded in Forlì[1], built surroundings that have undergone several changes from its originally intended use. The reconstruction of the events is quite difficult as it is not free from inconsistencies or deficiencies from documented sources. However, according to what is possible to state, it is quite likely to imagine the reconstruction of three distinct properties that came in succession were: The Cemetery of the Black “Battuti”, the Countess Gerez’S stable-tack room and the "Aurelio Saffi" Masonic Lodge. A survey was found in the deed[2], scale 1:200, that shows how the pedestal of the former stables and harness are consistent with that of the future House for War Wounded. Starting from the 1900, the Grand Orient of Freemasonry in Italy, namely the Supreme Magisterium of the Masonic Order (during the time of the Italian colonies), the only existing Masonic organization in the country, states the establishment of the

[1] The research is an idea and a thesis project: DOLCETTI Andrea, SASSO Daniele Felice. *La Casa del Mutilato di Forl un monumento del Ventennio. Progetto di restauro ed applicazione del protocollo GBC istoric Building*. Degree Thesis, University of Ferrara, Department of Architecture, academic year 2013-2014, graduation session 21 march 2015, supervisor: Prof. Arch. FABBRI Rita, co-supervisor: Prof. Arch. BALZANI Marcello, Arch. BOARIN Paola, Arch. ZUPPIROLI Marco

[2] PANCIATICHI Tommaso, *“Atto di vendita di parte di fabbricato e terreno in forma aleatoria”*, Repertorio Generale 29362/7692, Repertorio Particolare n. 25089/3702, Archivio Notarile Distrettuale, Forlì

Loggia Forlivese entitled to Aurelio Saffi in 1903 [3], with an official decree on 23rd October, signed by Ernesto Levi Nathan, the Mayor of Rome. For about twenty years since its formation, the Loggia "Aurelio Saffi", recognized as n. 105 from the Grand Orient of Italy, enjoys a high reputation, coexisting peacefully within the Forlivese scene. After initial support through fascism by the Freemasonry, in 1925 the government approves the "Law on Associations", inhibiting, the activities of Masonic lodges in the territory under the fascist regime[4].

Fig. 1: House for War Wounded in Forlì (photographed by Giancarlo Zoli, 1933, private archive)

January 12, 1927: The Directory of the Fascio of Forli receives compulsory donations from the former headquarters building of the Masonic Lodge in via Piero Maroncelli with the annex garden and the sum of 15,000. The goal was to restore and use the building as a Music Institute named after Angelo Masini[5]. Although the building, "donated" by the Freemasons, was intended for housing the headquarters of the Istituto Musicale Masini, on 24th October 1928, after several technical assessments, the building was not suitable for its purpose[6]. It was determined and approved as the building for the House for War Wounded, at that time under construction, and adapted to the seat of the Provincial Section of the ANMIG of Forlì, located near the Gymnasium in Via Campo Ustrino[7]. The functional motivation comes up along with the symbolic value of the location. In Via Maroncelli, not far from the building, is the native home of Piero Maroncelli, and the palace of Raniero Paulucci of Calboli, Fulcieri's father, the young man who took an active part in the Great War and had aroused enthusiasm with his passion after the defeat of Caporetto, thus becoming an example of courage and an example for the Wounded and War Invalids[8]. On 18th May 1930 the shareholders' assembly discussed the first design for the House for War wounded in fifteenth-century style drawn up by the engineer Maltoni and Roberto Casalini. It has several functions: the headquarters of the Sezione Forlivese dell'Associazione, the Provincial Delegation of the National Wounded and Invalids of War, the circulating library of the Maimed, the Management and Administration of the Cooperative for the construction of affordable war wounded housing, a Hall of meetings and a space dedicated to the Company of Public billboards[9]. Work began on 14th September, 1931 but stopped at the end of the year due to the technical management differences with the Association. This problem forced the board

[3] RISPETTABILE LOGGIA AURELIO SAFFI n□105 (curated by), *Cento anni di libero pensiero a Forl□*, Russi (RA), Edizioni Essegi, 2000, pag. 13

[4] MOLA Aldo Alessandro, *Storia della Massoneria Italiana dalle origini ai giorni nostri*, Milan, Bompiani, 1993, pag. 512

[5] *Revoca di delibera relativa ad accettazione di donazione*, 24 October 1928, Prot. Generale n. 13150, in *Archivio privato ANMIG*, Busta 33, Titolo VIII, Rubrica 4, "Atti Legali Casa del Mutilato 1933"

[6] *Decreto del Prefetto della Provincia di Forl□*, 30 Janaury 1928, Div. 2/1 n. 1485, *Bolletta n. □□6□ del 9 febbraio 19□□*, in *Archivio privato ANMIG*, Busta 33, Titolo VIII, Rubrica 4, *"Atti legali Casa del Mutilato 1933"*

[7] "La monumentale casa del mutilato" in *Il Corriere padano*, 6 Janaury 1933, pag. 6

[8] "[...] Il tempio sorge in via Maroncelli, via passata due volte alla Storia della città perchè in essa Maroncelli nacque e Fulcieri visse [...]". In Popolo di Romagna, 28 October 1933, public library "A. Saffi", Forlì

[9] *Verbale di Adunanza dell'Associazione ANMIG Forlì*, 2 December 1930, in Archivio Privato ANMIG

of directors to find an alternative solution which did not take a long time in coming. In July 1930, thanks to Minister Costanzo Ciano (1876-1939), Mussolini government ordered Architect Engineer Cesare Bazzani (1873-1939) to design and implement the Post Office building in Forlì. The president of the Association, on the advice of the Family Calboli[10], send some design sketches of the House for War Wounded, asking Bazzani for his opinion. In this case his advice was required in order to find worthy solutions to be taken in the atrium, stairs, Memorial hall and, above all, the façade details.
Cesare Bazzani took the job by sending the Association a letter on 25th December 1931. In the documents he addressed to the Chairman Zanotti as follows: *"I drew an austere, sober fa□ade, with onl□ two decorative details on the adornment of the portal and the coping t□mpanum. The facade covered with Trani stones and the frame of the portal and the two archers possibl□ with bronze"*[11].
The interior design provides a hall decorated with marble (Verde Tinos, Cipollino of Verslia and Venato Crocicchio) both coating, and flooring, in which two bronzes stand OUT depicting Cesare Battisti and Fulceri Paulucci of Calboli, placed inside two sunken arched niches. A marble step and a valuable glazed frame with patterned wood separate this room from the stairwell, in this area both the entrances of the two wings dedicated to the offices and the exit, under the stairs, to the garden-vegetable garden lean out. In this project, not only does Architect Bazzani take care of the functionality and harmony of the space, but he also enhances the stair as an artistic object of high value. The risers and treads, both of the steps and of the landings, appeal to the same finishes used for the floor, as if it were a carpet coming down from upstairs. The handrail, made of brass and corodal, is separated from the parapet through alternating vertical posts and horizontal beams shaped like steps. A metal frame, decorated with stained glass windows[12] designed by Bazzani, illuminates the compartment as far as the atrium. Upstairs, the Meetings Hall catches the eye thanks to the coffered wooden ceiling with stucco finish. However, the splays of the windows, are embellished with fake "Giallo di Siena" (painted putty) marble arch ashlar. Since 1933 the House for War Wounded has never undergone any changes, both externally or internally. Through the years, ordinary maintenance works mainly follow one another.

2□Integrated survey for GBC Historic Building assessment

Fig. 2: 3D morpho-metric model of House for War Wounded generated by Cyclone□

The innovation introduced by GBC Historic Building assessment consists of flanking the standard procedures of verification of the sustainability of the building, provided by the LEED/GBC rating system, with a specific application for the conservation purposes. The research which had begun in

[10] *Lettera del Presidente □anotti a Cesare Bazzani*, 8 December 1931, in *Archivio privato ANMIG*, Busta 1931, Titolo IV rubrica 3 e 10.

[11] *Lettera di risposta di Cesare Bazzani al Presidente □anotti*, 25 December 1931, in *Archivio privato ANMIG*, Busta 1931, Titolo IV rubrica 3 e 10

[12] In the 1:10 pencil drawing on glossy paper realised by Bazzani concerning the window, store at the *Archivio di Stato in Terni* (Fondo Bazzani, Unità Archivistica n. 088, Vecchio Numero Corda 1622 - Recto/Verso), is present the motif of the three daggers placed in a votive temple, in front of two Doric columns interspersed by a star.

the thesis[13], has followed the certification guidelines, applying them to the restoration project of the House for War Wounded in Forlì, simulating its inclusion among the Case Studies of GBC in order to verify the applicability of the protocol evaluation.
Starting from the survey, studies have been realized related to the "State of art of the building", to plant design, to the relationship between the design and the realization based on historical data.
Therefore, the purpose of the survey was to acquire a three-dimensional database to demonstrate the state of the art architecture. Manifestation of the architectural features explains the need for an intervention of its heritage.
The metric survey for the acquisition of the object's characteristics was performed with a Leica C10 scanner with 1cm/25m resolution by effectuating 3 target points outside the building. As for the interior, traditional direct relief operations have been preferred.
The study of the façade through HDS relief arises from the need to check the overturning fronts that operate in the tympanum after recent earthquakes. The 3D morpho-metric model generated by Cyclone software describes the shape and size of the object by using the set of 117.042.456 spatial coordinates. The preliminary model obtained enables a multi-scale reading of the object, highlighting the macroscopic changes which influenced the structure.
It is necessary to highlight that the use of 3D scanning instrumentation has been useful in order to improve design performance in the thematic areas of "Historical Virtue" "Materials and resources", "Energy and Atmosphere" and "Indoor Environmental Quality" of GBC Historic BUILDING. The survey was the basis for the construction of A three-dimensional model through the BIM platform Nemetsceck.

2.1 BIM Model for GBC Historic Building analysis

The representation of the collected and recorded data by Leica Cyclone software on Nemetschek Allplan BIM platform rises from the need to test and verify the use of the digital model related to the project phases, the implementation phases of the restoration site and, last but not least, the life and management cycle of the building according to the GBC Historic BUILDING protocol.
A free-form modelling was necessary for historic structures because the walls have irregular shapes and sections which are barely configurable. On the other hand, the foundation structures have not been marked since they have been excluded from the survey process. The flexibility of the software allowed to create a fast computable 3D geometry of the building and to use these useful data for metric calculations and RAE data (aero-illuminating reports) and to quantify the volumes and the state of art of the surfaces and the project.

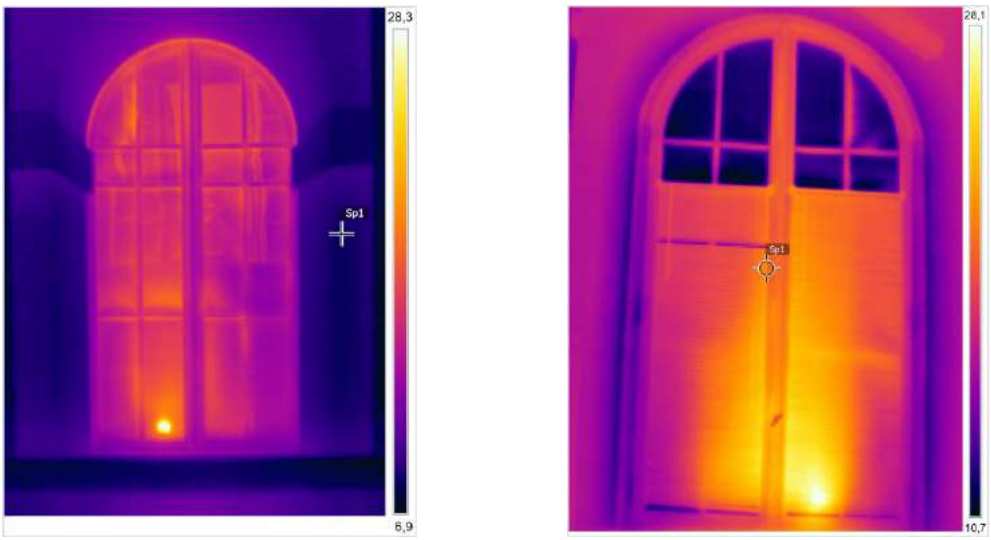

Fig. 3: Thermographic survey. The definition of BIM features is based on data acquisition.

[13] DOLCETTI Andrea, SASSO Daniele Felice. *La Casa del Mutilato di Forlì un monumento del Ventennio. Progetto di restauro ed applicazione del protocollo GBC istoric Building*. Degree Thesis, University of Ferrara, Department of Architecture, academic year 2013-2014, graduation session 21 march 2015, supervisor: Prof. Arch. FABBRI Rita, co-supervisor: Prof. Arch. BALZANI Marcello, Arch. BOARIN Paola, Arch. ZUPPIROLI Marco

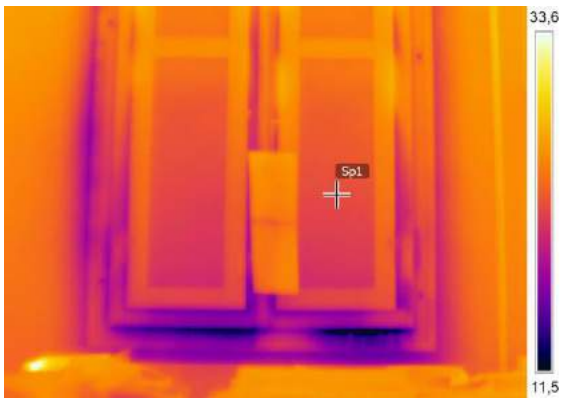

Fig. 4: Analysis of the gasket performance in the original windows

In addition, the state of art of the building was modelled considering the qualitative and quantitative data resulting from thermal, heat-flow and endoscopic measurements. The conductance numerical parameters of individual external walls have been implemented in the free forms of the model, especially in the sequence of external coatings and splays of the arches of the windows. The interiors, highly characterized by fine finishes, were modelled separately for a different final computation.
The BIM model of the state of art has also been enriched with the existing engineering details in order to assess the current energy performance. In the design phase the terminals and original equipment have been preserved and restored. New all-air heating systems have been implemented. They use existing ducts which were found by thermography and endoscopy.
The simulation of the thermal behaviour of the interior spaces has affected door and window frames as well, intervening only on the size of the glass, preserving the overall figuration. The BIM model allowed accurate calculation of materials to implement by checking the perfect compatibility with the structure itself. The design of the interior spaces was made by masking and incorporating the technical installations: the use of the BIM platform has proven to be effective in solving many technical and aesthetic problems. The BIM model allows to speed up the creation of comparative tables, by inserting in specific boxes the state of art and project: the software generated quickly (and accurately) results that would require hours of effort and work if realized in the traditional way.
The integration of real time rendering software, Allplan offers the opportunity to visualize and verify not only the exterior design, but mainly the interior in an extremely realistic way. A project can be realized, during a preliminary stage, within the pre-estimate of the GBC Historic Building parameters, in the GOLD class assessment system, with precise yet limited interventions.

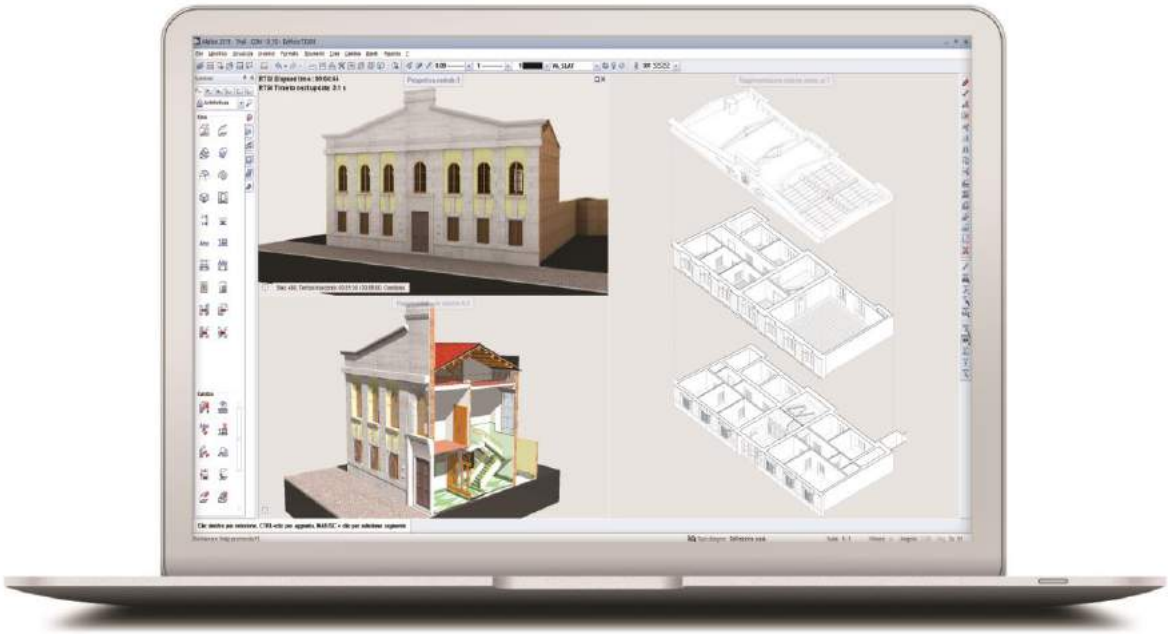

Fig. 5: The BIM Model is based on the data acquisition (metrical, thermical, fluximetrical). The model allows to perform simulations to verify the GBC Historic Building assessment in a relation to the design hypotheses.

Fig. 6: Thermical analysis for the windows and project proposal for the performance improvement.

3 Web-Gis platform for the building management

The continuous interaction between the various interfaces of information technology has led to the contamination between WebGis and BIM systems, thus creating a critical issue. Both are mature and structured systems that can be implemented in different ways. Even though interoperability process by IFC Open Standards[14] was simplified, the integration process for creating architectural and spatial information platforms was created.

The system which will be used for the House for War Wounded is structured as a computer platform that stores all information related to the architectural structure for the management and building maintenance. Through an interactive graphical basis (plans, elevations, sections or 3D model,) the user chooses how the Graphic User Interface (GUI), spaces, works, technical and technological systems, accesses and safety cameras will be controlled. The system handles all operating data, related to the environment and to inserted objects (works, installations, environmental data, consumption, etc.): the system inspection, the contacts of maintenance companies, specialized personal Contacts, useful numbers, contract references, deadlines for inspections, CO_2 levels, etc.

The platform takes advantage of the geometric-semantic structure of BIM through a direct communication with the GIS database via sockets. This allows implementation of additional materials such as pictures, Word or PDF documents in order to conserve and manage the maintenance book, testing, certifications, inspections, contracts. The information may always be available, depending on the type of user, and stored in temporal order. Similarly, the spaces will be handled organizing activities, exhibitions, events, scheduled ordinary or extraordinary maintenance works, avoiding overlapping or misunderstandings. The developing system will automatically alert interested users via email of current activities. The entry level system is structured to acquire the environmental and management data, reporting them to the direction of the House for War Wounded, informing third parties in charge of the "events" of management and/or required maintenance of the building.

The system allows for dynamic users, so that all internal and external employees or subcontractors will be able to enter personal information directly to document their work. This allows easy inspection and verification of the work done. Moreover, in case of emergency, the availability of all information will allow a faster and safer solution to a problem. The electronic file of the intervention can be viewed,

[14] Industry Foundation Classes (IFC) BuildingSMART is all about the sharing of information between project team members and across the software applications that they commonly use for design, construction, procurement, maintenance and operations.Data interoperability is a key enabler to achieving the goal of a buildingSMART process. BuildingSMART has developed a common data schema (IFC) that makes it possible to hold and exchange relevant data between different software applications

with attached photos, to verify if the affected area has been restored to the same condition as it was before. The system allows for management in a simpler and easier way. It reduces the complexity of the building structures, and work load of its employees. In addition, it will empower workers and outside contractors who will face a more simplified retrieval process of the information and material, as well as, define the planning-time of the situation. Every day, current activities, changes and their progress are signalled. Information about the condition of the property, collected from individual internal structures, are usually difficult to share with the direction, especially with external third parties. With this new model, a simple graphical database is produced where it is possible to update, read and historicize the data collected within the complex. The use of WebGIS technology eliminates the need for lengthy training and, above all, it is accessible from any location which is connected to Internet or Intranet, without installing any software. Ultimately, the system integrates a web management system, a strategic decisional support tool, the control of the management, Business Management Process and WebGIS. A complex control room monitors all the actions that increase the safety of people and things.

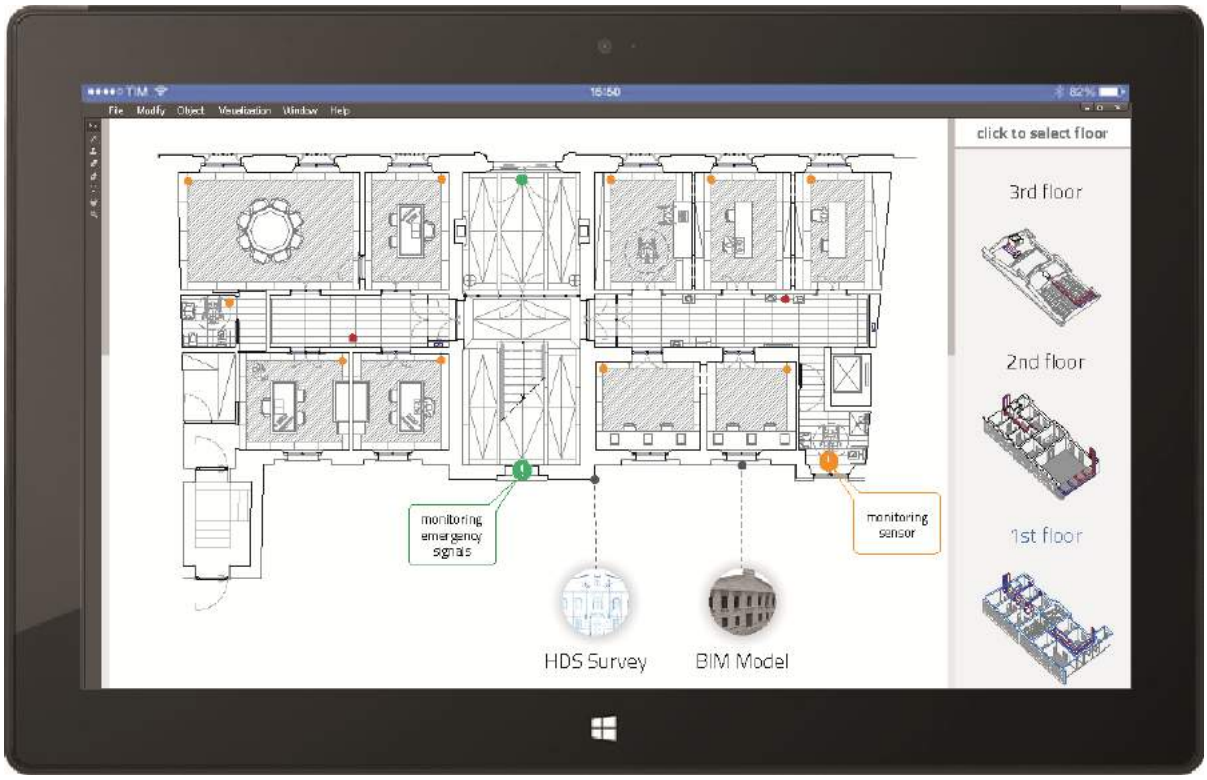

Fig. 7: Web-Gis platform for building management. The structure of the different interface (GUI) can help the user for integration data in the system.

4 Conclusion

The House for War Wounded in Forlì illustrates how the integration of different techniques and technologies including relief, modelling, drawing with the construction utilizing a "management" platform, allows for the best strategies to be adopted during a restoration with GBC assessment systems. The use of the management platform is a possible way of enhancing the performance of a historical building.

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Recovering an □rban Centre: the Case of Enna from Scars to Open □ ounds

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Abstract
The study's intent is to report on several recent episodes that have altered the appearance of Enna's historical urban centre, in the heart of Sicily.
The city has always suffered from the criticality linked to the consistence of its territory. The northern side especially has been recently threatened by various landslides. For example, in November 2015, a landslide caused the collapse of a section of Viale Paolo and Caterina Savoca, a scenic route that runs just before the historic centre and is the subject of the current study.
A successful collaboration between the Municipality of Enna and Kore University of Enna was encouraged by the pressing need for a project aimed at the reconstruction of the collapsed section of the road and that would, more in general, see to ensuring the safety of the entire roadway. For this reason, the University made available from its Engineering Laboratory all of the specific competencies and instrumentation for the project.
This type of interdisciplinary collaboration provided for the introduction of a geophysical investigation campaign and of three-dimensional morphometric surveys along the surface of the collapse and surrounding areas, as well as the extension of this survey to other bordering areas thought to be potentially at risk.
Drawing has taken on a fundamental role within this active collaboration as it is a unique instrument of 'interdisciplinary cooperation' which allows all key players to coordinate their efforts in ensuring safety and protection.

Keywords: Landslide, 3D Morphometric Survey, Geophysical Investigation, Displacement Map, 3D Multidisciplinary Model

1. Introduction *(M. Liuzzo)*
The thousand year history of our territory is characterised by the invaluable patrimony that it protects, as well as of its wounds inflicted over time by violent acts of nature as well as by careless acts of man.
News reports from recent years have helped bring to light a pathological frailty of this territory made up of wide-spread degradation or destruction, caused by occasional disastrous events, that can no longer be attributed, with a passive self-pitying attitude, to extraordinary natural disasters.
We are in fact dealing with a patrimony that has been tampered with at times by human interference, often being left in a complete state of abandonment and, more often than not, in precarious conditions of preservation, due also to the extremely limited economic resources available for its protection.
The scientific community's role can not be excluded from this discussion, as it has the non-delegable responsibility to focus its attention on the territory with which it interacts, setting forth actions to document, report and intervene.
This study aims to report, in a partial and synthetic manner, certain recent episodes that have altered the appearance of the historic city centre of Enna, in the heart of Sicily. It is an urban centre with ancient origins, average territorial dimensions and decent economic development. It was chosen to represent a photograph of an average non-exceptional reality within the territorial panorama. Precisely

for this reason, the precarious situation of the centre of Enna can be taken as a representation of the wide-spread state of emergency of our territory.
Intervention strategies - in cooperation with the governing bodies in charge of monitoring the territory and the university organisation rooted within the territory of Enna - are analysed by the study. Such an academic intervention is explained by the specific merging of various activities – didactic, scientific research and 'third mission' - meant as the real strategic objective, aimed at the safeguarding of the territory.

Fig. 1: The territory of Enna and its recent wounds

1.1 Enna, the history and the scars *(L. Floriano)*

Enna (or *Castrogiovanni*, until 1927), defined by the Romans as *Hurbs Inexpugnabilis,* rises from a mountainous ridge at a height of 930 meters. It was founded during the Greek era and goes back to 665 B.C. by Gelone, 70 years after the conquest of Syracuse. The territory was initially populated by the Sicani, then dominated by the Romans, Arabs, Byzantines, Normans, Almanni, and Aragonese [1]. Evidence of the Greek period was found in the Rocca of Cerere, on which stood the temple linked to the cult of the Deity; other important discoveries are the Lombardy Castle, which dates back to the Norman era, the medieval tower of Fredrick II and the Duomo. *Castrogiovanni* develops into the modern age due to the sulphur mines and the consequential increase of the railway network that connects it to the nearby communities, in particular, those to the east. Additional development took place during the Fascist period when it was nominated the capital of the province and took back its original name [2].

The city has always suffered from levels of criticality because of the consistence of its territory, as demonstrated by the reinforcement and remediation interventions that were carried out on the south, south-east side during the beginning of the '900s and which continue to be carried out today. Only recently though has the increase in damages due to the instability of the ridge surpassed a critical threshold. The northern slope, in particular, was recently threatened by various landslides which will later be briefly described (fig. 1).

During the initial months of 2014, certain parts of the underlying costal cliffs of the Pisana Tower, in the area around the Lombardy Castle, crumbled; in March of the same year work began to reinforce the rocky cliff. During the scarification process of the surface a layer of marlstone was revealed on which the entire northern part of the castle rests upon. A furious debate has been ignited regarding intervention methods due to the fragility of the monument complex that is still on-going today [3].

A landslide took place on November 1, 2015 and caused structural damage to a part of Viale Paolo and Caterina Savoca, a scenic route that connects two main reference points of the city, Piazza Garibaldi and Lombardy Castle. This landslide is the subject of the in-depth study of this report. The intrinsic criticality of the area where the road is located contributed to this phenomenon as well as the intense rainfall in the days before the event. The road repair work was estimated to be between 500 thousand and 1 million euros [4].

Viale Savoca runs above the state road Sp. 28, also known as 'Panoramica', and collapsed for similar reasons on March 25, 2015. This event took place just days before work began to ensure the safety of the slopes of the overpass, work that included the reconstruction of two pillars and a 40 m section of roadway that had collapsed 3 years prior, as well as the reinforcement of two other pillars, for a total of nearly 7 million euros [5].

Nearby used to stand a small antique church named the church of Kamuth, that was destroyed by the hand of man when it had to be cleared out as a cause of the collapse of Viale Savoca. The small church was one of the oldest churches in Enna (from the Norman era) and was located at the foothills of the area affected by the landslide. According to what was reported, it created an obstacle for the machinery to manoeuvre during the removal of dirt [6].

This last incident, as opposed to the previous ones, is indicated as an "indirect" consequence of the criticality of Enna's territory, as it is caused by the widespread negligence and inadequate attention the historical patrimony, for which Italy is wealthy, faces.

1.2 Survey of the historic city centre *(S. Savarino)*

The decision to merge both research and didactic activities was crucial in guaranteeing monitoring of the urban territory, thanks to the work carried out by survey technicians and a network of students occupied in studying significant portions of the historical fabric of Enna.

In recent years it has therefore been possible to periodically initiate survey campaigns on a wide portion of the city, conveniently chosen for it's historical, monumental and scenic value. It is located along a main east-western section between the so called 'piazza Balata' and the emerging area of the Lombardy castle and the Rocca of Cerere. This portion of territory is cut through by the centrally located via Roma and by the outlying Viale Paolo and Caterina Savoca, which delineates the northern city limits. [1]

The gathering of survey data, that was obtained with the integration of laser scanning technology, photogrammetric methods, topographic supports, direct surveys and visual sketches, have given way, in time, to a substantial amount of documentation conveniently dated and catalogued, readily accessible and upgradeable.

The survey activities which resulted as being particularly useful were those used near Lombardy Castle [7], in 2014 and 2015, and along Viale Savoca in May of 2015 (fig. 2), because of the unfortunate events which affected these sites.

The 3D laser scanning survey played a fundamental role in the fact-finding activity initiated along the entire northern historical city limits, which took place during four working days in June of 2015.

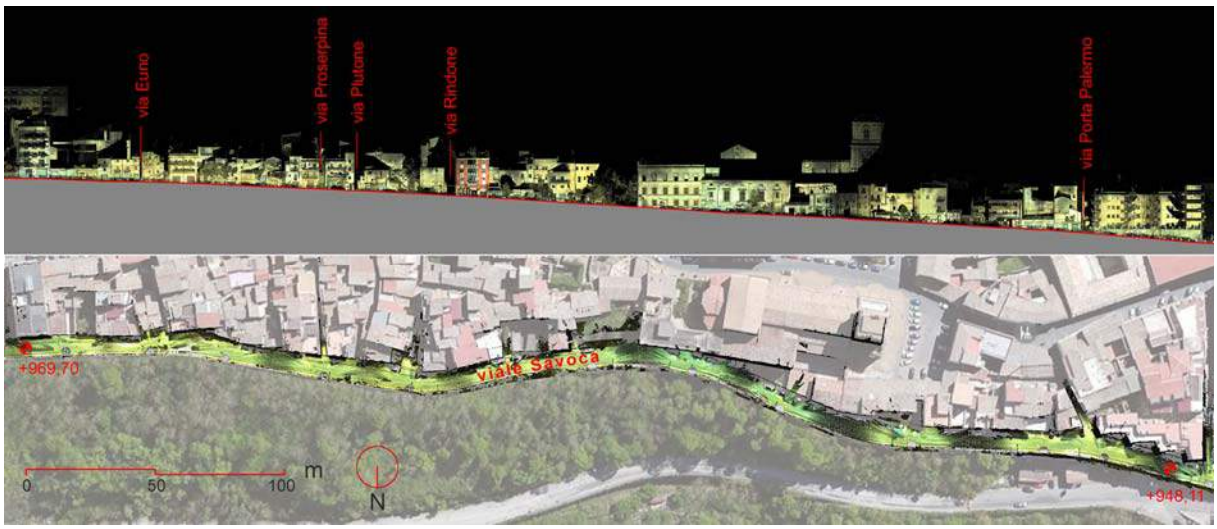

Fig. 2: Urban survey of Viale Savoca

The activity began in the area in front of the Lombardy Castle, in the eastern section of the city and proceeded all along the panoramic limits that open up to a wide view of the natural and anthropic scenery of enormous value: Viale Savoca, Via Alessandro Volta and Viale Guglielmo Marconi up until Piazza Francesco Crispi, exactly in the area of the overlook, 'Belvedere', for a total length of about 1000 meters.
According to a consolidated procedure, already used in previous activities, the three-dimensional survey campaign was developed using a time of flight range laser scanner, capable of surveying objects up to a distance of roughly 250 m. This was proven to be powerful enough to deal with an urban survey of Enna, that presents an extremely articulated plan and profile drawing. The fact that the GPS survey was carried out in a manner that was totally compatible and could be integrated with the laser scanner data in real time was fundamental. [2]
This way of working required precise programming of the daily activities. The reduced dimensions of the roadway and the presence of building to the south created particular difficulty for the GPS coverage, in some especially uneven sections. The operational problem was overcome by dividing the survey area into daily portions characterised by beginning and ending in bigger open spaces, in order to guarantee a satisfactory satellite signal coverage. It was essential to refer to the geographic coordinates as it allowed us to connect the adjoining scans carried out on different days, but also to insert all of the surveys performed into a complete three dimensional model of the urban area, result of survey activities conducted through the years.
The point cloud model was elaborated after completing the phases of data acquisition, the registration of the individual point clouds into a single geo-referencing system and the application of photographic data [3]. It provided the most suitable two–three dimensional elaboration to re-establish the roadway structure and the facade that defines it.

2. Viale Savoca case study *(M. Liuzzo)*

The landslide that caused the collapse of Viale Savoca, in November of 2015, is representative of a particularly significant episode for the city of Enna, even if other similar events of greater magnitude had already hit the town in recent years. This case, though, hit the very heart of the town and directly impacted daily life, economy and tourism.[4]
A successful collaboration between the Municipality of Enna's Technical Office and Kore University of Enna was encouraged by the pressing need for a project aimed at the reconstruction of the collapsed section of the road and that, more in general, would see to ensuring the safety of the entire roadway.[5]
The project was headed by the Technical Office while the University made available all of the specific competencies and instrumentation necessary from its Engineering Laboratories.[6]
This type of interdisciplinary collaboration provided for the introduction of a geophysical investigation campaign and of three-dimensional morphometric surveys along the surface of the landslide and surrounding areas, as well as the extension of this survey to other bordering areas thought to be potentially at risk.
The initial objective was that of being a timely intervention but ended up being carried out too late on an area already damaged by the landslide and unfortunately, this resulted in the objectives changing and going above and beyond the initial ones. The synergetic action with the governing bodies in

charge of controlling the territory was, in fact, strongly characterised by the desire to initiate efficient procedures directed to, not only the reconstruction, but above all to the protection and safeguarding.
With such a responsibility, Drawing's role has taken on a two-sided characterisation.
On one hand the current survey techniques and three-dimensional representation have provided a fundamental instrument capable of analysing, in an autonomous manner, the morphologic, metric and materialistic aspects that are fundamental to the understanding of the complex phenomenon being studied.
On the other hand, the same techniques have transformed themselves into an efficient 'interdisciplinary cooperation' instrument with an elevated sharing level, capable of integrating and clarifying, on the basis of the shared space positioning data, related specialised readings and different knowledge.

2.1 Survey of the landslide *(E. Di Maggio)*
The survey of the collapsed section of Viale Paolo and Caterina Savoca made up the initial phase and was essential in setting up a suitable fact-finding procedure on the criticality of the location.
The possibility to access data that was gathered regarding the site before the landslide was extremely useful. Similarly to the pre-landslide survey campaign of the road, the survey was conducted by means of 3D laser scanning technology integrated to the GPS positioning.
The common geo-referencing base of both surveys made the overlapping of the data obtained from the two survey campaigns possible, as well as a series of diachronic analysis of detail (fig. 3), necessary in order to establish the work required to ensure the safety and the reconstruction of the collapsed section of roadway.
An initial fact-finding phase aimed at the processing of two-three dimensional representations capable of describing in detail the morphology of the collapsed front in relation to the situation before the collapse.
Specifically, in order to better understand the extent of the landslide, numerous horizontal and vertical sections were done at a constant pace. The vertical sections, which were orthogonal in regards to the roadway, were particularly significant, at a pace of 1.5 meters. These sections, which were forced into both of the point cloud models, pre and post collapse, were able to provide a precise estimate regarding the extent of the collapsed volume: roughly 20 meters along the route, 5.40 meters of road width and a depth of 10 meters.
For the purpose of ensuring the safety and reconstructing the trunk of the collapsed roadway, it was necessary to identify the exact collocation of the adjacent dry-stone wall. Furthermore, the projection of the section of the load-bearing wall re-established the limits of the vertical underlying wall, that had not been observed during previous survey campaigns because of it being covered by dense vegetation.
A second fact-finding phase dealt instead with the construction that faced out toward the landslide which had been evacuated, for safety reasons, the day after the collapse.
The aim of the investigation was to verify the possible presence of movement and rotation of the facade due to the landslide.
This study was developed by comparing the overhangs present in the facade during two different moments, in May and November 2015.
For the purpose of simplifying the procedural process, every facade was individually analysed by isolating it into a single layer. A local referencing system was assigned to every surface of the facade, traceable to an xz plane that is perfectly vertical and with origins at the foot of each. The z axis was set and locked in a vertical position and the x axis was aligned with the facade being studied.
A displacement map was developed by comparing the individual surface surveyed and the corresponding vertical plane of reference.[7.] This was the result of the elevation map obtained along the y axis orthogonal to the xz plane of each individual facade [8], during both pre and post landslide situations.
By regulating the displacement map with a chromatic gamma that varies in reference to a 0.025 meter distance, it was possible to underline how the localised roto-translation phenomena present on the facade being analysed are equally displayed in the pre and post landslide models (0.05 meters from the base of the building to the highest eaves).
The tests carried out suggest, therefore, that fortunately the landslide did not inflict evident effects on the facades of the overlooking buildings.
The three-dimensional survey also had a fundamental role in the realisation and contextualisation, within a single geo-referencing model of the area, of certain significant considerations and interdisciplinary investigations which are shown below.

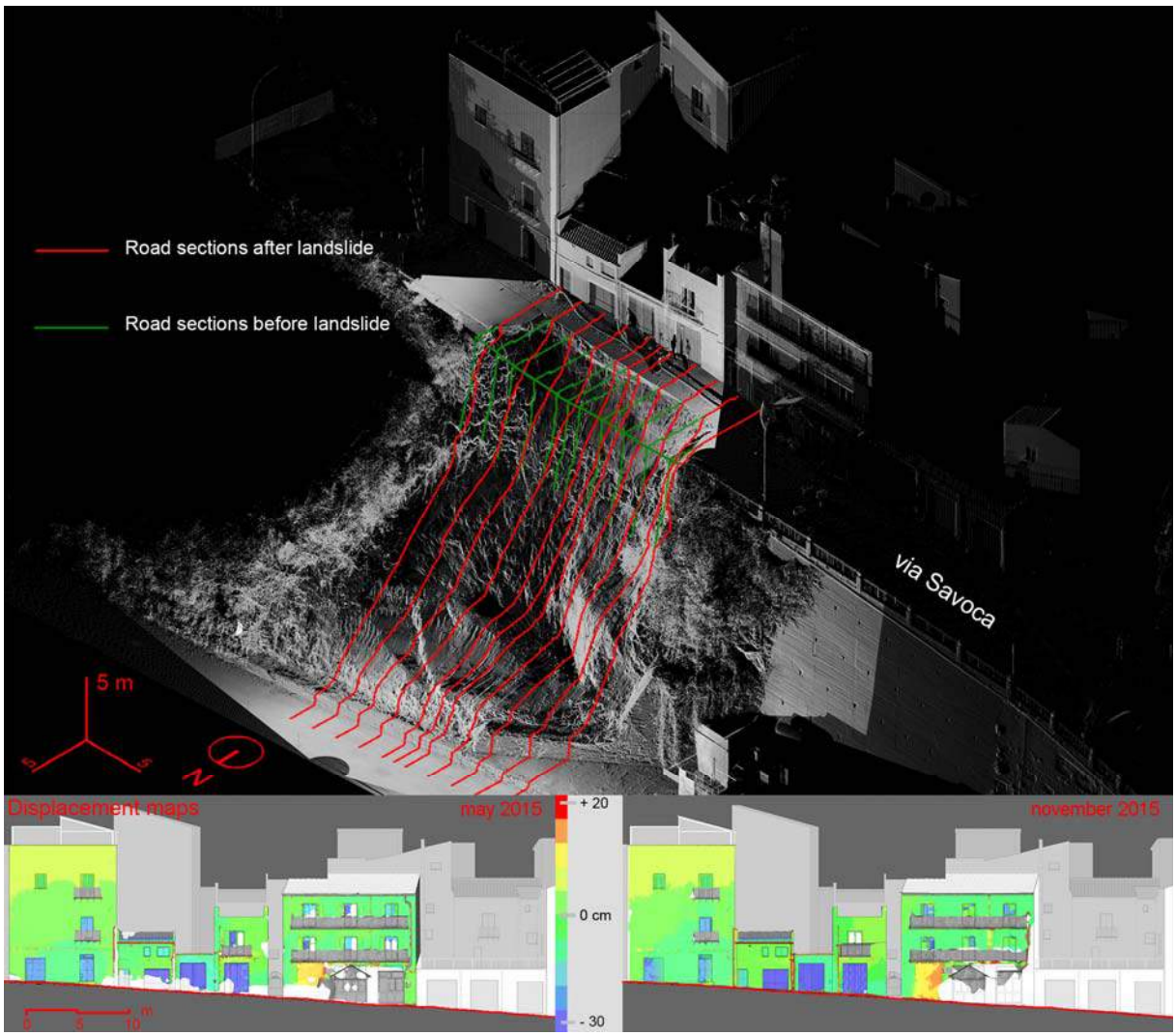

Fig. 3: Morphometric survey of the landslide and bordering buildings

2.2 Multidisciplinary assessment of the landslip *(R. Feo)*

Enna's urban fabric sits in a very complex area, where man and nature coexist in a precarious equilibrium. The old town centre is located on a plateau with vertically sloped sides, with a difference in height of 200 meters. Geologically, this area is situated in the middle of the foredeep basin area between the Maghrebian-Apennine Chain and the Hyblean Foreland, where Plio-Quaternary rock outcrops [9]. In particular the area of study is characterised by the presence of sandstones and quartz sands interbedded with silty-arenaceous alternations, with a maximum thickness of 300 meters, dated lower middle Pliocene Epoch. These rocks have mediocre mechanical behaviours and are vulnerable to weather conditions and often subjected to landslips. The nature of the materials is an influencing factor of the previously mentioned landslide. Especially, the anthropogenic filling materials, which were placed beneath the road and sustained by a dry-stone wall whose foundation was laid on top of sandstones that have collapsed.

In order to assess the damage linked to the landslide, to obtain geological and geotechnical data useful for foundation work and road reconstruction design as well as to monitor the landfall development, an integrated approach was adopted combining different geophysical tools (fig. 4): 2D Electrical Resistivity Tomography (ERT) and 3D Laser scanner survey. The former is an active geophysical method, very helpful and widely used to reconstruct, in a non-invasive way, the geological arrangement of the near subsurface, especially in landslip situations [10]. The latter is a new technology useful to gain 3D imaging and spatial information, when the geological evaluations are hindered due to the environmental and hazardous conditions [11].

The Electrical Resistivity Tomography provides 2D cross section electrical resistivity distribution of the substrate. The survey was conducted over the main scarp by adopting a 48 multi-electrode array distanced 1.5 meters each, for an overall length of 68 meters.

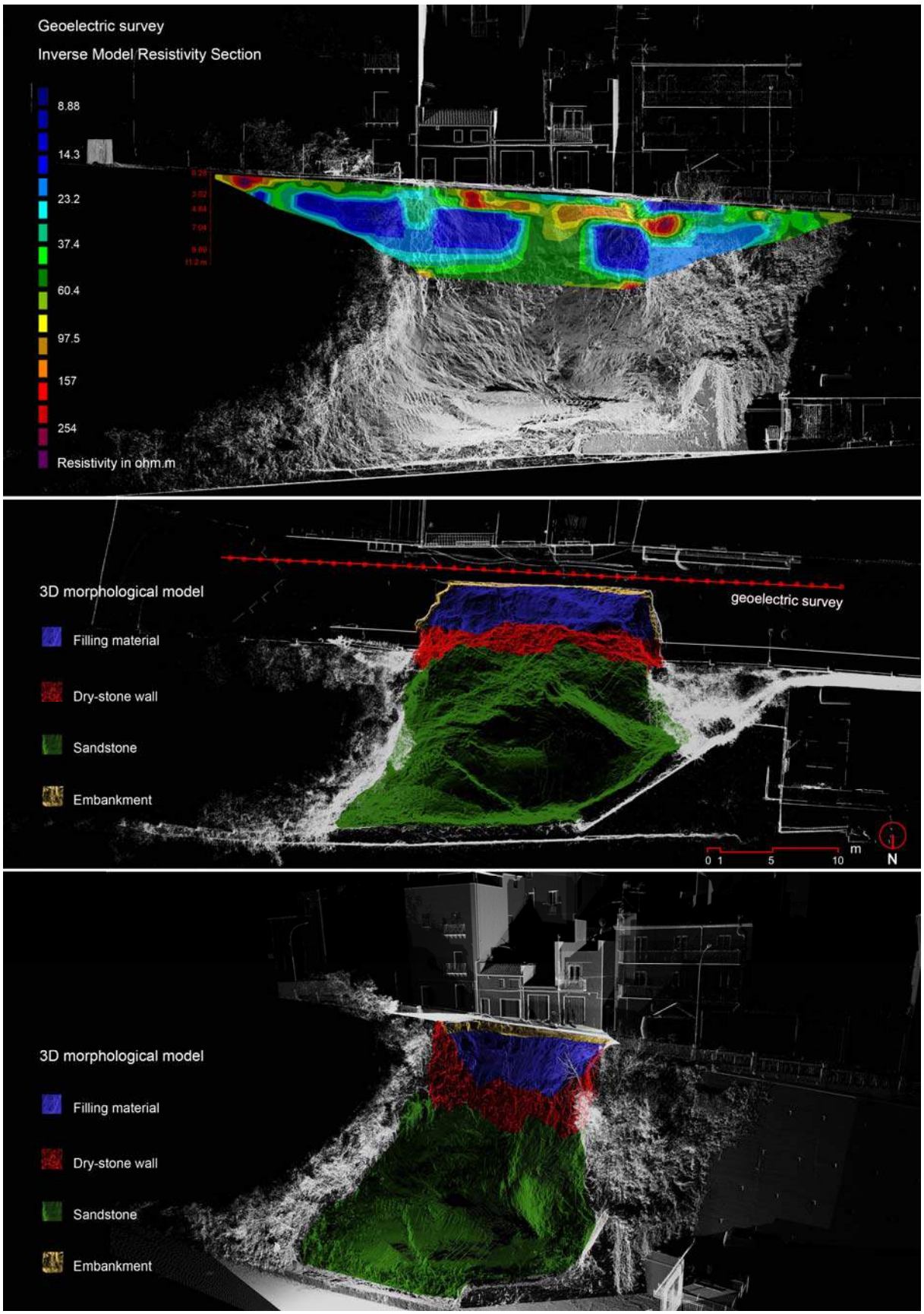

Fig. 4: The inverse model resistivity cross-section obtained by ERT survey placed on the 3D morphological model. On the figure below the different materials reconstructed and marked on the point cloud.

The instrument used is a geo resistivimeter made by MAE for which a parallel data acquisition from electrodes configuration pole-dipole (PD), pole-pole (PP) and dipole-dipole (DD) was adopted. The obtained data was post processed by the most commonly applied algorithm Res2Dinv [12] and the inverse model resistivity cross-section with an absolute error of 3.6% being produced. The ERT section was applied over the 3D terrestrial model, obtained from the laser scanner survey, and it shows three different areas: the first, parallel to the pavement, with an average resistivity including values from 40 to 250 Ω*m, the second deeper with a lower resistivity (15 Ω*m) and the third, in the centre zone, with a resistivity of 70 Ω*m.
The integration of these values and the morphological analysis of the 3D survey allowed discerning and marking different materials on the point cloud. Therefore, it was possible to recognize the embankment, the anthropic filling material with low values of resistivity, the main scarp of the landslide (70 Ω*m), the outcropping sandstone and also the entire dry-stone wall and its debris.

2.3 A reading for risk prevention *(S. Giuliano)*
The detailed analysis regarding the state of the collapsed area at the exact moment of the survey was not the only objective of the study, which extended to a series of readings finalised at risk prevention. This prevention can not only focus on the individual damage inflicted on the road, but instead must be an accurate reading on the entire road, whose endogenic and external characteristics unfortunately tend to confirm a concrete risk factor.
This study took advantage of the possibility to analyse the point cloud from the survey, done in May of 2015, on the area between the overlook area, the so called 'Belvedere', and Viale Savoca in Enna. Several different dips along the pavement of Viale Savoca were recognised and identified. These dips, which were observed in various points above the collapsed section, were predominantly present along the entire transverse section of road with larger sized dips on the external fringes.
A method of analysis was developed capable of guaranteeing a high level of experimental reliability, and certifiable along with the possibility of being repeated, according to set deadlines, as a means of monitoring the eventual condition of deformation in evolution of the studied site (fig. 5).
The colour maps geared towards assessing the gaps between the reference surfaces and the actual surfaces were representation instruments that satisfied the analytical needs, which were both precise and extensive over studied area [13].
A triangular mesh model was created from the pre-landslide survey point cloud of Viale Savoca. It was intended as the actual surface capable of faithfully reproducing the articulated plan and profile drawing in detail[8].
Particular attention was placed on creating a reference surface, meant as a model of the road surface that was complete without deformations and dips.
This reference surface was constructed beginning with numerous sections orthogonal to the road axis, that made it possible to take into account, in detail, the original morphologic articulation of the road. From this same point cloud model numerous sections were obtained at constant intervals. The transversal sections were then individually analysed in order to eliminate those characterised by evident anomalies and dips, and then reassembled along the same road section to form a single uniform surface[9].
The colour map, obtained by the overlapping of the two models, reference and actual, highlights the registered displacements between the two surfaces and their quantifications.
The incisive analysis of the results obtained with the displacement map highlights that among the critical areas that were signalled, the area that collapsed in November 2015 was quite evident. It is also interesting to note that four other sections of Viale Savoca indicate a similar level of displacement from the reference surface (roughly 0.25 meters). This evidence is proof of a concrete risk factor, which was later confirmed by specific geophysical investigations all along the roadway.
The adopted method of analysis in the case study, other than representing a valid help in the monitoring of the territory, aims to become an instrument for risk prevention and for the safeguarding of the architectonic and landscape patrimony which characterises our territory.

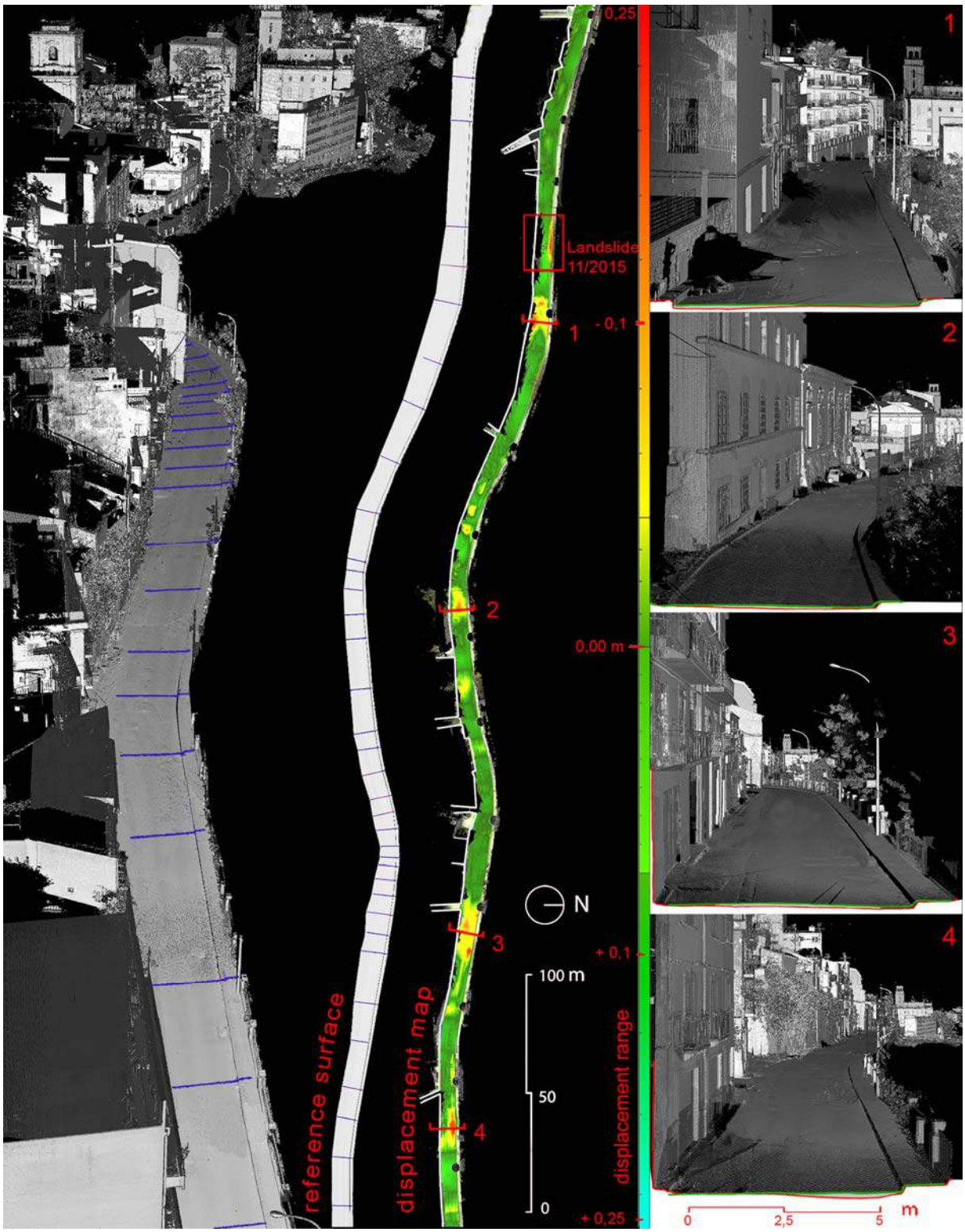

Fig. 5: Risk prevention study of Viale Savoca

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[1] Since 2011, the didactic survey activity has been organised within the course of 'Assisted Drawing and Survey and Representation Laboratory" taught by Prof. Mariangela Liuzzo within the Magistrate Graduate Course in Architecture at the Kore University of Enna.

[2] The survey campaigns were conducted as part of "The Survey and Representation" Laboratory within the Faculty of Engineering and Architecture at the University of Enna, run by Prof. Mariangela Liuzzo. The lab is equipped with the instruments used, a Leica ScanStation C10 laser scanner and a GNNS receiver, Leica Viva GS15 model.

[3] The phases were developed utilising Leica *Cyclone* proprietary software.

[4] As an immediate consequence of the landslide, the nearby buildings were evacuated and a large section of Viale Savoca was blocked to the traffic, resulting in considerable problems for all of the surrounding commercial activities.

[5] The preliminary project for the "Actions to Guarantee the Safety of Via Paolo and Caterina Savoca in the Municipality of Enna" was already financed by the Civil Protection.

[6] The interdisciplinary work on behalf of Kore University of Enna was coordinated by Prof. Giovanni Tesoriere, Dean of the Engineering and Architecture Faculty, and by Prof. Francesco Castelli, Head of "Geotechnical and Engineering Geology" Laboratory. The team, that involved the "Survey and Representation" Laboratory, was made up of architects, engineers and geologists who work within the above-mentioned laboratories.

[7] □*D Reshaper* software was used for the elaboration.

[8] □*D Reshaper* software was utilised for the modelling. The edge average length of the mesh model is 0.12 m. The sampling average distance between points is 0.04 m.

[9] The *NetworkSrf* command of the *Rhinoceros* software was used for the modelling of the reference surface.

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City Industry Museums: local identity cognition in Shanghai

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Abstract
By the process of cities' globalizations in China, people start to put the light on consolidating the local identity by musealizing culture heritage in a broader perspective. Especially the city as Shanghai, she integrates the residents worldwide, and there are still more than 700,000 migrants annually from other Chinese cities. Those factors lead Shanghai towards a Metropolis with multiple culture mixture, in turn, fading her characters away. In order to preserve those essence and heritage, local companies rooting in this city united with governments to establish several Industry Museums, as Shanghai Glass Museum. Those social agents take advantage of all related valuable heritages and connect various social communities, to accentuate their genius-loci. They reinterpret industry's history, culture, product, structure, etc. that are intertwined deeply with Shanghai's developments and spirit in a musealized context. Those Museums construct a scenario relating to city culture and intangible asset, meanwhile, foster the social cohesion for locals and migrants by presenting a local collective life associating with lifestyle. This paper intends to investigate the profound relation between the city industry museum and local identity in Shanghai, and verify how it develops into useful instruments at the service of society to be the force for sustainable improvement of quality of citizen's life, concerning both the local and migrating audiences through paradigmatic cases.

Keywords: culture heritage, identity, social cohesion, industry museum

We are living in an era so called "an age of migration" [1]. No matter how tranquil it looks like, the world around us is moving and transforming constantly. Those processes is happening in a gigantic statistic, and leading to the reality concerning much more than only the population's migration issue. Given the development of technology, the migration has been inevitably taking place along with the information, data shifting as well, which caused the dispersing and dislocation of local heritage (knowledge, culture, religious, ect.), and accelerated the process of globalization. The world we are currently facing is undergoing an unprecedented reformulation, for both the material and immaterial heritages are brought and placed worldwide to adapt to the unrelenting social-politic-culture forces by weakening their properties of locality. Just as Virilio (1996) [2] articulated, we are also in "an era of disappearance", by homogenizing the culture heritage in the globalized context. People are diluting their collective memory through the transition of their physical places. According to Archibald's words "Places, especially the ones that early nurtured us, are deeply impressed upon us. When we lose those spaces, we lose an essential part of our self and our stories" [3]. Vice verse, once a city is forced to change either the composition of residents or their relationships, the rooted but delicate balance among the place, people, and culture heritage could no longer maintains. If the culture heritage lacks of the mass society who sharing the past together to reinforce its physical existence, it's barely possible to conserve the place's identity producing local's culture belongings. Those current situations drag our attention back on the role of museum that is the major participator in the reconstruction and validation of the social culture [4], especially in nowadays. Since the local people hardly perceive the proper common perceptions for their diluting memories and less distinctive urban

space, the museum seems to be the significant emblematic place of consolidating the both the tangible and intangible local belongs reflecting city's identity [5] (elena p19).

The mega-city Shanghai, as one of the world leading globalized commercial centers, suffers the exact dilemma: fading its identity away in that process. The statistic shows there are around 25million residents in Shanghai, within which around 10million are migrants from the other Chinese cities [6]. Nevertheless, that connotes nearly half of the residents are newcomers to Shanghai by the flow of the population, it still welcomes around 600thounds new migrants annually. Some of them headed here for studying, and some came for hunting job position, etc. No matter what is the purpose of migrating, the fact that their leaving original place where supporting relative collective memories makes them searching for the new identity cognitions in the corresponding city. The migrants not only bring their promising hopes to Shanghai, meanwhile, they also grow their own local cultures in this territory. Nowadays, Shanghai is the most culture-mixed metropolis in China. In this city, people from the entire world share their cultures and identities, meanwhile build up hybridized culture elements to make it dynamic. Years ago, Shanghai residents were stills proud of their city's rushing for flourish, and its finance development, that attracts worldwide resource to flowing in. However, the multi-cultures' impulse in that short period easily diluted the particular nature of a place, including intangible heritage (dialect, tradition, know-how, etc.). That irreversible process alarmed people to be aware of loosing the city's original identity, which shapes people's sense of belonging. When people talking about Shanghai, they all fascinate about her globalized atmosphere, and glamorous lifestyle, like any other global city have. Seldom we pay attention on Shanghai's character: the most renowned Business and industry city. This city is developed and fostered by various industry fields, and it's impossible to discuss Shanghai's development without mentions its industries. Data shows that Shanghai covers 147 industry fields out of 162, takes over 90□ [7]. Those heritages tracing the city's grow path are scattered in relative fields. In order to cultivate people's acknowledgement on the local heritage, and reinforce rooted culture we need an instrumental setting to present those information to the public.

Around the later period of Qing Dynasty, Shanghai as the open port city, it absorbed a mount of capitals from both the local and foreign investors. That drove the various factories and companies starting to operate, and business manipulations activated the money world, leading Shanghai step into the industrialized era. The particular location made this city's uniqueness in Politic, Economy and Culture, and the entire nation threw the attention on its prosperous and dynamic in industries, which brought up lots of featured products, lifestyles, and even cultures. It's obvious that industries development in Shanghai was over the business of Economy but also intertwined deeply with that special Politic and Culture environment. There were a number of brand producers blooming, being renowned relying on either the refined product or renovated technology in Shanghai. Till now, many of those companies have been still operating successfully covering the industries of food, fashion, glass, machinery, etc. Although majority of them have experienced several crisis or reformation, they are maturating and turning up and down along with the development of Shanghai local environment that they are profoundly taking part with in instead of counting on. Analysis says Shanghai has the most amounts of the historical brand producers in Chinese cities, taking over 13□ out of 781 companies [8]. There is no doubts how important those industries are during past 100 years in Shanghai. They accentuated the discrepancy and enhance the competitiveness. Those industries reflect the invisible network of city's local community, tradition, and culture, that composing its identity. Both the individual organization and locality acknowledge the culture a crucial factor defining the identity and future innovation [9]. In Shanghai, the knowledge and cultures those industries bearing are appropriate compensation for the fading of its local identity. Nevertheless, currently those historical industries are showing public their updated production or motto in market, we are supposed to look insight the city's rooted culture through tracing their pasts, cultures, and spirits that knitted the invisible network. In order to let the people read the information, those historical industries ought to present something more than the products or services for the consumers, but to transfer the industry knowledge to public, to give the lights into the backstage of the brands. While, those knowledge requires official confirmation before conveying proper messages to the society, two prerequisites are needed：on the one hand by general accessibility, the other by monumentalizing presentation spaces where knowledge transfer could take place (exhibition and display). That's the reason we could find out a number of industry museums in Shanghai, such as the Bank Museum, the musical instruments museum, Railway Museum, Tabacco Museum, etc. that record, interpret, present, and communicate the industry and companies to local residents and migrants. Their erections are not simply to conserve their own industry history and culture, in term of the society development, they provides a window for discovering the city's cultural identity and growing traces in lens of industries.

Here we could elucidate the point of view through Shanghai museum of Glass (SHMOG) that opens its door in 2011. It is sponsored by Shanghai Glass Company, and stands on the exact historical site of Shanghai Glassware Factory. Considering Shanghai's leading position in the national glass industry, this museum narrating the entire story about the glass itself with hundred-year history and its connection with this city. The city started the glass industry around the beginning of the 20th century by local manufacturers. The Shanghai Glass Company is founded around 1950s, and it acquired and merged over 30 small-scale glass producers at that time to establish a complex glass company with high technology and art creation. The company almost covered most part of glass production in the city during the 1970s and 1980s, ranging from the daily glass commodity to industry supplication, and was one of the indispensible suppliers to Shanghai residents' daily lives [10]. Though, with the technology advancement and social-politic-culture reformation, such glass company has changed both the way of manufacture and operating system. Given the transformation of the industrialization era, the Shanghai Glass Company used to be thriving in this city has been now fading out from people's perception by generations. The glass museum's building up throws again the spotlight to that local culture heritage, on one side, the historical architecture's renovation reminds people's physical existence of the local manufacture; on the other side, the museum reformulates the important city industry heritages to construct the bridge from the public cognitions to Shanghai's precious past shaping the current city's features. The museum's main building was the former glass melting furnace room. The design respects strictly the factory's structure and space form, and remains the original space details visible to the public [11] [Fig.1]. By the physical space experience, that could provoke people's contemplation on the particular local environment at that moment supporting this industry. Every little traces on the site is a treasure witnessing the path of the industry and city's growths [Fig.2]. Both the new generation of the local residents and the immigrants shall learn the background by these historical pieces [Fig.3]. Besides, the exhibition content of museum tells the story including the very beginning of the glass production in Shanghai, such as the cover of kerosene lamps, presents the manufacturers' products serving Shanghai people's life. Through the featured products the industry chose to exhibit, even a small piece of glass decoration, it is an alternative method to articulate and memorize the part of local lifestyle composing the city rooted influential cultures. While, what the industry museum provides to the public is not only the tangible static heritage, the more important it representing is the overwhelming producing process. Thanks to the ICT and performative practice in the museum of glass that broaden the variety of conserving the heritage, the glass craft art could be performed to public in the original settings [Fig.4]. Because those related craft skills permeate to the local's practices, mutually effect, and have significance as culture heritage, it's worthy to reconstruct the scenarios and celebrations [5]. For helping people to form their own cognitions on the city's identity, those experiences of gestures and ceremonies have major impacts to the societies to recall, memorize or access the Shanghai's indigenous culture [12].

Shanghai Tobacco Museum is another significant case for recording and reinterpreting the city cultures with over 3000sqm exhibition area. It is a museum operating based on the national renowned historical tobacco brand "CHUNGHWA". Being different with the Glass Museum, it is arranged in a new constructed building, while the location is set approximately to the factory as well, to accentuate the connection between now and the past. In the museum, the visitors are designed to access the history concerning the tobacco, and its development [Fig.4]. Tobacco as an imported product, since its landing in Shanghai, localization to fit residents' habitation, merging into local's daily life, to founding the first Tobacco factory, wining the business success, is strictly related to Shanghai's physical and culture context. Those processes undertook the period of Colonization, WWII, Internal War, the Reform and Opening, etc as its growing background, connoting a strong link with social events, transition and identity. Without doubts, Shanghai Tobacco Museum actually shows the local's politic, social structure, economy, people's lifestyle development, nevertheless, it apparently collects, exhibits its industry-related history, products and spirit. The museum is organized as research-oriented organization that defines its activities of wide-range material collections after nearly hundred-year social transitions. Usually, at the beginning of museum's preparation, it is composed of four subdivisions: acquisition, selection, conservation and classification [13]. It's a sophisticated process even it could commence from its archive, it still needs a wider range for recovering the documents. In another word, the museum is creating a network for collecting and acquisition, covering all the people related to the industry or factory: the retired employees, the witnesses of company's growth, the loyal consumers, the random local-value sharers and even the competitors. The more completely the documentation covers, the better history being recorded, even the accessary of Tobacco is a treasure to completing of the culture [Fig.5]. In the occasion of the materials relocation, and the coming steps of conservation, classification figure a period of the public participation that probably will enhance the connections among the various communities. The public participators take advantage of this procedure to communicate inside a group having the communal experience, but meanwhile this public

involvement preparation could also inject the intangible elements in the Tobacco museum's formulation with more sharing local social knowledge than merely industry's history [14].

Musealizing the industry is a process of recording the local history from a new perspective instead of the classic anthropology. Shanghai is a city ranked as one of the most globalized metropolis and with most diversity; meanwhile, it was also Chinese historical industry and trading center for its openness and dynamic. Reversely, nowadays the flowing of migrants and information make the resident loosing collective memory about the local characters, features, and self-belongs to the city. Not to mentions to educate the immigrants who bearing the other local identities. In this context, the industry museums oppose resistance to this loss of memory diluting. It provides a multi-layers recording of the identity. Its collection reflects the local culture in different phases combining the politic, economy and social state. People access the city's past and nature not only through the historical museum, also the industry museum since the lines of business could collect the past as well. Those exhibits may present the local culture in a more efficient way since most of them are products or services involving people's daily life, and being most familiar with. Moreover, local industry museum's completion is a public-participated process, the multi-communities involvement enhances the cohesion of the society which leads the local identity fully performed, instead of scattering each corner of the city. With both the local and newcomer's accesses, the industry museums in Shanghai provide an influential resource to convince the strong identity behind their surrounded material world.

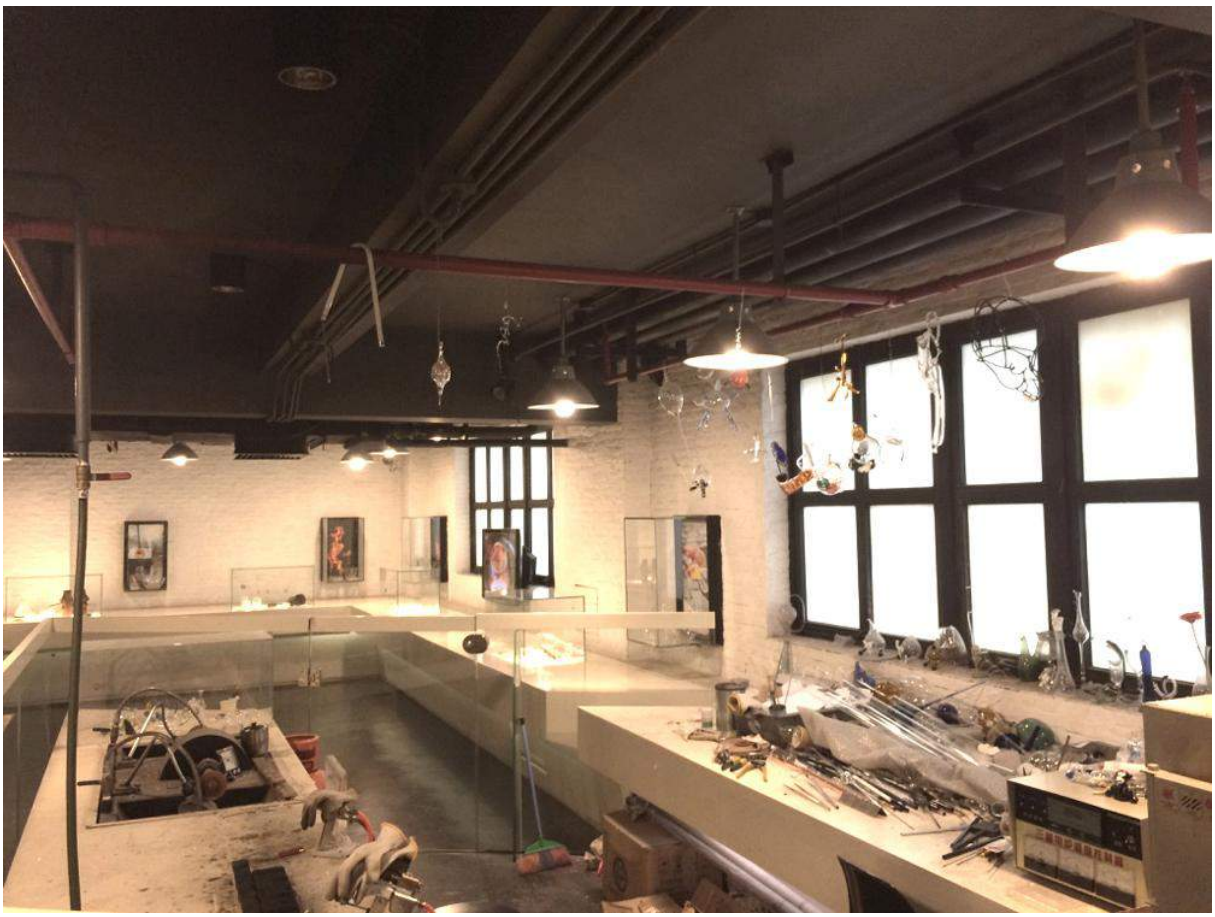

Fig. 1: **Representation of original Glass Factory Crafting room in SHMOG.** *Photograph by author, 2015*

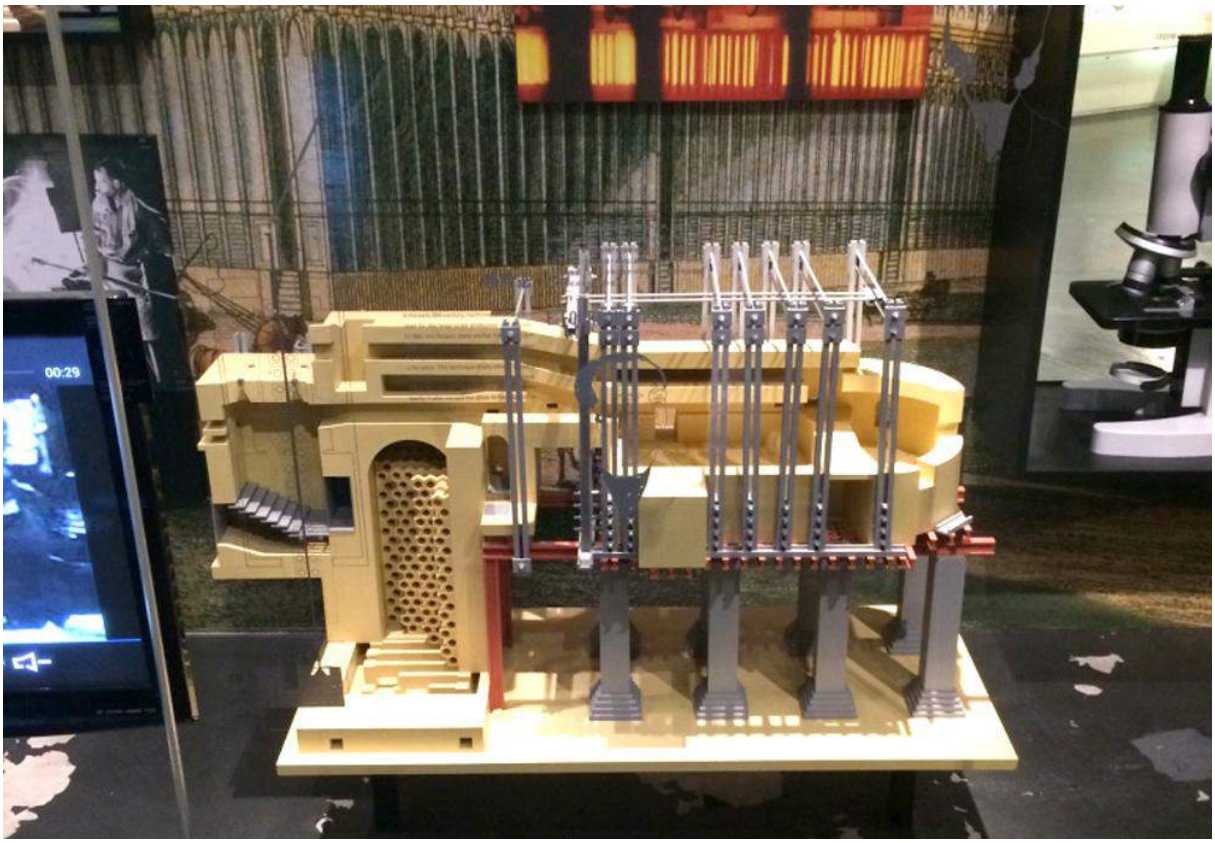

Fig. 2: **Exhibiting model manufacturing.** *Photograph by author, 2015*

Fig. 3: **Renovated former glass melting furnace room.** *Photograph by author, 2015*

Fig. 4: **Performance of glass art crafting in museum & Exhibits of daily commodity.** *Photograph by author, 2015*

Fig. 5: **Interior Exhibition of Tobacco Museum.** *Source web: http://blog.sina.com.cn/s/blog_7eabe53801013vwi.html*

Fig. 6: **Exhibits of the Tobacco's historical package.** *Source web: http://blog.sina.com.cn/s/blog_7eabe53801013vwi.html*

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Dynamic identification of an innovative technology building

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Abstract
This paper concerns the structural identification of an innovative manufacturing and assembling building technology system allowing fast times to build up.
The building has been subjected to an experimental investigation and to an accurate FEM modeling. The experimental investigation has been carried out using a vibrodyne. The comparison between the experimental evidences with the results of finite element models allowed us the dynamic identification of the structure.
The experimental modal analysis is a kind of test in which input forces and structural responses are known. It is important to note that the dynamic behavior is a kind of "fingerprint", in fact it depends only by intrinsic characteristics (mass, stiffness, damping, boundaries, degree of freedom, etc.) and not by the applied loads. Therefore, the structural response still remains unchanged in absence of modification (structural damage, etc.), otherwise a variation of frequencies and vibration modes occurs. The dynamic structural identification is a non-destructive technique, so that it can be applied to new structures (for monitoring the construction phases), to existing and even historical buildings (for checking the health) and to innovative structures (where there is not well defined design criteria).

Keywords: Dynamic testing, EMA, experimental modal analysis

1. Introduction
This work concerns a theoretical and experimental research about a structure built up using an innovative technology regarding both the manufacturing technique and the assembly system, which allows short times for building up.
The structure has been subject to static and dynamic tests and it has been investigated trough a sophisticated numerical modeling. The experimental investigation has been carried out using a vibrodyne designed to excite this structure dynamically [1]. The comparison between the results of the experimental analysis and the results of Finite Element Models allowed us the dynamic identification of the structure [2].
It's useful to specify that by "dynamic identification of a structure" it is meant all those techniques, both analytical and experimental, allowing to define the dynamic response of the structure, i.e. the natural frequencies, its vibration modes and damping ratio [3].
The experimental modal analysis is also known as "inverse problem" (in analogy with the so-called "direct problem", in which the inputs and the structure are known, and the objective is knowing the structural response) in which structural response and input forces are known, whereas the structure it is not. Various identification techniques were initially born in the aeronautical research field, due to study the behavior of the aircraft under the action of vibrations induced by the dynamic loads; then they were extended to various other fields, from automotive to robotics, and then civil engineering.

The main reason of interest towards experimental modal analysis is related to the consideration that the dynamic behavior of a structure is a kind of "fingerprint " in the sense that it depends only on its intrinsic characteristics (mass , stiffness , damping , degree of constraint , etc ...) and not by the entity and / or the type of applied load: therefore, if there are not internal modifications (such as , for example , of structural damage) , the behavior of the structure remains unchanged; Otherwise, a variation of the frequencies and of their dynamic shapes occurs. Furthermore, the structural identification is itself a non-destructive technique, as it can be applied to both new structures, for example in the testing phase, and to existing or historical structures for their monitoring.

2. Objective of the work

This work is the first step for developing a general procedure aimed to characterize dynamically many kind of structures. The usefulness of this research is to develop a method of investigation which allows to model any structure even in the absence of design codes or on structures for which it is not able to estimate the extent of any damage due to seismic actions.
This procedure can be used to obtain these goals:
- Static and dynamic identification of the structure even in absence of design documents;
- Propose modifications of existing structures even in the absence of design documents;
- Evaluate the seismic performance of the structures.

In this work, the proposed methodology aims to characterize the structure through the application of sinusoidal forcing with variable frequency and to define a method for calculating the structure.
The procedure starts from the geometrical relief of the structure and static tests on supporting boards, consisting of different aggregate materials (concrete, steel, polystyrene, expanded clay), in order to know the mechanical parameters. Meanwhile a vibrodyne used for dynamic testing, has been subjected to specific tests to plot the generated force for different frequencies and to ensure the correspondence with the theoretical forcing.
Then we proceed to apply the harmonic forces to the structure by the vibrodyne and reading (placing accelerometers in different points) accelerations, velocities and displacements.
Once recorded the different functions, we performed a calculation model in order to run a non-linear dynamic analysis using sinusoidal forcing generated by the vibrodyne due to compare the theoretical calculation results with the experimental results.
If the theoretical results coincide with the experimental ones, the Finite Elements Model can be considered suitable to represent the real behavior of the building and to simulate the response to any seismic event.
Otherwise needs a model updating.

3. Dynamic tests

The dynamic tests are made by exposing the structure to a dynamic excitation and recording the response in terms of displacements, velocities and accelerations. The data obtained, suitably processed, provide the dynamic characteristics of the structure (natural frequencies, damping, mode shapes).
Such tests shall define an "identity card" of the analyzed system and allow to directly calculate the response of a structure subject to any dynamic action (an earthquake or an operating dynamic load), to define a suitable and efficient numerical model capable of representing the structural response.
The significant parameters in the dynamic behavior of a structure are:
- It's vibration period T,
- The coefficient of structural damping which provides guidance about the energy dissipated by the oscillator while in motion if his behavior deviates from that perfectly linear elastic. The damping is usually expressed as a percentage of critical damping, and depends on the hysteresis of the own material and by a series of side factors such as the real behavior of the constraints and the presence of non-structural elements.

3.1 Different kinds of dynamic tests

Depending on the type of excitation the dynamic tests are distinguished in tests with natural excitement provided by the surrounding environment such as wind or traffic, the so called OMA (Operational Modal Analysis), and tests with artificial forced excitation induced by loads applied ad hoc in the experimental phase (for example the vibrodyne) also called EMA (Experimental Modal Analysis). The first avoid the use of external instruments, but processing the response data is in general a very complex phase and the results are sometimes uncertain. In the second analysis the forcing is under the direct control of the operator, because it is produced artificially by suitable vibration generators. The choice of survey mode is especially associated with the operational constraints relating to the building peculiarities. However, testing by artificial forced excitation is preferable because there is a better control of test mode, a greater availability of results (the test is repeatable), a better interpretation of the results.

3.2 Dynamic test OMA

The expression "Operational Modal Analysis" is used to indicate a procedure of identification based only on the output information (output-only). We talk about OMA in the case of environmental vibrations; the input on the structure, in this case, is not known but it is still possible to evaluate the dynamic parameters of the structure. OMA procedures, such as the classical EMA, allow to evaluate natural frequencies, natural modes and damping ratios; however, it is not possible to evaluate the modal participation factors as well, due to the unknown input. Considering its nature OMA procedures allow measurements made under actual operating conditions of the structure, so the modal parameters obtained are representative of the dynamic behavior of the structure in its real conditions of use and test does not interfere with the operation of the structure (for example, it is not necessary to close to traffic a bridge when it is analyzed). The correct results provided by an operational modal analysis may, however, be undermined if a not random excitation is added to the white noise.

3.3 Dynamic test EMA

In the EMA the excitation is applied by a vibration generators that can be :

- Instrumented hammer;
- Electro-hydraulic exciter;
- Electro-dynamic exciter ;
- Electro-mechanical concentric masses exciter (vibrodyne), such as the one used in this work.

The Electro-mechanical concentric masses exciter (vibrodyne) is a machine that is rigidly connected to the structure to which transmits a sinusoidal force with programmable intensity and frequency [5].

4. Case of study

The structure consists of 2 floors, with a total area of 220.25 m2 and a total height of 8.60 m. It rests on 8 footings connected by 4 foundation beams each one having a base of 60 cm and a height of 70 cm

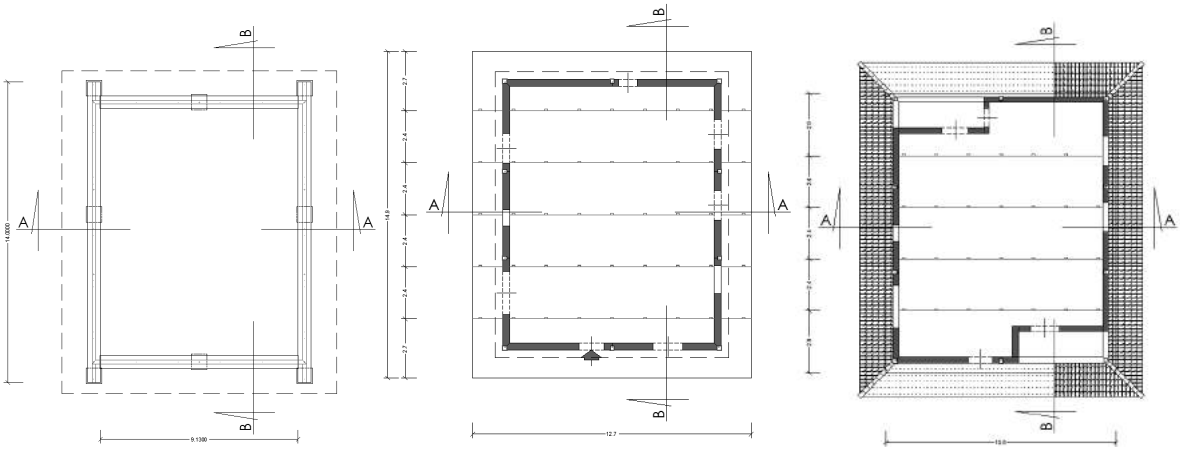


Fig. 1: foundation plan, 1° floor plan, 2°floor plan

Fig. 2: Structural plate

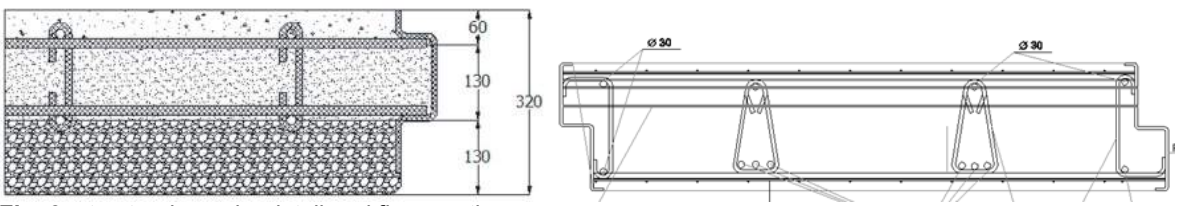


Fig. 3: structural panel – detail and floor section

Fig. 4: first floor, second floor with structural plates

Fig. 5: built up structure

4.1 Assembly system

The foundation beams are joined by a "male-female" link. Even the elements constituting the slab are hooked to the foundations by plug-in connections. On the upper side of the first floor there is an u-shaped steel profile with plugs; the same technology is used at the lower side of the second floor. The panels have on both sides a steel profile. The structural panels, therefore, are positioned on the first floor by matching the holes with plugs. The connection between adjacent panels is guaranteed following the same procedure. Once the second floor is positioned, in order to ensure a complete assembly of the floor, some steel cables are inserted, running into the holes in the two floors and in the channels left free between adjacent panels of the first level (Figures 18 and 19). The cables are bolted on top of the ceiling of the second level and in the foundation through specific holes.

Fig. 6: foundation beams, structural panels, detal of the joint between panel and floor

5. Static tests on structural elements

The necessary knowledge of the mechanical characteristics of the carrier panel was achieved with the three-point bending tests. This way we evaluated the load to apply to the panel to reach the elastic limit of the panels.

5.1 Bending test

The objective of the bending test is to measure the displacement in three point of the panel that is loaded orthogonally to its plane in the middle section. The sample panel, in plan, has a length of 1.50 m, is 2.00 m wide and is 0,32 m thick; It is bound on the two sides with simple supports (hinges). The test is conducted using a testing machine with a steel structure on top where is installed an hydraulic piston. Three centesimal analogical comparators are positioned under the panel for measuring the displacements. The panel is located on the supports welded to the test machine. The piston transmits the load to the panel by a rigid beam. In order to obtain an imprint of the load as small as possible, under the steel beam, a steel bar is welded. The comparators are positioned one on the right and the other to the left of the panel, at the center line of the supports, in order to measure the vertical

displacements; a third is positioned in the center of the panel to read the displacements of the point where the load applied. Thus, monitoring the displacements suffered by the panel, the mechanical characteristics can be identified.

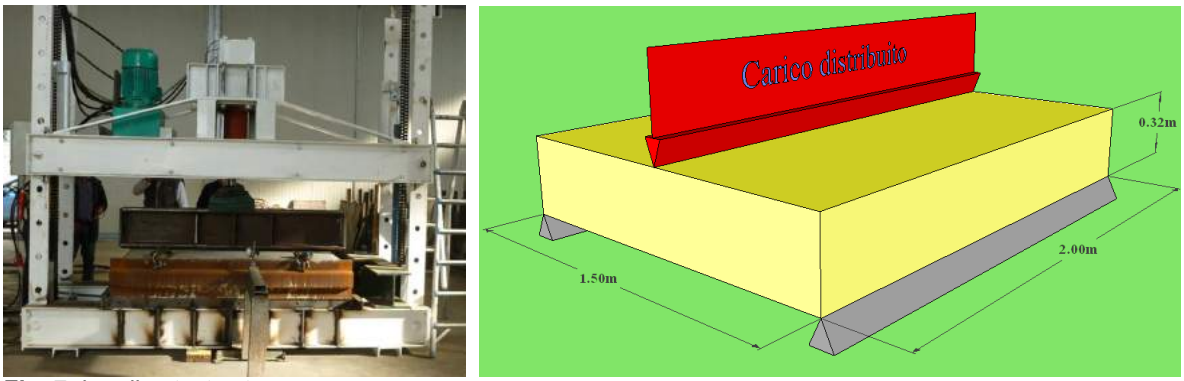
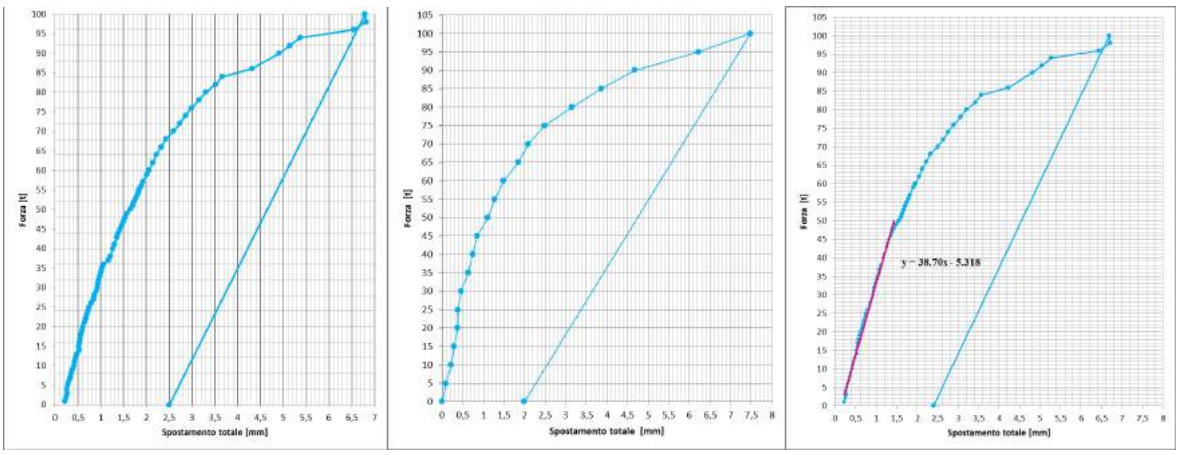


Fig. 7: bending test setup



5.2 Shear test

For the shear test has been used the same test machine. The panel was located as shown in fig. 8. The specimen was loaded in its own plane. Three comparators have been used for monitoring elastic displacements and also rigid displacement caused by any rigid rotation of the panel.

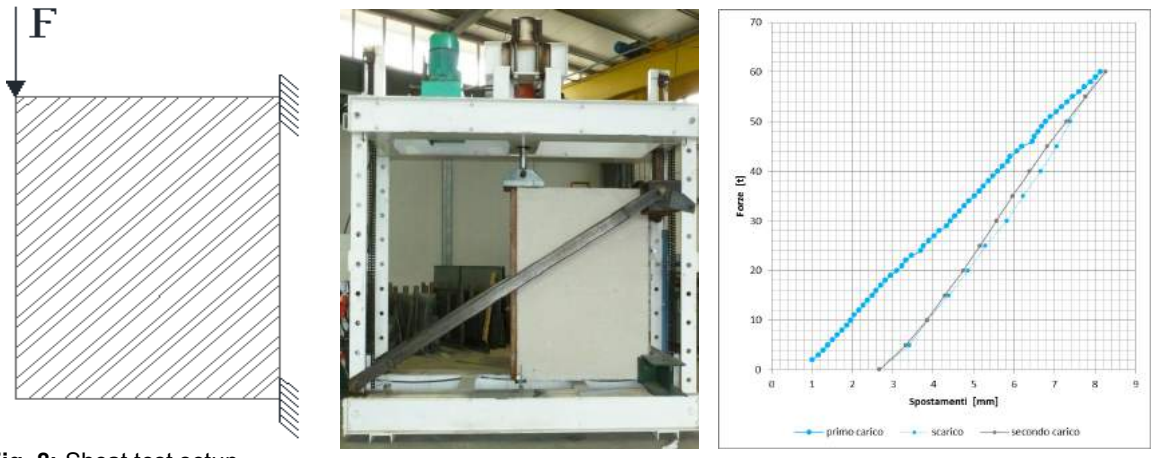


Fig. 8: Sheat test setup

5.2 Shear force and bending moment values on the elastic limit

Performing the bending tests, we derived the loads to apply to the panel so that the elastic limit is reached: 48t for the 1st test and 50t for the 2nd. Then, applying an average load of 49 tons, the value of the bending moment of elastic limit equal to Me is evaluated with the following formula:

$$\mathbf{M_e} = \frac{F \cdot L}{4} = \frac{24{,}5 \cdot 1{,}320}{4} = 8{,}085\ [t \cdot m] \cong \mathbf{79{,}31}\ [kN \cdot m]$$

Where, F is considered half of the value of the load applied for the test because of the wide of the panel.
In the design phase, a safety coefficient was adopted, in order to consider a value of the bending moment decreased of approximately 20□ of the limit value, obtaining the design value of the bending moment Md to be taken in the design phase:

$$\mathbf{M_d} = 0{,}8 \cdot 79{,}31 = \mathbf{63{,}45}\ [kN \cdot m]$$

Concerning the shear design value, the test has provided acceptable results up to the value of about 40 tons, over this value were encountered problems in the test machine. Therefore, you can consider a shear value to the elastic limit of:

$$\mathbf{T_e} = F = 20\ [t] \cong \mathbf{196{,}2}\ [kN]$$

Even in the case of the shear, in the design phase, a safety factor is adopted, but in this case it is greater than the bending moment, because this type of test is more uncertain. For this reason, Td is equal to 2/3 of Te value:

$$\mathbf{T_d} = \frac{2}{3} \cdot 196{,}2 = \mathbf{130{,}8}\ [kN]$$

6. Dynamic test on the structure (EMA)

The structure is subjected to dynamic tests by fixing the vibrodyne on the second floor, through a system of plates and anchor bolts , first in the x direction (the shorter side) and then in the y direction (longer side), to obtain a forcing effect in the two different directions [1]. Whenever measurements are made of accelerations, velocities and displacements at different frequencies with an acquisition system consisting of five accelerometers Kinemetrics Episensor monodirectional, placed at the four corners of the floor of the second deck. The processing of the results leads to the identification of the period T for which recording the maximum displacements in the x direction and y . To obtain the own periods of vibration of the building the results are depurated by the forcing value induced.

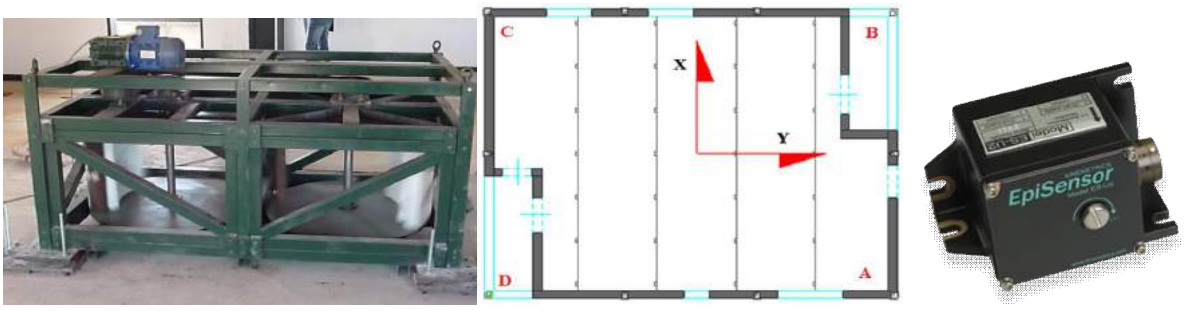


Fig. 9: vibrodyne, floor plan, accelerometer

6.1 Experimental results

Once the dynamic test on the building is performed, were measured average displacements, under the effect of forcing vibrodyne at various frequencies. Plotting the data in the tables, the graph shows the trend of the displacements suffered by the structure to various periods of the harmonic forcing produced by vibrodyne. Observing the diagram, it is clear that for both test directions the maximum displacements are recorded for a value of the period T □ 0,286 s, the maximum displacement in the x direction is equal to 0.345 mm, while in the y direction is equal to 0.337 mm.
The data are influenced by the value of the force, so, own periods of the structure greater or equal to the registered ones are not deductible.

It is necessary to purify the results from the forcing induced by vibrodyne. For this purpose, the relationship between the displacements and the forces developed by the vibrodyne is evaluated, obtaining the structural deformability at each frequency.
By relating the deformability with periods, informations about the periods of vibration of the structure are known, purified from the forcing generated by the machine.

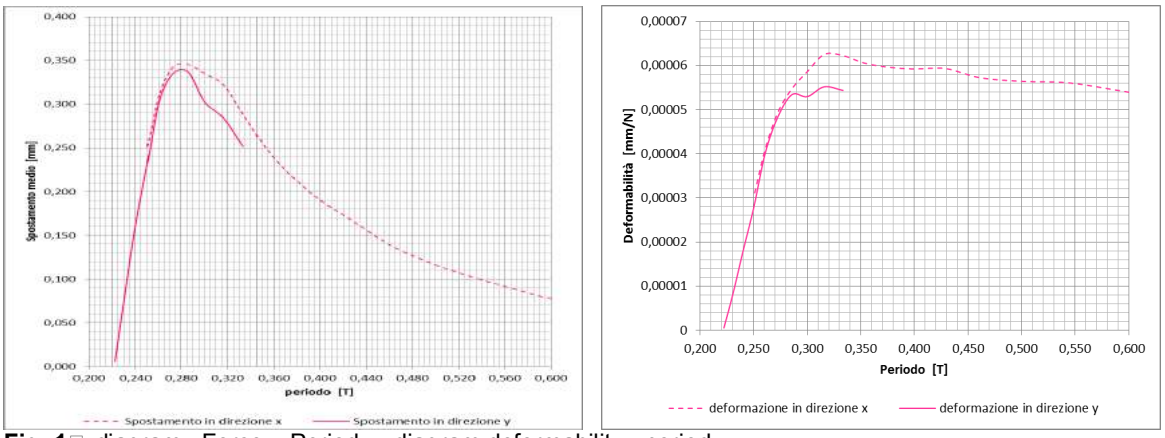


Fig. 1□: diagram : Force – Period; - diagram deformability - period

7. FEM structural model

For the realization of the model of the structure a finite element analysis has been carried out. The elements that make up the structure (foundations, floors, walls, roof) are modeled as follows:
- Foundation beams modeled by using "frame" elements and tied with eight supports, in order to simulate the support of the eight foundation plinths;
- The first floor they was modeled by using "frame" elements;
- The load-bearing panels that form the walls are modeled with "shell" elements combined behavior slab-plate. Around the openings (doors, windows), in order to outline the metal sections present, they are inserted the elements "frame" with dimensions and inertial characteristics equivalent to the profiles themselves;
- The beams, which form the roof of laminated wood, are schematized with elements "frame".
The loads used are the dead load and the weight of vibrodyne (1160 kg), placed in the center of gravity of the first floor slab.

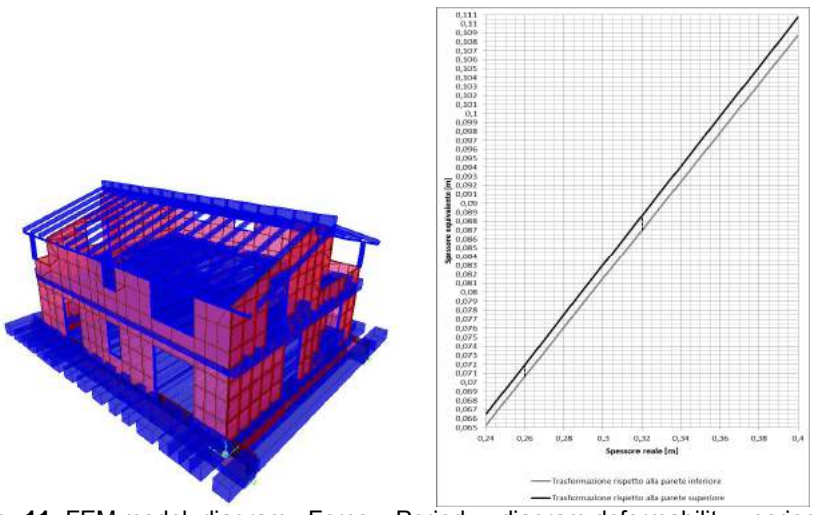


Fig. 11: FEM model, diagram : Force – Period; - diagram deformability - period

After defining the geometric model it is necessary to define the thicknesses to assign to the upper and lower walls (whose real thicknesses are respectively 26 cm and 32 cm), so that the first vibration periods coincide with those obtained experimentally.
The calibration is achieved with the identification of the "equivalent thickness" to assign to the supporting boards and the damping search, by comparing the values of the deformability and the displacements obtained by experimentation with those obtained with the calculation software.

Once all the features of the model are identified, in order to best represent the building, the stresses in the structure are analyzed in two or more floors, subjected to earthquake, to determine the values of the elastic limit of the shear and the bending moment of the structure.
It is important to point that the maximum value of the structural deformability is observed for both load direction (x and y) in correspondence with a period equal to approximately 0.32 s and in the y direction is has a relative maximum in correspondence with a period equal to approximately 0.29 s
Proceeding by trial and modeling the walls using the concrete C35/45 (present in the inner layer of the panel) is obtained an equivalent thickness to the bottom wall equal to 8.7 cm and one for the top equal to 7.2 cm. In fig. 11 there is a diagram, which gives, once established the actual thickness of the structural three layered plate, the thickness of the shell to be taken in modeling as "equivalent thickness".
The straight line processing with respect to the upper wall (represented by the black solid line) is obtained by multiplying the "conversion coefficient" with respect to the upper wall for the real thicknesses for practical use. The conversion line concerning lower wall (represented by the gray solid line) is obtained by multiplying the conversion coefficient of the lower wall with the real thicknesses for practical use.
The dotted lines indicate the thicknesses used for the case under study.
With dimensions identified for the panels (8.7 cm and 7.2 cm) are obtained the first period of vibration equal to 0.321 s (vibrational mode in the x direction) and the third period of vibration equal to 0.286 s (vibrational in the y direction). The first period is almost perfectly coincident with the experimental results obtained in the x direction; the second, however, coincides with the relative maximum of the period-deformation curve in the y direction.

8. Conclusions

In carrying out the experimentation was operated on frequencies of vibrodyne in correspondence of which the forcing produced is not perfectly coincident with the forcing theoretical.
The floor is constituted of side by side beams in the x direction and when the test is carried in the direction y, it is not possible to achieve reliable information about the real propagation of forces between the elements constituting the floor.

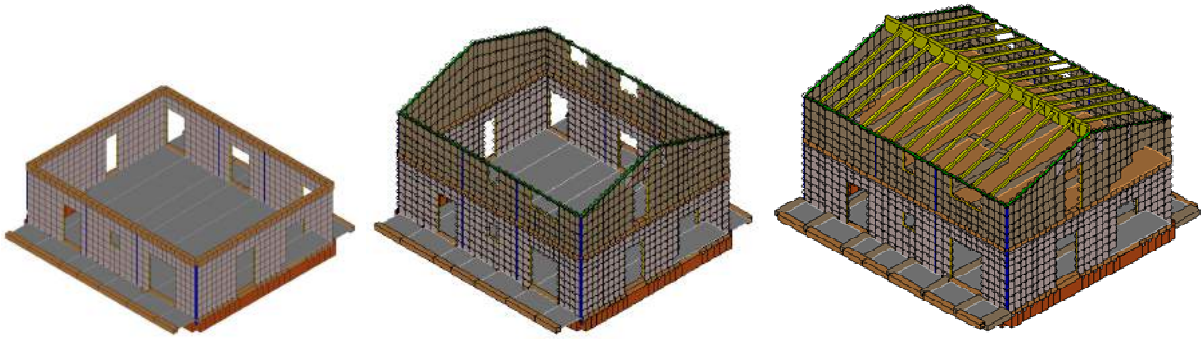


Fig. 12: FEM model

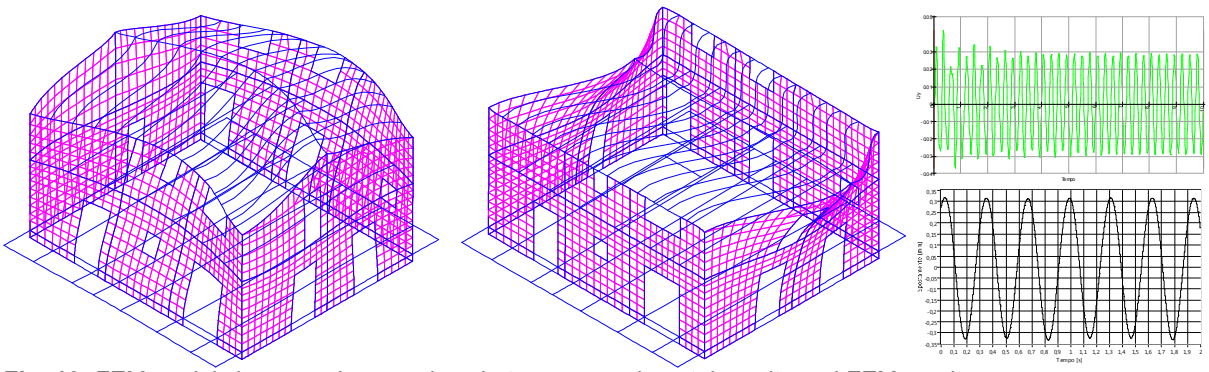


Fig. 13: FEM modal shape, and comparison between experimental results and FEM results

The data obtained from experimental tests allowed to establish with good approximation as follows [5]:
1. the calculation of the structure can be performed by modeling the load-bearing walls as a continuum and using two-dimensional elements with combined behavior slab-plate.
2. The “equivalent” thickness recommended to be attributed to the panels is equal to 8.7 / 9 cm to 32 cm panel and 7.2 / 8 cm to 26 cm panel. The equivalent thickness is homogenized to the concrete used for the inner part of r.c. 6 cm (structural core) which in this case was the C35 / 45 concrete type.

3. The structure for effect of horizontal connections replies in box-shaped manner to the horizontal actions and the risk of panels opening is eliminated. However, for structures with multiple decks such horizontal links, which are steel rods, must be dimensioned using a calculation model in discontinuous panels connected in the passage with tie points
4. The presence of panels assembled with the mounting tolerances, in dynamic phase still provides a damping effect and greater energy dissipation of the equivalent monolithic structure, therefore there is a considerable advantage in terms of seismic response of the structure.

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The portuguese milling heritage and outrage over its destruction: from a productive space to a mutilated form.

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Abstract

Auguste Perret reminded his students to “design beautiful ruins”. The ruin has an important place in the imagination of those who live space; it promotes the conditions for travelling through time and represents the will of a persistent architecture in remaining anchored to matter.
If we travel across the Portuguese landscape and beyond, we notice the presence of a number of ruins: industrial buildings. Buildings that once had a productive life, a defined image in the landscape, and that now appear in a state of fragmentation, a formal mutilation. A romantic attitude would lead us to recognizing that within their mutilation is a form of new beauty and a chance to learn something new of the buildings. Yet the issue becomes controversial if we begin to consider the perception of those who experience the urban area, where these buildings represented poles of social organization and sources of economic support. This is the case of factories related to the production of goods or those which produced staples from primary commodities linked to survival, such as bread, pasta and cereals.
This paper aims to “cross” the territory and analyze the conditions affecting some of the most significant milling factories, what they represented for society and what they could represent even in their current state.

Key words: Factory, Milling, Ruin, Identity

1. Fragments

Fig. 1: Igor Mitoraj: “Angelo” (left), display at Pompei (right).(https://ilsassonellostagno.wordpress.com/tag/igor-mitoraj/)

Ruins have a significant place in the experiential life of man: they bring about altered states of consciousness. These states range from poetic emotion to the feeling of rejection. Their poetic nature is expressed in the ability to provoke a journey in the viewer; certainly not a physical journey, but a temporal transposition leading to a time in which the identity and function of a building coincided in an indissoluble unity. We are unsure of when the moment of conjunction between form, material and function is; we only know that we travel in search of a virtual moment which we locate, at will, within time and this indefinite moment helps us to satisfy our unnatural need for infinity. Having the possibility to repeat this a-temporal experience pushes us towards making a real physical journey, often exhausting, beyond our comfort zone, in order to discover and admire fragments of buildings without life, which are still there, it seems, exclusively to enable our journey.
This is not a solely contemporary attitude. Ruins, in history, moved multitudes of scholars, designers, poets, architects and painters, fascinated by their indefiniteness, by their imperfect presence in the world. Their incompleteness, whether intended or brought about by decay, returns architecture to a dimension in which time becomes matter. We find ourselves having to relate to objects that do not belong to that which we are most used to: completeness, unity, the finite, the delimited, the accomplished. When we approach a ruin, that which remains of a completed building, we are instead confronted with the unfinished, the mutilated, the fragmentary, and though it may seem peculiar, all of this has a strong aesthetic. Unfinished architecture is the expression of human weakness and the mortality of a work and this moves and carries us both emotionally and physically. It is a fatal beauty which reconciles us with the temporality most appropriate to us: “it is like a broken shell: with the interior exposed we discover a fascinating world. In architecture, the same thing happens: a building that should have been covered remains uncovered, offering images of spaces in the open air, unexpected and powerful images. An incomplete canopy etc. etc. A building for which only two or three bays are completed and these, having lost the original relationship between height and overall length of the building, appear as giant fragments”.[1]
By way of contrast, this new idea of beauty immediately provokes the need for some recompense to this indeterminacy due to our human condition to “limit”, “reconstruct”, “redefine” and “rebuild”.

2. Heritage in search of authors.

Spatial fragments once played a role in a locality through a specific function that served the development of society, of which they were a part and in which they were designed.
If this function were, for example, aimed at production, reference is thus made to industrial buildings. The recognition of an industrial object is not always immediate within the wider definition of heritage. A plurality of definitions exists that generate attitudes of consensus as well as generating strong attitudes of dissent. While heritage is understood, in its broadest sense, as something that is socially recognized but at the same time varies depending on the cultural and geographical context and historical era to which it belongs, industrial heritage, as a recent acquisition, still suffers from friction due to its etymological location. This is due to a number of factors, not least the fact that it has been recently acquired, but also as it includes a variety of not always quantifiable heterogeneous elements in its meaning.
Assuming such definitions, reference should nevertheless be made to those provided in the Nizhny Tagil Charter (17 June 2003), establishing the characteristics of an industrial heritage which “... includes the traces of industrial culture that have historical, technological, social, architectural or scientific value. Such traces include buildings and machinery, workshops, factories, mines and processing and refining plants, warehouses and laboratories, centres of production, transmission and use of energy, means of transport and all its facilities and infrastructure, as well as the premises where social activities related to industry developed such as housing, places of worship and education”. While defining industrial archaeology as: “an interdisciplinary method of studying all the tangible and intangible traces, documents, artefacts, stratigraphy and structures, human constructions and natural landscapes, created for or by industrial processes. Industrial archaeology employs the most suitable research methods in order to increase understanding of the industrial past and present”.

It is clear from the definition adopted as canonical by the scientific community that interfaces with such heritage how difficult it is to recognize, classify, limit and, therefore, to protect, enhance and recover. It is therefore understood, in the face of these multiple indecisions regarding the recognition of the values of such heritage, that it is perhaps simpler not to take a position and to stay and "observe" what is left of the ruin of an industrial building. Indeed, there is little doubt that we engage with such values when we enter into a relationship with industrial heritage and, if we refer to the definition established by the VALUES of the Nizhny Tagil Charter we understand that "Industrial heritage is the evidence of activities which had, and still have, profound historical consequences. The reasons that justify the protection of industrial heritage shall commence essentially from the UNIVERSAL VALUE of its features, and not the singularity or uniqueness of the site". It continues: "Industrial heritage is invested with SOCIAL VALUE as part of the condition of the life of men and women and, as such, gives them an important sense of identity. The Charter concludes by stating: "In the history of industry, engineering and construction, industrial heritage has a SCIENTIFIC and TECHNOLOGICAL VALUE, as well as representing an aesthetic VALUE, for the quality of its architecture, its design or its planning".[2]
With a significant delay compared to that which was identified as the Industrial Revolution in the rest of Europe, Portugal also experienced a new form of industrialization, a new form of territorial occupation and new social ways of living in urban space, less revolutionary, yet equally striking. This new industrial society shaped territories and lifestyles, building objects completely foreign to the dominant constructive modes: smouldering factories began to appear, bridges, railway stations, warehouses, power plants. Alongside all of this, further social support buildings were necessary such as housing for workers, schools, canteens and gyms. Objects appeared at speed, in some cases not allowing sufficient time for the urban context to understand, both in spatial terms and in terms of meaning. This frequently produced predators of urban space, chaotic, scenically unbalanced elements (think of mines, quarries, railways), only justified and accepted due to their primarily functional value. Of this new world, we today are only witnesses of that which remains, what was left behind and survived, leaving its "function" behind. We must give a new name to all this, we must attempt to apply the most appropriate definitions within a modern perspective. We need to replace it, forced by a multitude of factors to sometimes sacrificing function, sometimes dimension, sometimes context and sometimes the building itself.

3. Flour, pasta and bread: industrial production and social survival.

It is relatively simple to frame the study on milling factories within this theoretical context since, as reported by Jaime Alberto Couto Ferreira "*Our civilization or, rather, the entire civilization which is ours made up of component parts of the Mediterranean, Northern Europe and the Atlantic, was, in terms of staple foods, a civilization of bread, wheat and rye. (...) Due to these multiple implications, bread has been, over the centuries, a good that has aroused, in cities and in States, moral, religious, political and administrative questions, contributing to the development of knowledge that is at the basis of sciences such as agronomy and that disciplines such as economics, anthropological studies, sociology, law, ethnography and history have elected as the subject of their analysis*".[3]
Portugal, as in other European countries, experienced two major periods related to milling culture, separated by the 1700s. The transition took place within a legal framework which both regulated the import of foreign grain (Law of 18 April, 1821) and prohibited its import altogether (Law of 7 August, 1837). It was during the 1870s that some of the most important milling factories were founded in the Lisbon area such as: the Caramujo factory of Manuel José Gomes, the Estrela factory of Jo□o José Martins, the Santa Iria factory of Jo□o da Silva Ferr□o di Castel Branco, the Santo Amaro or Calv□rio factory of Eduardo Conceiç□o Silva □ Irm□o, the Bom Successo factory of Edward Harrington and the Sacavém factory of Domingos José de Moraes □ Irmao. Between 1874-1877, the factories developed from being individual concerns to the establishment of the so-called Companies.[4]

The ever-increasing strength of industrial milling associations, the increasing control of flour and the animosity of landowners led the government, in 1888, to founding a milling factory at the convent of the Carmelites (Grilas) within the Military Maintenance complex in Lisbon. This latter factory was conceived as an organ for regulating bread prices and products derived from flour, in order to mitigate speculation and limit the profits of industrial millers. On 15 July 1889 a law was passed that imposed a neo-protectionist veto on Portuguese cereal industries and authorized factories, through a “Table of Distribution” in the purchase of foreign grains on the condition that they would guarantee more than double the use and milling of domestically-grown grains. The following years saw the constant superiority of factories in Lisbon compared to those in Porto. In 1904 the Companhia Nacional de Moagem was founded which, by 1918, was known to possess four of the six largest milling units present in Lisbon. A significant development occurred in 1918-1919 when two major groups were clearly outlined: from the Nova Companhia Nacional de Moagem, the Companhia Industrial de Portugal and Col□nias was born along with the Sociedade Industial Aliança, formed from the Caramujo and the Cruces □ Barros factories. The CIPC was the most powerful of the milling groups, possessing some of the most important production factories of flour and pasta: the Sacavém factory, the Pasta and Biscuits factory in Rua 24 de Julho, the Milling and Biscuits factory in Rua de Santo Amaro, the Milling factory in Xabregas, the Estrela factory and the rice cleaning factory in Rua 24 de Julho.

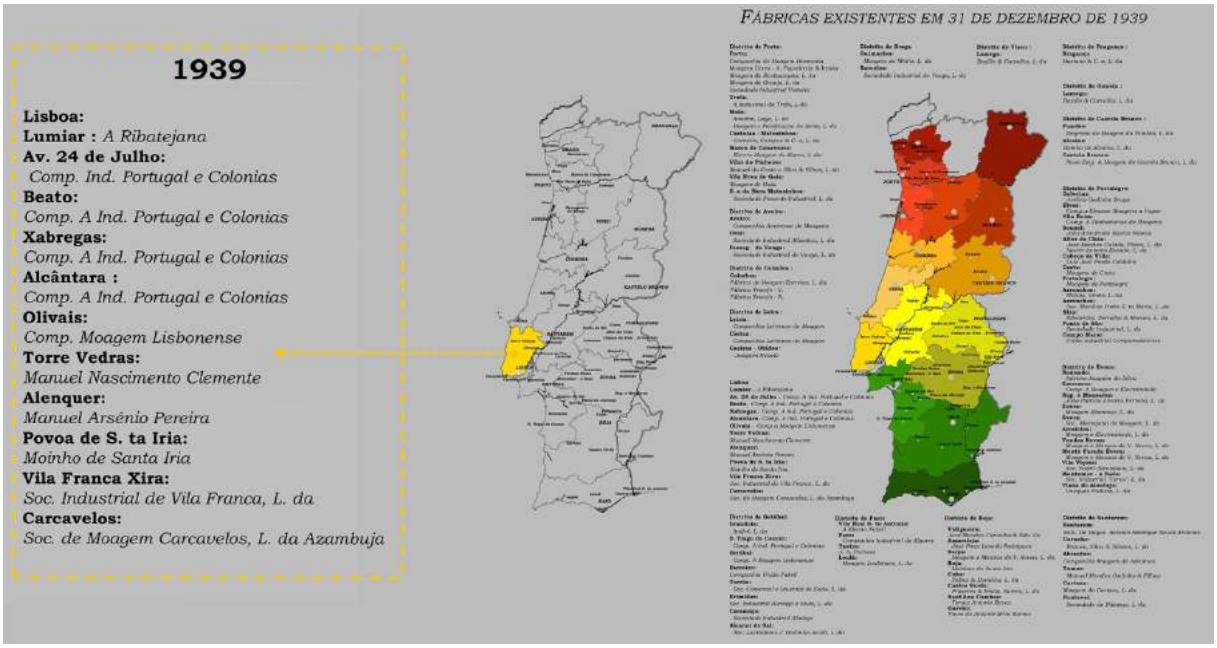

Fig. 2: milling Factories present in Portugal in 1939, specifically in the area around the city of Lisbon (graphical reworking by Raffaella Maddaluno).

4. □rban amnesia and heritage relics.

Today, this panorama of the built geography of milling factories in Portugal remains a fading memory. This multitude of built sites has left empty and fragmented spaces. They are barley recognizable as the great complexes of flour that regulated the economy, politics and the law as discussed in the historical summary above. They have been replaced by a silent geography that we struggle to rebuild. These silent, non-communicative places provoked a social reaction during the decades following their

functional neglect; polemical, multifaceted complex reactions. Only those factories fortunate enough have survived and continue to carry out their original function, both due to a sequence of events and astute business decisions: the Nacional in Lisbon continues to produce pasta and derivatives along with the Ceres factory in Porto. Some have changed their original function, such as the Napolitana factory in Lisbon which, having witnessed a complete overhaul of its interior spaces, is now home to offices. Yet the majority are now fragments without any real recognition of their identity as part of the local area (the Triunfo plant in Coimbra, the Milling Factory in Beja, the Caramujo factory in Almada, etc.). All examples of industrial buildings that constitute excellence in terms of historical, economic and constructive significance and that now face total indifference.

It is evident that this represents far more than a destroyed heritage; it does not simply refer to corruptible matter. It refers to a deep connection with questions of identity of these places which, in turn, leads towards questioning how we can reconnect to these spaces once again. Whenever issues of identity are raised it is necessary to interact with issues relating to the memory of the events that built them. It is also recognized that a specific building generates different images depending on who benefits from it and these images remain in the mind in different ways and with different features: *"... Will all these images accumulate in the brain, or, if the brain chooses, which one will it prefer We must admit, however, that it has its reasons for choosing one: this same word, uttered by someone new, how will it reach the memory from which it differs"*.[5] It is thus immediately clear how difficult it is for those who enter into a relationship with urban memory to select those signs which should be maintained, especially if these spatial signs have suffered "urban amnesia" over time, that is to say abandonment, demolition, replacement and depopulation. It is also of interest to note that we could apply the same terms that are used in sociological and psychological disciplines to reactions in the field of architecture in general, and in the field of industrial heritage in particular, when we witness phenomena related to loss and memory.

Our body, with all that surrounds it and all that it builds, is a conductor, with the ability to gather movements and transmit them to motor mechanisms, involuntarily if the action is the result of a reflex mechanism, voluntarily when the action is a choice. Memory is like an independent object that gathers images over time, and among them are those of that same body, of which it is the centre. The things that surround the body act upon it and the body acts on images. It is therefore to the body in motion and, as a consequence, to the notion of time that we must relate when referring to the past. Bergson claims that images of the past are preserved in two forms, that is to say that memory has two forms that may be transmitted: motor mechanisms or independent memories.[6] In the first case, when we experience a space, for example when we pass a building for the first time, we "read" it, taking in elements. We may pass that same building several more times and, if our attention is present, we will store more and more detail until assuming that the building is part of our acquired experience and conscious memory or, rather, we "understand" it. Each individual experience with that building and everything that surrounds it will come to mind with its own individuality along with the circumstances that generated it. Each of these "readings" will be imprinted in the memory and will form memories. In this case we would speak of the memory of an object the building in question, which was acquired through habit (continuously passing the building) or through the repetition of an effort. The "understanding" of the building will instead be nothing but a composite image acquired as the result of a series of repeated "readings": a total reconstruction. On the contrary, the memory of a single reading has nothing of mechanical habit, but for some reason was chosen and stored in a different form and has the characteristic of being unrepeatable.

This operation is often experienced when referring to an architectural past where only a few examples of a historical account have been extrapolated, applying selection criteria which in one case would be functionalist and in another aesthetic. Industrial heritage becomes worthy of attention and protection if it responds positively to the established criteria. Thus, a form of selective memory that actually conceals an amnesia of all that which was not selected is not worthy of being counted among memories. It was thus decided that in the case of an industrial building, it was worth preserving only a part of its constructive history, sacrificing some aspects such as the machinery which, no longer functional, is therefore not useful to an "exclusive memory".

The memory of that particular reading of the building is a representation to which an arbitrary time period is assigned. However, the memory of the understanding of the whole building is an action that requires a total and complete retracing of all readings needed to compose it in the memory. Such a memory is lived - it is not represented. We thus obtain a "*profoundly different memory from the first, always striving towards action, located in the present and addressed only to the future. Of the past it has retained only the intelligently coordinated movements which represent accumulated efforts; it does not find these past efforts in the images-memories which recall them, but in the rigorous order and systematic nature with which you reach current movements. In truth, it does not show us more of our past, but puts it in place; and if it still deserves the name of memory, it is no longer because it preserves old images, but because it prolongs the useful effect up to the present moment*".[7]

Cases have also been seen in which industrial heritage has been robbed of its social value by a society accustomed to an attitude of consecration towards heritage relics. This approach of considering heritage only through its value as a "relic", as in the case of castles, palaces, convents and cathedrals ruled out a substantial number of buildings and everything that the buildings had created around them. This has generated, for operators within the cultural heritage field, the right to select by choosing relics and eliminating the connective tissue between relics. As a result we have witnessed the irresponsible choice of individual objects, individual buildings, saved from destruction but given over to another type of abandonment: the renunciation of a function, an aesthetic, of a totality of meaning.[8]

Yet the traumatic awareness of the concept of loss can result in the opposite tendency: the tendency to persist in repeating and producing automatic responses aimed only at defending themselves from the possibility that what caused the trauma may come back and repeat the painful experience. This anxiety leads to non-choice, confuses the weighting of the selection criteria, disturbs the clarity of a reasonable project and leads to a phenomenon of "absolute and total capitalization", i.e. everything that has come to be respected tout court. In a positive perspective, this leads to valuing and conserving the less evident, less canonical: there is no longer any separation in the gap between objects and the objects themselves, no difference between that which is content and that which is contained.

How should we react in the face of such complex conditions and occurrences? What kind of memory should we hold for a place born with an industrial identity of this level? We could choose to align ourselves with one of two extreme states; the first in which we would employ "*a totally contemplative memory, with a vision only able to learn in the singular*" which promotes the memory of differences and unconditionally accepts all changes, all amnesia, all intrusions and the anomalies of identity.

A second approach would be to assume a "*fully motoric memory, which imprints the sign of the generality of actions and promotes the perception of similarities*"[9] and, therefore, having established which is to be our principal identity, acts to ensure compliance with that and only that.

Yet these two concepts would not be complete without the addition of that which in phenomenology refers to the perception we have of the duration of transformations in urban space and were we not to pose the fundamental question "*How are we aware of what is no longer and what is yet to be (...) We perceive what is happening now, we remember what is no longer and we imagine that which has not yet happened"*.[10] In order to understand the architectural object, be it a factory, housing or specialist building, extended in its temporality, it is necessary to possess a fluid perception of the succession of its change. However, when we are faced with such a strongly structured urban fabric, the perception we have of buildings is both an "identity synthesis" consisting of integrated moments rather than disconnected fragments, and a "temporal synthesis" or the semantic integration that they involve. Therefore, the consciousness of time must be considered as a formal condition for the possibility of the perception of an object.[11] In the fluidity of time and in the succession of transformations, those moments when we witness the "dissolution" of space, i.e. the loss of buildings, should also be contemplated. How should we operate, therefore, in a possible design stage without falling into the trap of "trauma"? Foucault helps to formulate a methodological approach in the reinterpretation and revision of signs. We could talk of a principle of discontinuity, i.e. having the courage to accept the "empty", assuming that when a building has finished its dialogue with the urban space, it is not

necessarily the case that an outright substitution is an essential action. "*The fact that there are systems of depletion does not mean that underneath them, beyond them, a great unlimited discourse may reign, continuous and silent (...) discourses should be treated as discontinuous practices, to be crossed, flanked at times, but also ignored or excluded.*" When Carlos Martín Arís speaks of a void, referring to the work of the sculptor Oteiza, he defines the process as spatial inoccupation, a subtraction for the creation of an active void, a new source of energy and possibility. "*The sculptural mass corrodes and thins out and while it tends to atrophy, the void begins overtaking the work. Outer space penetrates the limits of sculpture and becomes confused. The ultimate goal is the achievement of an evacuated space, available, in which the traces of the laborious process of removal and disposal remain*".[12] We could also adopt a principle of specificity, which would save us from the constant temptation towards the museumization of all things and render us constant accomplices of knowledge, "*not resolving discourse in a game of preconceived meanings; not imagining that the world makes our faces readable, we would only have to decipher; the world is not an accomplice of our knowledge*; (...)".[13]

In cases such as that of milling heritage, questions are raised on which innovative strategies and which ideas should be employed in order to "save" the place. Four concepts have, very generally, dominated the traditional history of creativity: **meaning, originality, unity** and **creation**. Generally we seek the "*point of creation, the unity of a work, of an epoch or a theme, the mark of individual originality, and the undefined treasure of hidden meanings*".[14] However, as Foucault points out, the concept of **event** (as opposed to creation), **regularity** (as opposed to originality), of **possibility** (as opposed to meaning) and the concept of the **series** (as opposed to unity) should perhaps instead be employed as regulatory principles. New forms of "spatial occupation" have recently been witnessed, legitimized by the absence of historical production capabilities. The sudden and irreverent presence of urban art accelerates the reading process, it fractures it, chops it up until reaching saturation point, then quickly reassembles a new language of identity which is now already in the new forms of the urban present. It should not be overlooked that the factory is an anthropological space which contains memories, organizational hierarchies, knowledge, constructive wisdom, flows of goods and materials. Every factory builds a protocol of relations, from the first moment of its foundation, within the district that hosts it, and defines the words of the dialogue which will be developed from that moment on. If these incursions of artistic language provide, on the one hand, dynamism to the process of urban renewal and delay spatial neglect, it is perhaps correct, on the other hand, to enquire as to how long such an identity alteration may hold (albeit remaining in the sphere of creative "production"). Such artistic gestures do not always have the strength to drag with them the constructive and functional connective tissue that supports industrial space and makes it part of the "everyday". These operations, when viewed as single events or events that are not structurally designed in a dialogue of interdisciplinary skills, bring only temporary change, a change of faces (from inhabitants to "visitors" or "tourists"), a change of sounds, and distances the **normality** of the typical daily activities of a multipurpose district.It is with the term urban "normality" that this set of reflections and analysis should be completed, borrowed as a final synthetic image, i.e. a balanced need for spatial conditions that lead us back to the habits and regularity and that removes us from the exceptionality of the constructive event or the randomness of redevelopment. Only in this way is it possible to avoid being the carriers of functions, but they will be understood and, as a result, urban spaces may be designed that welcome everyday life and thus establish a balanced relationship. It is in the everyday that we must locate the urban past of any given built presence.[15]

Fig. 3: The Triunfo factory in Coimbra (http://historiarimagens.blogspot.pt/2014/07/triunfo-e-cerveja.html) - abandoned.

Fig. 4: Factory in Almada (Photo on left at http://www.lugaresesquecidos.com/forum/viewtopic.php?t□839, photos in centre and right by Raffaella Maddaluno) □ abandoned.

Fig. 4: Nacional factory in Lisbon (photos by Raffaella Maddaluno) - partially functioning**.**

Fig. 5: The Napolitano factory in Lisbon (photos by Raffaella Maddaluno) - currently partially functioning as offices of a supermarket chain.

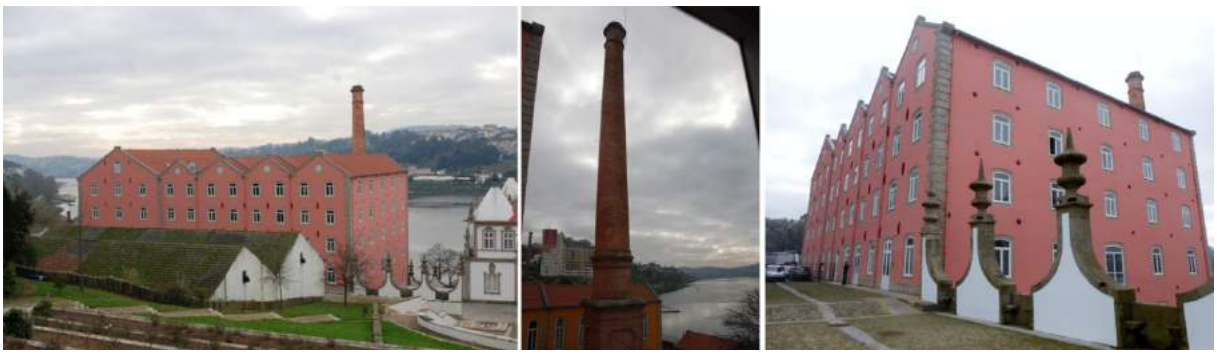

Fig. 6: Harmonia milling factory, Porto (photos at http://viajaredescobrir.blogspot.pt/2012/12/antiga-fabrica-de-moagem-da-companhia.html) - currently a hotel.

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ASSISTED ANALYSIS ON WORKS INTERFERENCES ON RESTORATION CONSTRUCTION PROJECTS

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Abstract
Workers' safety management in restoration construction sites is an arduous task for designers since the difficulties given by particular environment and the wide range of works existing in the restoration panorama. In order to properly face this task, construction site needs to be studied since the preliminary phase of the design process, especially in restoration where work processes has a great influence in the success of the intervention. In fact this preliminary study on operational issues is able to solve a great number of criticalities that affect the project, if discovered during works, in terms of time, cost and worker's health and safety. In particular works interference analysis is an important challenge to void delays due to the overlapping of works in adjacent spaces. In order to facilitate this task the ongoing research developed an IT based method for construction site interferences analysis. The main mission of this method is to assist the choice of the right action to solve interference criticalities. The system is primarily based on the storage of typical construction work places in a database and it is supported in particular by BIM tools and spreadsheets linked together. That way is possible to have a simple access to information required for interference analysis such as potential damage for workers and feasible technical solution. This amount of graphical and informative data permits to foreshadow interference situations in a restoration work and to automatically find, thanks to a proper data match, possible solutions of the analyzed interference to be chosen by the site designer.

Keywords: Restoration site design, interference analysis, risk assessment, BIM, CoSIM

1. Introduction
Safety evaluations on construction sites are important tasks to be faced during design phase, not only by the site designer but also by the whole design team, as law requires. In restoration projects this task is certainly more arduous to face, since the intrinsic uncertainty given by the particular context of an existing building. If not promptly studied during design phase safety issues could extremely affect the project especially in restoration where work processes has a great influence in the success of the intervention. In fact, a preliminary study on operational issues is able to solve a great number of criticalities that could affect, if discovered during works, the project in term on time, cost and worker's health and safety. One of the most important task for a site designer is the evaluation, and then the resolution of interferences between working areas of the construction site since the need of coordination between different construction firms. In fact times and costs evaluations require frequently the realization of different works simultaneously with the presence of different firms on the same place at the same time. A correct evaluation of the interferential risk is always an arduous task for a site designer since the unpredictability of site situations and the number of possible interferences that could occur in each construction phase. Since these difficulties, detectable especially in restoration projects, the presented research aims to develop an IT based method for construction site interferences analysis and resolution, if possible, by the insertion of proper site technical elements that could avoid the interference. The development of this system fits in a wider research on the BIM implementation for construction site design that aims to make more efficient all aspects of site

planning. Therefore, the proposed system is primarily based on BIM tools used for site design linked together with spreadsheets for a faster information management. As the application on a real case study will demonstrates the developed system permits to foreshadow interference situations in a restoration work and to automatically find, thanks to a proper data match, possible solutions, to be chosen by the site designer, of the analyzed interference.

2. Literary review

The recent spread of BIM AEC Industry took the research to examine widely different aspects of this technique with the aim to improve step by step efficiency in building design and management. Although a large part of the research focuses primarily of aspects related to new construction, in the last years the focus on restoration projects improves. A great work in focusing BIM research for existing building was carried out by Volk et al. [1]. In particular they observed in a wide literary review a “scarce BIM implementation in existing buildings” both from industry and from research points of view. The main reasons of this scarce development could be the not yet solved difficulties in conversion of existing matters into BIM objects and in reaching certain data of already realized buildings. In addition, many studies and researches applied in existing building have been taken into account maintenance and facility management of recent structures rather than architectural heritage. The development observed in BIM research concerning existing building takes into account a trend that is named by further researchers as HBIM (Historic Building Information Modelling) or, in some cases, BHIM (Building Heritage Information Modelling). In particular, the improvement of 3D survey techniques such as laser scanning facilitate the diffusion of HBIM since the possibility to have at disposal a precise 3D survey to be translated in BIM. In this sense, Murphy et al. [2] aim to create a “prototype library of parametric objects” starting from the collection of survey data in order to produce complete architectural 3D models not only characterized by surfaces but also by parametric information (e.g. construction methods). Conversion of such particular objects concerning historical buildings (e.g. classical orders columns) into parametric objects has been a great challenge to face, due to distinctiveness of many elements [3]. Another challenge is to represent actual conservation conditions of an object in order to manage possible maintenance/restoration intervention. Oreni et al. [4] follow this way, studying HBIM for several aspects, starting from model render of 3D survey to make it interoperable for conservation and restoration management. From this points of view is possible to start to think about operational issues of a HBIM in order to properly produce a site design. Academic research analyzed many different aspects of site and works planning trying to implement it in a BIM environment. However the largest part of this concerning with new construction rather than restoration and recovery. Vimonsatit et al. [5] underline the possibility to enhance site planning thanks to simulations and BIM that shows available spaces throughout the construction stage. However this research focuses on a problem on a lack of serious design tools that do not leave the choices entirely to the knowledge of the users. Lot of the researches the concerns construction sites are indeed focused on construction scheduling (with the implementation of 4D models) and safety planning. In particular from many years researches on 4D scheduling have been carried out starting from 4D CAD tools [6] to 4D BIM and use of data to generate schedules [7]. The 4D tools and the resulting possibility of construction phases visualization permit a detailed design of construction works taking into particular consideration, first of all, safety aspects. However planning for safety has been considered an important task in the satisfaction of the project needs. For what concerns site spaces management Kassem et al. [8] focused their attention on the development of a 4D tool able to visualize in time working space in each BIM environment since the compatibility with IFC. A further improvement was given by Moon et al. [9] who focused particularly on interferences underlined by schedule. In general the main goal is to facilitate safety planning production [10] ensuring a detail level suitable for hazard identification before starting construction. The presented research aims to the same objectives by give an overview of the construction site design process and developing a coherent method supported by proper tools able to help the site designer in his tasks. One of these tools -specifically developed for the purpose by the task group of A.B.C. Dept.- consists in the presented IT system for working spaces interference analysis.

3. Research method and background

The presented research takes into consideration a solid background developed during years about construction site planning and management. It consists in particular on some principles, in continuous development thanks to research on the topic supported by many direct experiences carried out especially in relevant restoration construction sites. These experiences permit to get and remain in touch with the developments of professional work to whom our research activities is dedicated. For this reason, our research method consists in simple circular path that starts from the on-field observation for research development to the on-field application of the research (see figure 1). In fact our research aims mainly to facilitate and make more efficient the work of designers in terms of on field feasibility of work and construction site planning and operation.

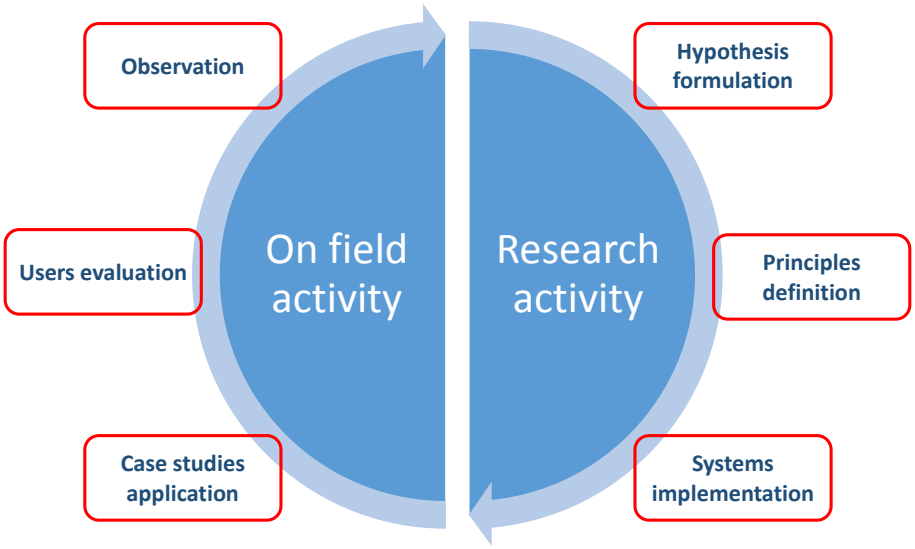

Figure 1 – Research method as a circular path

Thanks to the experience given by a direct on-site observation is possible then to make a system between the developments of the research and the increasing needs of designers in order to develop methods and tools for enhance efficiency to site planning and management of restoration projects.
The field analysis permits also to have at disposal different case studies useful for testing implemented system and evaluate their efficiency of, if necessary, to refine them. Tanks to this approach we developed step-by-step many issues related to construction site design of existing project concerning also, especially in the last years, IT tools use and implementation. One of the last research reports [11] developed in particular a proper methodology for BIM use to achieve operational planning on existing building projects realizing a proper Construction site information model (CoSIM) [12]. It concerned in particular the interaction between designers during the whole design process (starting from the survey, to the operational planning, through architectural, structural, MEP and other design disciplines). In particular that part of the research focused in the modelling processes of a heritage building in order to guarantee a correct element level of development (*i.e.* an adequate graphical detail and number of related information - LOD) for operational planning. The method concerned also the insertion in the model of construction site elements (*e.g.* equipment, machines, temporary structures) in order to study working places development during construction time and evaluate construction time, costs and safety issues.
The element choice for construction planning is always an arduous task since it involves different concerns from time, costs and safety points of view. In order to facilitate this operational design step, our research frame the construction site as a system [13] divided in sub-systems with precise functions for the satisfaction of the construction site needs. We can define the following three principal sub-systems:

- The technological system
- The productive system
- The functional-spatial system

The technological system represents the set of technical components useful for the realization of a particular working phase. In particular, they represents all the temporary facilities needed in a construction site (*e.g.* scaffolding, fences, etc.).
The productive system represents the set of productive elements useful for the realization of a particular working phase. In this system are grouped all the equipment or machines related to the production in construction sites (*e.g.* cranes, trucks, etc.).
The functional-spatial system is then made of the spaces needed in the construction site with their own specific functions (*e.g.* Logistic Spaces, Production Spaces, etc.).
Our research on BIM use for construction planning contemplates the modelling of a reasonable number of these elements, taking into particular account that related to restoration and recovery projects.
On this basis, we develop some specific tools able to simplify and assist operational choices during construction site planning. Since the particularity of restoration project that creates a lot of interference between working-places, is here presented the tool to assist the choice of safety devices to solve these interferences.

4. Overview on the developed method

Starting from the issues underlined in the previous paragraph the proposed method develops in particular the functional spatial system, but takes into account also the others since the strict relationships between them. In fact, as said, the system is based on the study of interferences between different spaces of a construction site and its boundaries. To do this the first step concerned in the identification and modelling of an adequate number of typical site space that could cover the range of possible places needed in a restoration construction site. The models consist essentially in a parametric (with changeable dimensions) surface that identify the standard spatial elements. Each type of surface was then inproved by a symbol that identify the specific function of the space and colored to make it visible compared to the others (see figure 2 for examples of the BIM related to spatial element). Table 1 shows the 7 different types of studied places with their own characteristics.

Spatial element	Function symbol	Identification colour
Working place	Concrete mixer and stored bricks	Red
Aerial handling place	Tower Crane	Purple
Excavation	Excavator	Orange
Walking path inside construction site	Worker	Green
Vehicle path inside construction site	Truck	Blue
Public walking path	Pedestrian	ellow
Public street	Car	Grey

Table 1 – Construction site spaces types

Once identified the space types, in order to study the construction site interferences, an inventory of combinations between two of this spaces has been created in order to cover the largest possible number of interference configurations. To do this each type of space has been related to the others at the same level, or at a different height. Furthermore, each configuration has also a semitransparent shape that identifies the interference volume to be taken into consideration. In fact this volume will be replaced, during design process and with the assistance of the proposed system, by a proper safety device. The result of this research step is an inventory of 70 modelled standard configurations similar to the 7 showed in Figure 2 and here explained:

a) Interference between a **Walking path inside construction site** and **public street** at *the same level*
b) Interference between a **Working place** and **Vehicle path inside construction site** at *a different level*
c) Interference between a **Walking path inside construction site** and **Vehicle path inside construction site** at *the same level*
d) Interference between a **Public walking path** and **Working place** at *the same level with another place in the middle*
e) Interference between an **Aerial handling place** and **Working place** (aerial handling places are always considered *higher* compared to others*)*
f) Interference between an **Walking path inside construction site** and **Excavation** (excavations are always considered *lower* compared to others*)*
g) Interference between a **Working place** and **Walking path inside construction site** at *a different level*

All these models are included in the proposed system in order to facilitate the identification of interference and to have at disposal an inventory provided with ready solutions.

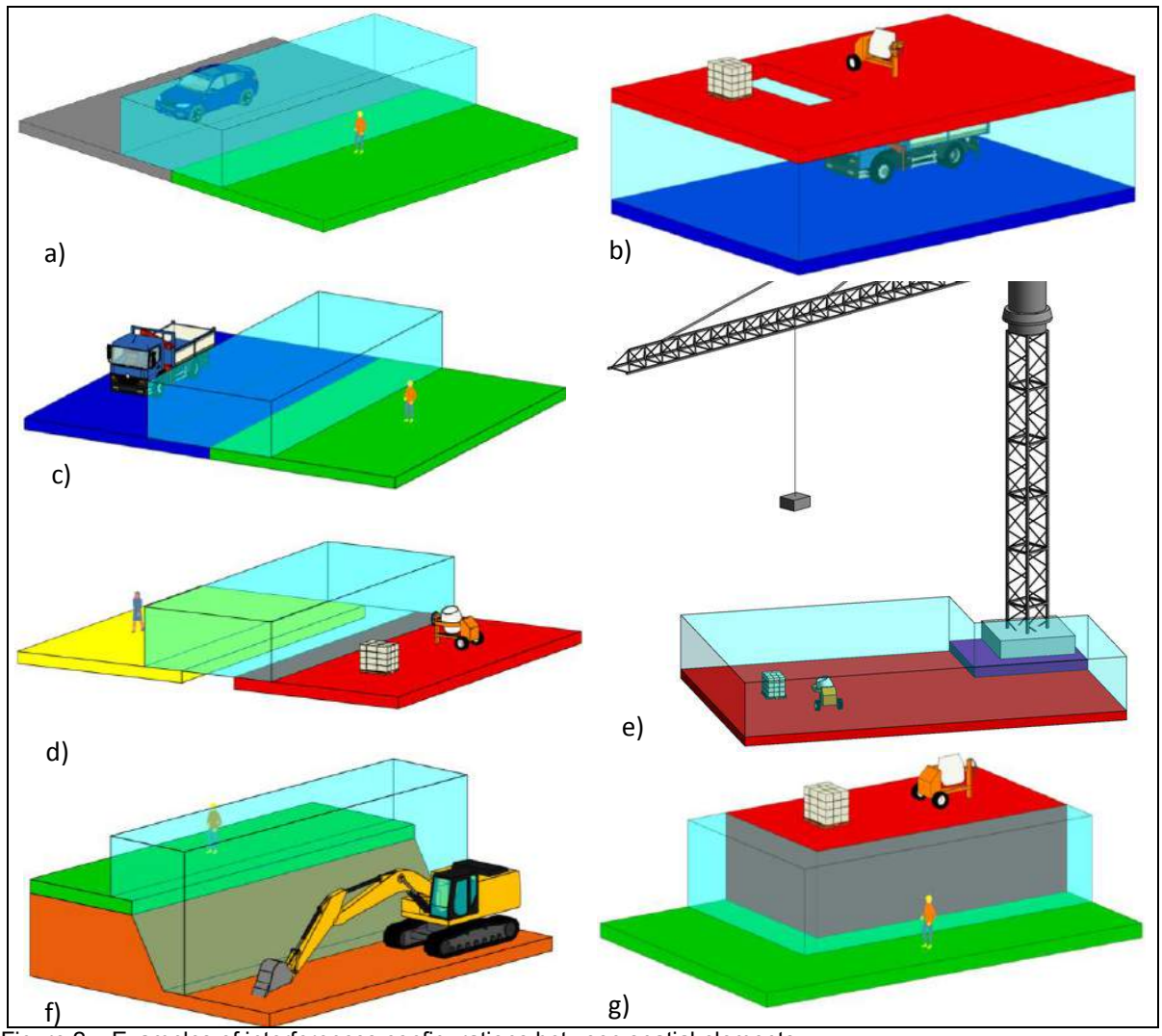

Figure 2 – Examples of interferences configurations between spatial elements

The modelling work consists also in the creation of a number of technological elements (such as fences, guardrails, etc.) able to technically solve the interference and so to replace the semi transparent shape. As said in addition to the BIM method the system is based also on spreadsheets linked together in order to have a simple access to information required for interference analysis such as potential damage for workers and possible technical solution. In other works the spreadsheets permit to access to a database of technical solutions able to solve the interferences underlined in the different studied configurations. The spreadsheets is provided of a searching tool that permits to automatically select a solution according parameters to insert as an input (potential damages founded in the real construction site situation. In order to better understand the whole process of selecting the solution a workflow is provided in figure 3. It explain the process of solving interferences from a site designer point of view during a real design process explaining the steps of his task.
The first step consists in the initial modelling of the construction site with the identification, in function of the available spaces, of the functional spatial organization of the construction site. Thus, once available the Survey HBIM [11], the first task is to add to the model the colored surfaces with their specific functions. As will be showed in the case study (see next paragraph) this task need to be faced for each construction site phase since the site configuration changes during time. The second step is the identification of the interferences between the identified places that have to be searched in the inventory of created configurations. Each configuration has, as related information, a range of possible damages given by the interference. Damages represents the input for the spreadsheet searching tool. Obviously, during data input the potential damages can be changed or added according to the designer risk assessment according to the particular site situation. In fact, although the inventory of configuration has been created taking into account on-field observations during restoration projects, it is obvious that these kind of works have always a certain level of unpredictability. Thanks to the input of potential damages in the spreadsheet, the searching tool select those solutions able to avoid those specific hazards in that particular condition. It is then a task of the site designer to choose between the proposed solutions according to his experience and the other situations studied in the area.

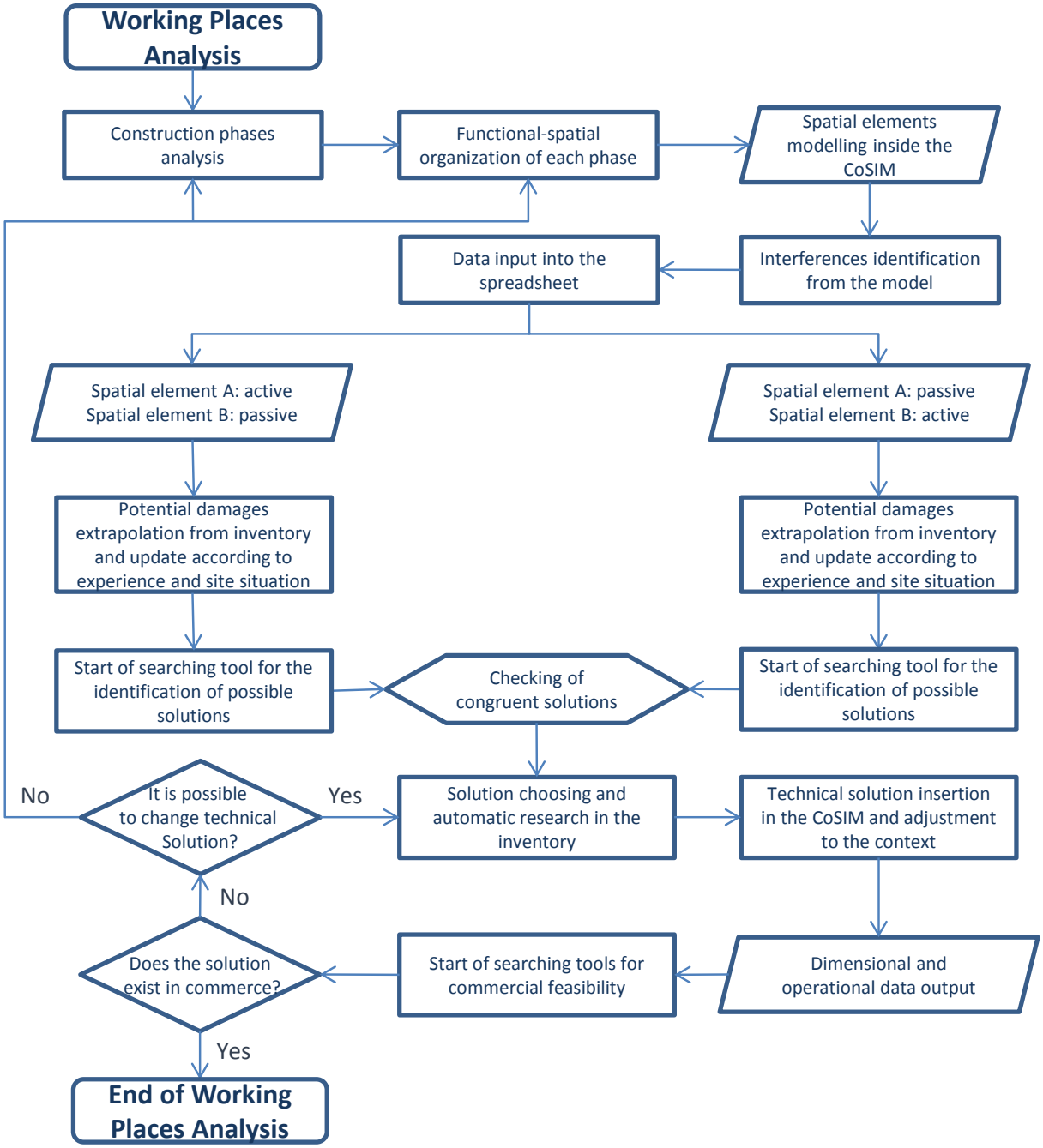

Figure 3 – Design workflow for the proposed system

Figure 4 shows the input panel of the searching tool. It is divided in two parts since the need to take into consideration the possible damages in two directions. In fact hazards could occur from a space to the neighboring and vice versa. The first data inputs concerns the type of places and their position, and permits to search in the inventory of configurations the correct related to site situation. An image from the inventory appear to make clearer the choice. The choice of the configuration take to the second sheet (Figure 5) in which possible damages are visualized according to the explained standardization. As said, the site designer can change them according to its experience. For each potential damage the system proposes a technical solution to avoid hazards. At the end, the congruent solutions between the two directions of interferences automatically appear in the last cell and the site designer can make the final choice. This choice automatically appear in the image in substitution of the interference volume. It is also related to the BIM model in the inventory so it's possible to take the solution and put it inside the CoSIM in order to evaluate the general site situation. The inventory of technical solution is in fact created as parametric elements that can be simply suite each site situation and contain useful data design evaluations. Some of this data represents the inputs for the last spreadsheets that permits to evaluate the feasibility of the choice. In fact it permits to search in a database of commercial solution if the technical elements is really possible to realize on field. [14]

Passive spatial element (subjected to a damage)	**a**	Walking path inside construction site
Active spatial element (generator of a damage)	**b**	Excavation
Mutual position		Ha>Hb

Passive spatial element (subjected to a damage)	**b**	Excavation
Active spatial element (generator of a damage)	**a**	Walking path inside construction site
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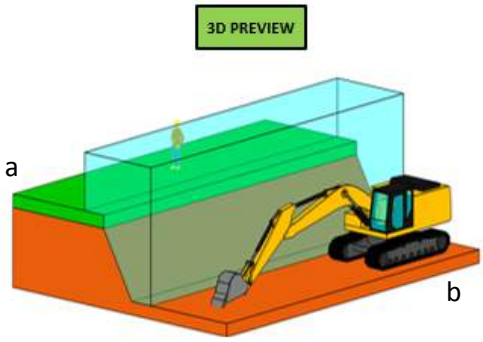

Figure 4 – Input panel of the searching tool

Potential Damage	Technical solution
E12 - Grabbed by boom	Steel fence
E13 - Hit by excavated materials	Guardrail
E26 - Falling down into the dig	Guardrail

Potential Damage	Technical solution
E13 - Hit by falling materials	Guardrail

Final technical solution → **Guardrail**

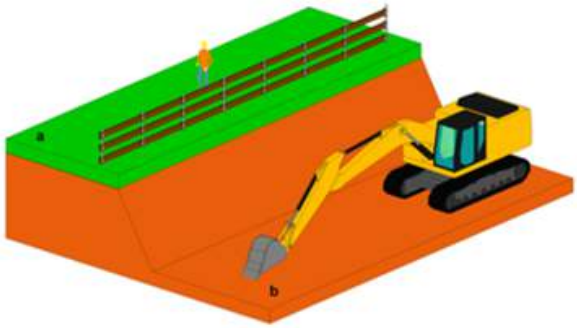

Figure 5 – Output panel for potential damages and final choice of the technical solution

5. Application on a case study

The cited early report of the research [11] presented the case study of the restoration of Basilica di Collemaggio (L'Aquila) and focused on the modelling process of the building elements in order to realize a proper operational planning thanks to the related information attached to the elements themselves. The following part of the CoSIM design process is here presented. In fact, once produced the work plan thanks to the above mentioned information, is necessary to analyze working-places in order to evaluate, and eventually optimize site planning in terms of time, costs and safety. The proposed system permits to make at the same time the analysis and the optimization of working-places at the same time.

Figure 6 shows an overview of the Church that presents significant damages produced by the earthquake of 2009. Due to particular structure of the church, earthquake affected primarily transept area, with the collapse of two main pillars and consequently of the central dome, that is now covered by a metal-structure roof. Also octagonal columns and walls of the naves were subjected to a lot of damages so that, just after the earthquake, in was necessary to reinforce that structures with temporary facilities (see figure 6b)

Figure 6 – External and internal overview of the basilica before works

Restoration works have been promoted and funded by ENIservizi and have involved “Soprintendenza per i Beni Architettonici e Paesaggistici per l’Abruzzo”, “Politecnico di Milano”, “Università degli Studi di Roma, La Sapienza” and “Università degli Studi dell’Aquila”. Intervention concern in particular the reconstruction of the transept and structural rehabilitation of columns, walls, and roofs. Surfaces restorations and plants will be the final activities to return the church to the city of L’Aquila. As said the first part concerned the insertion in the model of operational information and their management for scheduling works taking into account many contemporary activities and to calculate and optimize costs for the realization of site facilities such as fences and scaffold. Then CoSIM design continued with the visualization of the sequences of contemporary working-places studying thus actions to be performed for workers safety thanks to the described method.
Figure 7 shows in particular the starting situation of the working spaces inside the basilica during one of the construction site phases. As the figure shows, there are 5 contemporary works inside the area and as well as a pedestrian and a vehicle path. The number of contemporary work is explained by the need to finish soon the works and to open the church to public in few time. Since the quantity of places studied, interference volumes are hidden in the figure in order to have a better visualization of the situation. For the same reason identification of the working places are here made by the specific colour (red) and a worker instead of concrete mixer.
So the internal area of the basilica presents some facilities that are the same for the whole construction site (e.g. the vehicle path inside construction site in the middle of the central nave) and some areas specific of the construction phase (e.g. working areas). Obviously, thanks to 4D tools the presented study was performed for each construction phase in order to properly manage interferences during the whole construction stages and correctly calculate the total extra costs given by the insertion of proper technical solution between adjacent places.

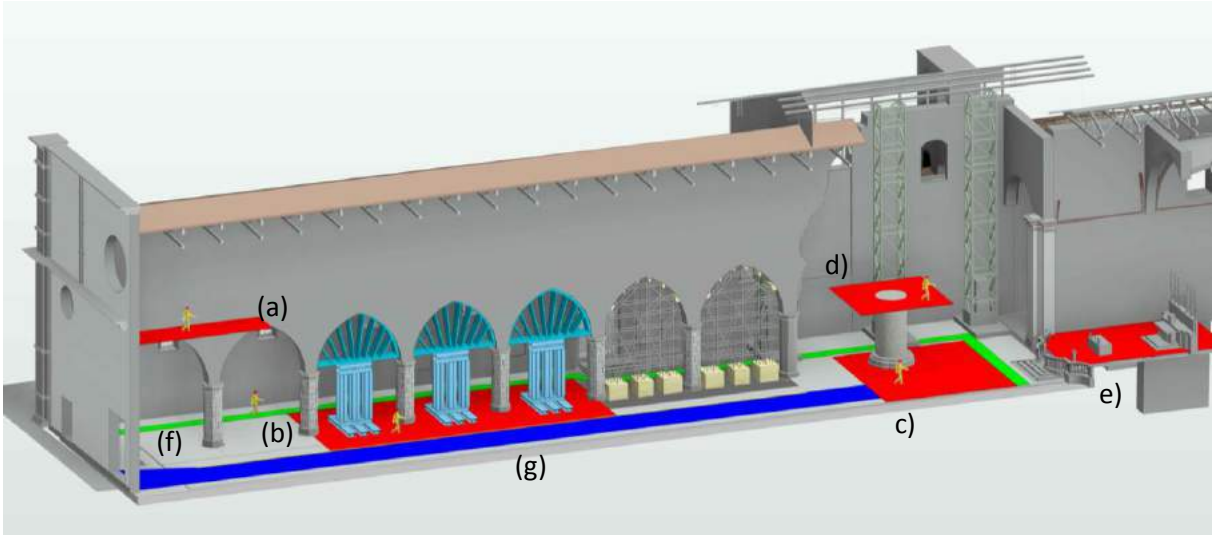

Figure 7 – 3D view of the different place of work inside the church needed for a specific phase

For each phase the study followed all the steps described in the previous paragraph for the extrapolation of possible technical solutions for each interferences between a couple of places. These single solutions have been inserted in the model for the final evaluation on choice. Table 2 shows an

overview about the solutions for single interferences while figure 8 shows the final configuration of the construction site for that particular phase. In this case some temporary structures are simplified in order to have a better view on the places of work (for example some part of the scaffolding such as guardrails are hidden in the 3D view).

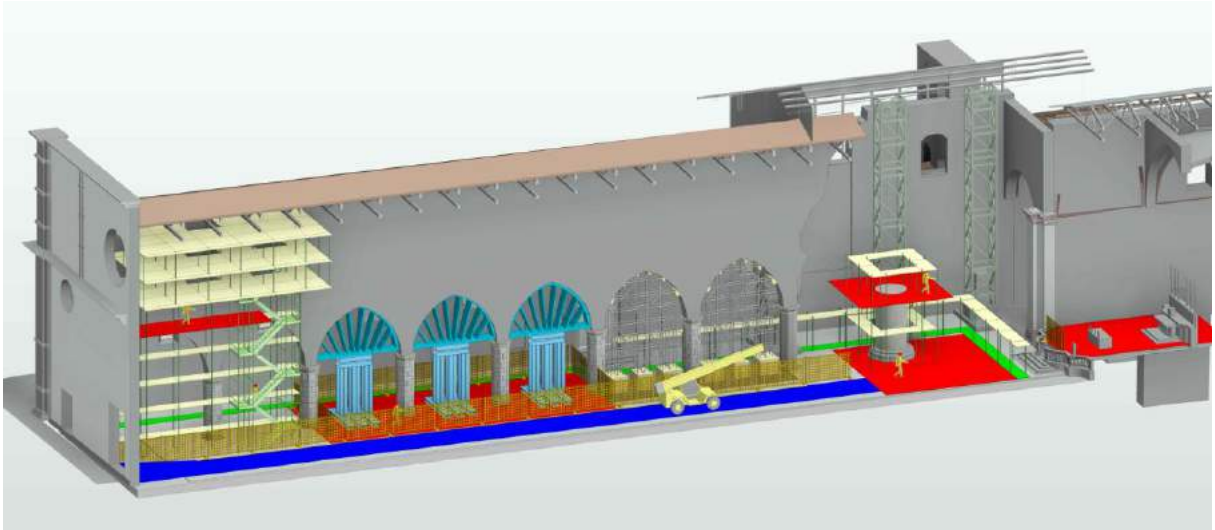

Figure 8 – 3D view of the different place of work and technical solution for interferences

Spatial element 1	Spatial element 2	Position	Solution
Working place (a)	Vehicle path (g)	(a) In height on (g)	Scaffold
Working place (b)	Vehicle path (g)	Same Level	Steel fence
Working place (b)	Pedestrian path (f)	Same Level	Steel fence
Working place (c)	Pedestrian path (f)	Same Level	Fence on the scaffold (Hidden in figure)
Working place (d)	Working place (c)	(d) In height on (c)	Scaffold
Working place (d)	Pedestrian path (f)	(d) In height on (f)	Continuous protection roofing (added also for other workplace in height in following phases)
Working place (e)	Pedestrian path (f)	(e) In height on (f) with a gap	Steel fence

Table 2 – Summary of the interference analysis between the places of work

6. Conclusions

The proposed methodology suit perfectly to the chosen case study since the yet expressed need to have many contemporary works during the whole construction process. Thanks to the use of this method such advantages has been observed in the developing of the site layout for each phase of the construction site. First of all this method helps a lot to graphically identify the different places of work in such a chaotic context. Since the models of the different places are ready and parametric their positioning results very fast and efficient and thus each phase can be simply managed. For what concerns the addition of technical solutions it's obvious to say that an experienced site designer can chose the solution using its own knowledge. However in such an intervention, in which are present a lot of interference for each phase, the availability of the inventory and of the searching tool results helpful in particular for what concern the following points:

- To have a standardized evaluation method for each interference
- To make faster the research among the inventory of BIM elements to put into the CoSIM
- To have at disposal some ready risk evaluation sheets to update only if necessary
- To make faster the production of safety documents thanks to the availability of this sheets

Obviously, the system results more useful and efficient if the construction site is very complex. For this reason, as the case study demonstrates, it fit particularly with relevant restoration projects. As a future development, we take into consideration the possibility to manage the choice taking into account more than two spaces for configuration. In addition to this we are updating the spreadsheets in order to evaluate different configuration together if necessary in order to be congruent with chouces in the whole construction site. Obviously, in order to make more efficient this system and the whole CoSIM design some more steps need to be carried on. As an example the availability of construction site objects among libraries is still poor. Furthermore, their level of detail is often inadequate both from a graphical and from an information point of view.
Despite of this, the field test encourage the task group to continue in this research in order to spread as much as possible CoSIM method and realize the aim of raise construction site planning to a clear design discipline to be faced since the first phases of each project.

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Seismic collapse analysis of stone arch bridges

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Abstract
The present paper deals with the collapse behavior of an historical stone arch bridge. Ancient stone or masonry arch bridges are still a useful and a not rare engineering road in Italy, as well as in other parts of Europe. Some of the most ancient arch bridges are concentrated in Italy and constitute an integral part of the Italian transportation system. They also represent a valuable engineering achievement of the people that have lived in Italy for centuries and a cultural heritage of the world.
A finite element modal analysis and seismic load evaluation has been performed building a suitable program code. The assessment of the collapse and shakedown states, related to a nonlinear constrained optimization problems, has been analyzed using lower bound and Bleich-Mélan theorems of limit analysis.
Whereas the retrofitting of this stone structure cannot be executed in the intrados surface of the stone vault, so that an application of CFRP strips on the arch extrados is a more useful constructive technique, especially if a significant increase of the limit and shakedown load multipliers occurs.

Keywords: CFRP-Reinforcement, Masonry Arch Bridge, Limit Analysis, Lower Bound, Shakedown.

1.Introduction

Masonry arch bridges are a common road engineering structure in Italy, as well as other parts of Europe, as well as the United States. Some of the most ancient masonry bridges are concentrated in Italy. These ancient bridges are not only an integral part of the Italian transportation system; they also represent the great engineering accomplishments and heritage of the people that have lived in Italy for centuries. Recent earthquakes in Umbria and Marche (Italy, 1997 – 1998), Molise (Italy, 2002), Abruzzo (Italy, 2009) and Emilia Romagna (Italy, 2012), caused significant damage to many historical masonry structures, resulting in a considerable loss of human life. Recent seismic activity in the world underscores the importance of using an advanced set of strengthening techniques on these masonry structures, through the analytical evaluation of collapse and shakedown states. The collapse analysis of these structures is a matter of utmost importance, both to protect human life, and to preserve these historical structures [1], [2].
For every structure, seismic actions can be modeled by means of appropriate horizontal and vertical force distributions, with intensity dependent on proper oscillation periods. It is important to take into account suitable solutions for any construction type involving the seismic action in the completed state, based on the contribution of the complete set of significant proper vibrational modes, frequencies and design seismic spectra. The results of the analyses carried out in this study (see Fig. 1), indicate that if only the first vibration mode is taken into account, a significant error of 70□ occurs, leading to underestimated seismic actions and an inadequate retrofit design.

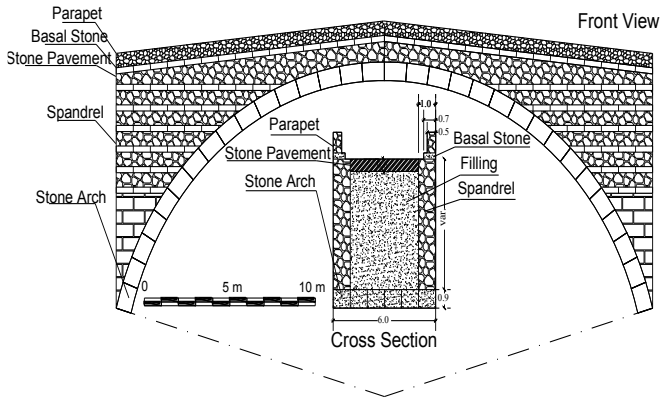

Fig. 1: Picture of Saint Martin bridge, Saint Martin town, Valle D'Aosta

The importance of designing an efficient, effective retrofit for historical masonry arch bridges, that addresses seismic vulnerability concerns, but also maintains architectural beauty of the bridge, is obvious. In the case of analyzed ancient Roman arch bridges, constructed of gneiss, conventional retrofitting techniques, such as intrados reinforcement with steel plates, CFRP (Carbon Fiber Reinforced Polymer) strip or surface concrete coating, are not acceptable because the design would destroy the aesthetic, historical and architectural appeal of the bridge. A retrofit that uses CFRP strips at the extrados for reinforcement, and a bond filling that reduces the risk of delamination addresses both engineering and aesthetic concerns, and is the most suitable retrofitting solution.
The thin amount of CFRP required for strengthening is especially important when designing a seismic retrofit for historical bridges, as it minimizes changes to the appearance of the bridge. The application of CFRP composites to masonry structures is less well established, although it has been the subject of research and development in recent years [3], [4], [5] and in [6] adopting singular stress field specifically for masonry-like vaults.
It has been demonstrated that CFRP can be used to upgrade the structural performance of a variety of masonry elements. The National Research Council in Italy and the American Concrete Institute recognize CFRP for this purpose, and have issued design guidance. Further work is required, however, to apply CFRP strengthening to increase the load capacity of masonry arch bridges.
CFRPs were initially proposed for the reinforcement of concrete structures. The use of these materials on masonry structures has been recently studied, both experimentally and analytically. FRP is made of a polymeric matrix with different fibers (glass, carbon, etc.). As a strengthening material, it presents a number of advantages, including high tensile strength, negligible self-weight and corrosion resistance.
An important aspect of structural analysis, especially for ultimate safety assessment or design, requires evaluating the maximum load the structure can sustain. The use of methods based on the classic Limit Analysis, which avoids computationally expensive and often uncertain time-stepping analyses, represents a useful and valuable approach. The distinctive feature of classic Limit Analysis is the determination of the load factor or, in practice, of its upper and/or lower bounds at which a critical event occurs, namely plastic collapse. The Limit Analysis research field has been the focus of intensive research efforts recently. In general, the most up-to-date formulations are derived within an optimization problem framework, aiming to take advantage of the latest mathematical developments in nonlinear convex programming algorithms. Nevertheless, in spite of the rapid evolution in computer performance, determining accurate collapse load estimates can still present a significant computational effort. Additionally, as is the case in most plasticity problems, the principle of superposition of loads does not hold true in the framework of classical limit analysis. This principle is extremely useful in the treatment of many practical engineering problems and has been widely exploited in the past two centuries on the basis of linearized strain and constitutive laws and linear equilibrium equations for the stress state. In the classic theory of plasticity, owing to both non-uniqueness of the stresses in strains and nonlinearity of the incremental elastic-plastic process until the collapse, superposition cannot be applied. In the framework of classic plasticity, even when limit multipliers and collapse mechanisms associated with different loads independently acting on a solid or structure are known, not much can be inferred on the limit multiplier of the combined loading [7].
Recently, it has been suggested that the useful life of many seismically vulnerable short-span bridges could be extended significantly if these structures were allowed to enter into the inelastic range for a low number of cycles. This limit state is known as the shakedown or incremental collapse limit. Shakedown is a term used to describe structural behavior under large cyclic loads and implies that after repeated applications of a prescribed load history that exceeds the elastic limit, but not the plastic collapse load of the structure; the residual deflections in the structure will stabilize. Residual

deflections are the permanent deformation remaining in the structure after the load has been removed. Because yielding has occurred, additional forces, known as residual moments, will be locked into the structure when the loads are removed. It is important to note that shakedown implies some damage to the structure, generally in the form of yielding of main members, and thus may result in a serviceability failure. However, a key feature of shakedown is that once the deflections stabilize, the structure will respond elastically to any additional cycles of the prescribed load history. Because the residual deflections stabilize, shakedown does not result in a structural collapse or ultimate strength failure. If the shakedown limit is exceeded, the structure will keep deflecting more and more, with each successive application of the load and fail by an incremental collapse mode [8].
The results of research by Boothby et al. [9] may prove very useful in the assessment of masonry arch bridges, in that a shakedown limit state may be established as a basis for loading rate, similar to what is currently proposed for steel girder bridges.
The solving procedures can be divided into two large categories corresponding to incremental methods and limit analysis. The former is referred to in Castigliano [10], and the latter in the works of Kooharian [11] and Heyman [12], who extended the plastic limit analysis theorems to structural systems with a slight tensile yield material.

2.A brief description of Mery's and Heyman's methods

The early method characterized by a collapse analysis was used by Mery for semicircular arch with constant thickness, homogeneous material, symmetric load. This method can be explained with a graphical application of the static limit analysis. The method of Mery is applicable using the parallelogram rule; the check of an arch's parts included between the key and the springers require the division in blocks of the arch. Establishing the loads agent on each block, the resultants of loads are determined and the thrusts line can be obtained applying the parallelogram rule again and again. With this method we draw the arch's pressure curve and must belong to third medium of all the arch sections for the stability of the structure. Heyman [12] enounced the safe theorem of the Limit Analysis particularized for masonry arches; and proposed for the determination of the load carrying capacity of stone arch bridges. It is based on the estimation of the thrust line, similar to Mery's method. According to Heyman it is necessary to determine at least one line of pressure curves contained inside the thickness of the arch, to ensure that the structure is safe. On the other hand, there is a sufficiently small variation in the position of the line of pressure curve, caused by loading increase, to allow the formation of localized cracks. As consequence, the hinges formation can occur and a kinematical mechanism can be activated. Generally, the collapse mechanism occurs for formation of four hinges, two at extrados and two at intrados, alternatively located. When the pressure curve in a cross-section is tangent to the ring of the arch, the eccentricity *e* of the axial force P, from the center line of the arch at a given cross-section, becomes maximum. As a result, a bending moment $M = Pe$ is developed around the center line of the arch, and a hinge opens, on the assumption that the arch does not develop any tensile strength. Since a three-pin arch is a statically determinate structure, opening of a fourth hinge converts the structure into a mechanism, and collapse occurs.
Fig. 2 shows the results of the application of the Mery's and Heyman's procedure:

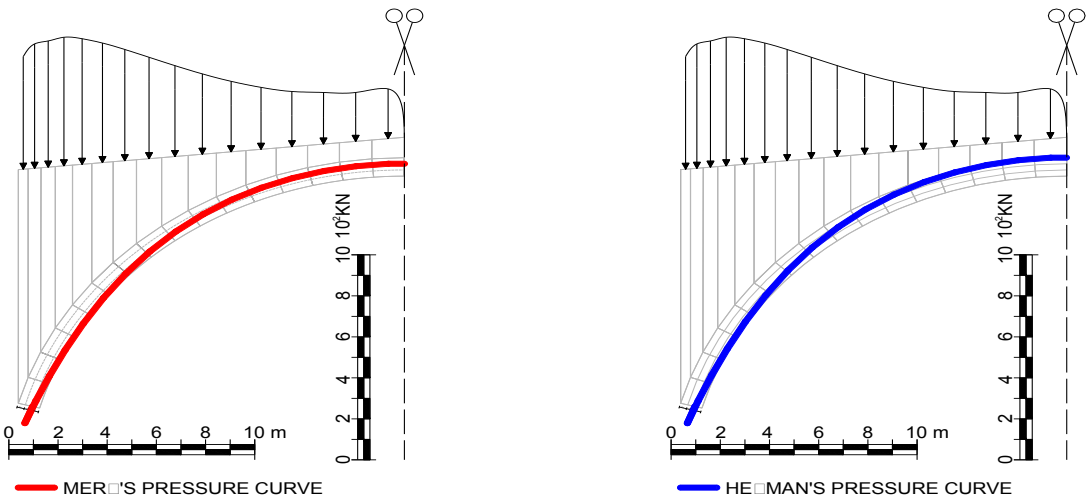

Fig. 2: Pressure curve

3.Seismic limit analysis procedure

3.1 Finite Element Method in Static and Dynamic. Limit Analysis and Shakedown

The proposed research presented here has been carried out by the implementation of two fundamental theories: the dynamic finite elements method (DFEM) and the associated modal analysis which enable us to evaluate the seismic action employing the response spectra, the static FEM which obtains the elastic solutions of seismic loads and the self-equilibrated stress states of structure, and finally the limit analysis procedure, in order to assess the collapse loads and the shakedown. The DFEM procedure, implemented in Mathematica [14], is shown in Fig. 3:

- **Dynamic FE model with Hermite shape functions**

```
Sf = (H1  0   0   H4  0   0 ); B = (∂x H1   0          0          ∂x H4   0          0 ); {Sf, B} // MatrixForm;
     (0   H2  H3  0   H5  H6)      (0      ∂x,x H2    ∂x,x H3    0       ∂x,x H5    ∂x,x H6)
```

$$\left\{\begin{pmatrix} 1-\frac{x}{L} & 0 & 0 & \frac{x}{L} & 0 & 0 \\ 0 & 1-\frac{3x^2}{L^2}+\frac{2x^3}{L^3} & x-\frac{2x^2}{L}+\frac{x^3}{L^2} & 0 & \frac{3x^2}{L^2}-\frac{2x^3}{L^3} & -\frac{x^2}{L}+\frac{x^3}{L^2} \end{pmatrix}, \begin{pmatrix} -\frac{1}{L} & 0 & 0 & \frac{1}{L} & 0 & 0 \\ 0 & -\frac{6}{L^2}+\frac{12x}{L^3} & -\frac{4}{L}+\frac{6x}{L^2} & 0 & \frac{6}{L^2}-\frac{12x}{L^3} & -\frac{2}{L}+\frac{6x}{L^2} \end{pmatrix}\right\}$$

```
Cs = (EA  0 ); KeLoc = ∫0^L B^T.Cs.B dx; MeLoc = ∫0^L ρ A Sf^T.Sf dx; {Ke, Me} // MatrixForm;
     (0   EI)
```

$$\left\{\begin{pmatrix} \frac{EA}{L} & 0 & 0 & -\frac{EA}{L} & 0 & 0 \\ 0 & \frac{12EI}{L^3} & \frac{6EI}{L^2} & 0 & -\frac{12EI}{L^3} & \frac{6EI}{L^2} \\ 0 & \frac{6EI}{L^2} & \frac{4EI}{L} & 0 & -\frac{6EI}{L^2} & \frac{2EI}{L} \\ -\frac{EA}{L} & 0 & 0 & \frac{EA}{L} & 0 & 0 \\ 0 & -\frac{12EI}{L^3} & -\frac{6EI}{L^2} & 0 & \frac{12EI}{L^3} & -\frac{6EI}{L^2} \\ 0 & \frac{6EI}{L^2} & \frac{2EI}{L} & 0 & -\frac{6EI}{L^2} & \frac{4EI}{L} \end{pmatrix}, \begin{pmatrix} \frac{AL\rho}{3} & 0 & 0 & \frac{AL\rho}{6} & 0 & 0 \\ 0 & \frac{13AL\rho}{35} & \frac{11}{210}AL^2\rho & 0 & \frac{9AL\rho}{70} & -\frac{13}{420}AL^2\rho \\ 0 & \frac{11}{210}AL^2\rho & \frac{1}{105}AL^3\rho & 0 & \frac{13}{420}AL^2\rho & -\frac{1}{140}AL^3\rho \\ \frac{AL\rho}{6} & 0 & 0 & \frac{AL\rho}{3} & 0 & 0 \\ 0 & \frac{9AL\rho}{70} & \frac{13}{420}AL^2\rho & 0 & \frac{13AL\rho}{35} & -\frac{11}{210}AL^2\rho \\ 0 & -\frac{13}{420}AL^2\rho & -\frac{1}{140}AL^3\rho & 0 & -\frac{11}{210}AL^2\rho & \frac{1}{105}AL^3\rho \end{pmatrix}\right\}$$

```
For[i = 1, i ≤ FEnumb, Kg_{i++} = Q_i^T.KeLoc_i.Q_i]; For[i = 1, i ≤ FEnum, Mg_{i++} = Q_i^T.MeLoc_i.Q_i];
Ku = Σ_{i=1}^{FEnumb} C_i^T.Kg_i.C_i; Mu = Σ_{i=1}^{FEnumb} C_i^T.Mg_i.C_i;
K = OpC.Ku.OpC^T; M = OpC.Mu.OpC^T;
```

- **Modal analysis and seismic forces**

```
ω = √Reverse@Eigenvalues[{K, M}] ; f = ω/(2π); T = 2π/ω; Ξ = Eigenvectors[Inverse[M].K];
Do[S_i = Sa[T_i], {i, 1, Length[modes]}]; Table[S_i, {i, 1, Length[modes]}];
Do[F_{inertia i} = M. ψ_i S_i G_i, {i, 1, Length[modes]}];
```

- **Horizontal and vertical modal seismic forces; combined seismic force (SRSS)**

```
Fx = Table[F_{inertia i}[[j]], {i, 1, Length[modes]}, {j, 1, 3 (2 n - 1), 3}];
Fy = Table[F_{inertia i}[[j]], {i, 1, Length[modes]}, {j, 2, 3 (2 n - 1), 3}];
Table[{fx_i = Fx^T[[i]], fy_i = Fy^T[[i]]}, {i, 1, Length[F_{inertia}]/3}];
Fcx = Table[√(Σ_{i=1}^{Length[modes]} fx_j[[i]]^2), {j, Length[F_{inertia}]/3}];
Fcy = Table[√(Σ_{i=1}^{Length[modes]} fy_j[[i]]^2), {j, Length[F_{inertia}]/3}];
```

Fig. 3: Dynamic FEM and modal analysis synopsis-program in Mathematica

in which Sf is the shape functions matrix composed by Hermite polynomials, $KeLoc_i$ and $MeLoc_i$ (Kg_i and Mg_i) are the stiffness and mass matrix in the local frame (global frame) of the finite element "i", and $Sa[T_i]$ is the acceleration spectrum values depending on fundamental period T_i of the structure.

The theorems of Limit Analysis are the milestone of the classical elastic-plastic analysis of structures: the static, the kinematic and the shakedown theorem.

The Static Theorem (Lower Bound Theorem) states that the collapse load obtained for a structure that satisfies the equilibrium and the yield criterion is not greater than the collapse load. Consequently the true collapse load can be found by choosing the greatest value of the statically admissible states in the structure.

The use of this theorem for calculating the collapse load of a hyperstatic structure considers the equilibrium and the self-equilibrated states of stress.
The Kinematic Theorem (Upper Bound Theorem) asserts that the kinematical admissible load multiplier for a structure is either greater than or equal to the true collapse load multiplier. The true multiplier collapse can be found by choosing the smallest value of kinematical admissible multiplier obtained from all possible shapes of ultimate mechanisms for the structure. The method derived from this theorem is based on the balance of external work and internal work for a particular collapse mechanism and it is usually referred to as the mechanism method.
The Shakedown Static Theorem (Lower Bound Shakedown Theorem)affirms that the shakedown occurs if there exists a residual time-independent inner solicitation, and when combined with the elastic solution, the yield criterion is satisfied.
The lower bound theorems are implemented in symbolic code Mathematica with a mathematical constrained optimization problem, involving the solutions in terms of bending moment-axial force interaction, both in the real case and in the retrofitted one.
The application of the limit analysis theorems in the stone arch bridge was discussed in the relevant paper of Kooharian [11].
Recently, it has been suggested that the lives of many seismically vulnerable short-span bridges could be extended significantly if these structures were allowed to enter into the inelastic range for a low number of cycles. The irreversible deformations develop self-equilibrated inner forces that could preserve further inelastic deformation. When this state occurs, the stable inelastic state of arch, or shakedown, takes places.
Shakedown implies that after repeated applications of a prescribed load history that exceeds the elastic limit, but not the plastic collapse load of the structure, the residual deflections in the structure will stabilize. In the alternative, if the residual stress state cannot preserve the prescribed load history by additional plastic deformation, the incremental collapse state occurs. This unstable behavior constitutes the “true” collapse range of the structure with several load conditions. The shakedown load multiplier is the element that shares the set of the inelastic behavior in both stable and unstable behavior: this factor has fundamental importance in the structural ultra-elastic performance. An important result obtained concerns the shakedown seismic load multiplier that coincides with the minimum collapse load multiplier: the nonlinear material behavior of arch bridge is fully stable.

4.Outcome for real structure

The limit analysis and shakedown lower bound theorems on a stone arch bridge with different seismic load conditions are applied in our study to assess the collapse and shakedown seismic load multiplier.

The static theorem implementation has followed the next assumptions:

- Independence of the collapse loads from the loading history
- Small displacements
- Enough ductility
- Perfect plasticity
- Plastic stable material and normal plastic flow rule (as a consequence yield convex domain);
- Low tensile strength materials;
- Nonlinear yield domain.

The analysis was led according to the subsequent mechanical properties:

- oung modulus Ey 400 MPa
- Ultimate compression strength σoc 30 MPa
- Ultimate tensile strength σot 5 MPa.

The nonlinear yield domain in (1) (see Fig. 4) was determined for the effective arch’s rectangular *b h* cross section with length equal to 6 m and thickness equal to 0.9 m. The upper and lower boundary of the ultimate bending-axial force interaction (M-P) domain are represented in the next relationships:

$$\begin{cases} M_{\mathrm{up}} = \dfrac{P^2}{2b(\sigma_{oc}-\sigma_{ot})} - \dfrac{P\,h(\sigma_{oc}+\sigma_{ot})}{2(\sigma_{oc}-\sigma_{ot})} + \dfrac{b\,h^2\sigma_{oc}\,\sigma_{ot}}{2(\sigma_{oc}-\sigma_{ot})} \\ M_{low} = -\dfrac{P^2}{2b(\sigma_{oc}-\sigma_{ot})} + \dfrac{P\,h(\sigma_{oc}+\sigma_{ot})}{2(\sigma_{oc}-\sigma_{ot})} - \dfrac{b\,h^2\sigma_{oc}\,\sigma_{ot}}{2(\sigma_{oc}-\sigma_{ot})} \end{cases} \tag{1}$$

and sketched in the following picture:

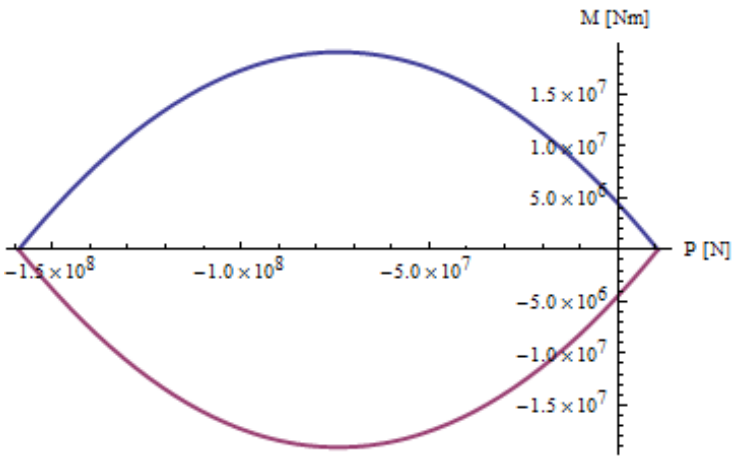

Fig. 4: Nonlinear domain

The analyses are carried out with reference to three load conditions, all defined in the plane of the arch as shown in Fig. 5: in the first load case the horizontal seismic action and permanent loads, in the second case permanent loads and vertical seismic action, and in the third case the combination of the first and the second load cases.

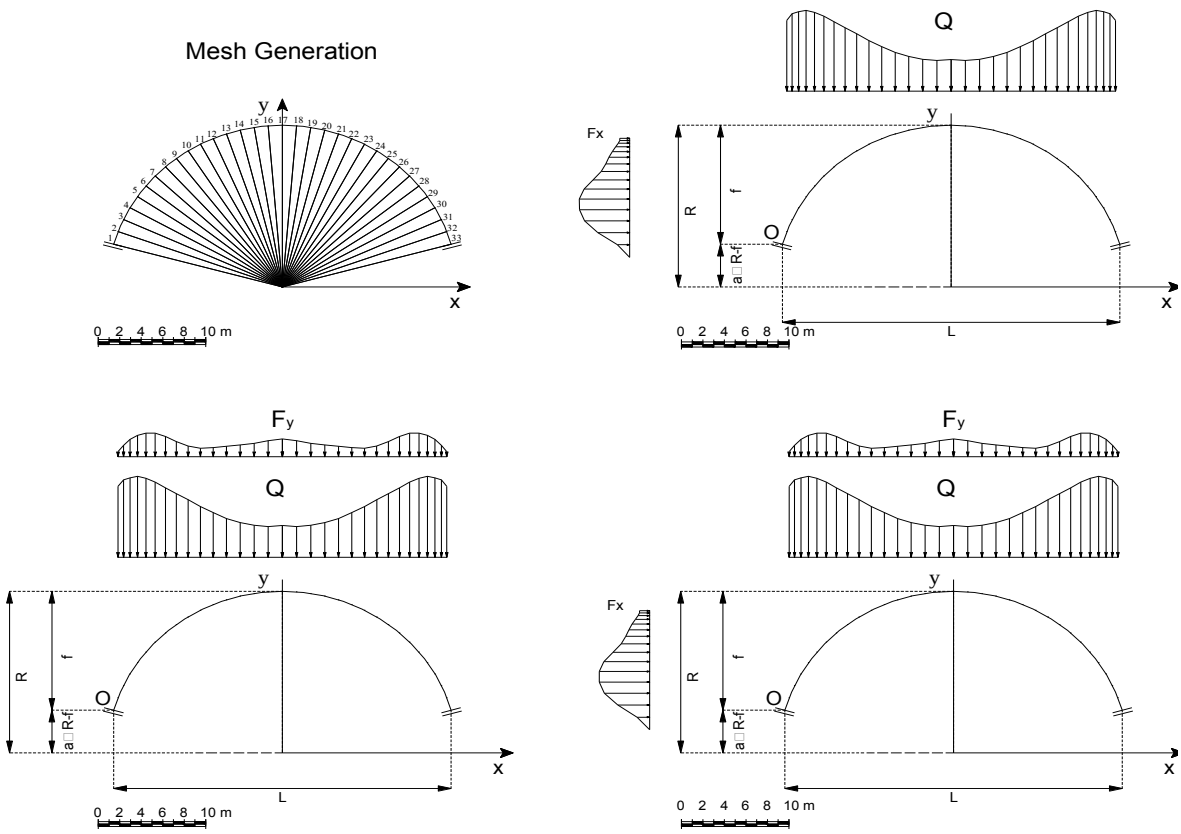

Fig. 5: Mesh generation and load conditions

The horizontal and vertical seismic actions are determined by calculating the natural periods of the structure with a finite element modal analysis that has been implemented in Mathematica and by the design seismic spectra of the Italian Rule [13]. The proper vibration modes considered in the seismic analyses, have the participating mass greater than 85□ of the structure total mass. The elastic response spectrum for horizontal accelerations are defined by the following relations (2):

$$
\begin{aligned}
&S_{h1}[T]=a_g S\eta F_0\left(\frac{T}{T_B}+\frac{1}{\eta F_0}\left(1-\frac{T}{T_B}\right)\right) && \text{per} \quad 0\le T<T_B\\
&S_{h2}[T]=a_g S\eta F_0 && \text{per} \quad T_B\le T<T_C\\
&S_{h3}[T]=a_g S\eta F_0\left(\frac{T_C}{T}\right) && \text{per} \quad T_C\le T<T_D\\
&S_{h4}[T]=a_g S\eta F_0\left(\frac{T_C T_D}{T^2}\right) && \text{per} \quad T_D\le T
\end{aligned}
\tag{2}
$$

where:

F_0 is an amplification factor, T_B is the first point of the horizontal portion of the response spectrum, T_C is the first point of the steady speed portion of the response spectrum, T_D is the first point of the steady displacement portion of the response spectrum, S depends on the quality and the type of foundation soil, η depends on the dumping of the structure and a_g is the peak ground acceleration.
Likewise the seismic spectrum for the vertical component (3) have the next analytical form:

$$
\begin{aligned}
&S_{v1}[T]=a_g S\eta F_v\left(\frac{T}{T_B}+\frac{1}{\eta F_v}\left(1-\frac{T}{T_B}\right)\right) && , \quad 0\le T<T_B\\
&S_{v2}[T]=a_g S\eta F_v && , \quad T_B\le T<T_C\\
&S_{v3}[T]=a_g S\eta F_v\left(\frac{T_C}{T}\right) && , \quad T_C\le T<T_D\\
&S_{v4}[T]=a_g S\eta F_v\left(\frac{T_C T_D}{T^2}\right) && , \quad T_D\le T
\end{aligned}
\tag{3}
$$

whose parameters are displayed in the following:

$$
\begin{aligned}
&F_v=1.35F_0\left(a_g\right)^{0.5}\\
&S_s=1 \qquad S_t=1 \qquad S=S_s S_t\\
&T_B=0.05 \qquad T_C=0.15 \qquad T_D=1
\end{aligned}
\tag{4}
$$

In the next pictures the vertical and horizontal elastic spectra are drawn for Pont Saint Martin town in Valle d'Aosta Region in which the bridge is located.

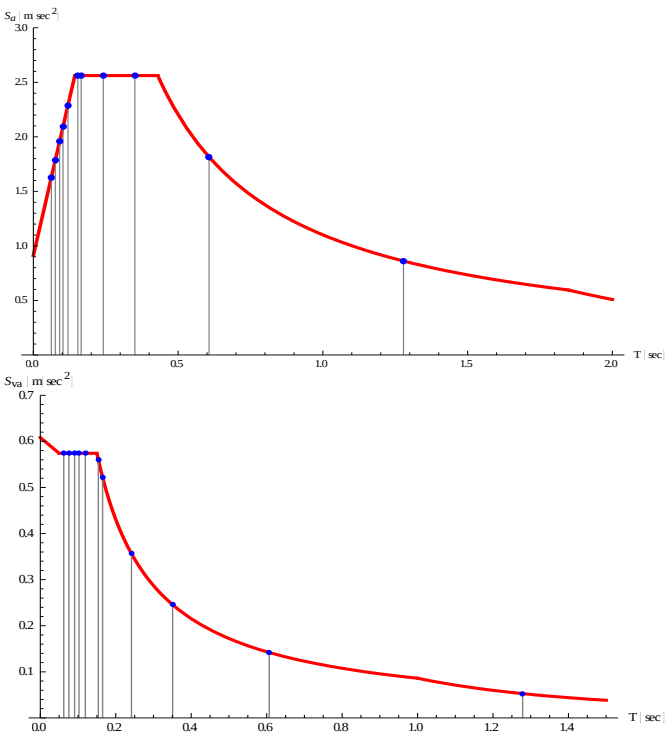

Fig. 6: Elastic response spectra for horizontal and vertical seismic action

where the seismic risk parameters for the collapse ultimate limit state are:

$$F_0 = 2.808 \quad a_g = 0.62\, m\, s^{-2} \quad S = 1.5 \quad \eta = 1$$
$$T_B = 0.143\, s \quad T_C = 0.430\, s \quad T_D = 1.848\, s$$

We have identified 11 vibration modes that excite 85□ of the total mass and the corresponding periods are shown in the following Table 1.

TABLE 1: Vertical and Horizontal Spectra Accelerations

Mode	T □sec□	S_h □m□sec^2□	S_v □m□sec^2□
1	1.279	1.628	0.574
2	0.607	1.786	0.574
3	0.351	1.959	0.574
4	0.242	2.093	0.574
5	0.165	2.287	0.574
6	0.154	2.562	0.560
7	0.120	2.562	0.521
8	0.103	2.562	0.357
9	0.091	2.562	0.246
10	0.760	1.814	0.142
11	0.062	0.861	0.053

For each beam element the vertical and the horizontal point loads (see Table 2) due to vertical and seismic loads, acquired by the combination of relevant modal forces are obtained:

TABLE 2: Vertical and Horizontal Modal Combined Seismic Loads

Element	□ □KN□m□	Fx □KN□	Fy □KN□
1	713.89	48.46	12.68
2	787.78	122.92	28.80
3	800.74	173.49	43.76
4	815.00	191.85	53.91
5	795.56	192.79	59.60
6	757.97	173.76	59.11
7	704.82	136.84	50.93
8	642.60	102.93	38.35
9	576.49	85.02	26.55
10	509.09	74.74	21.01
11	446.87	63.36	22.85
12	393.72	51.08	26.37
13	350.95	41.24	29.61
14	322.43	36.00	33.97
15	310.76	35.83	40.66
16	315.95	36.97	44.73

These actions have great intensity, although the site is a low seismicity zone, since the masses involved are important. After the modal and seismic load analyses for each loads conditions, the constrained optimization problem has been implemented in Mathematica for the determination of the collapse loads. Fig. 7 illustrates an outline of the implementation of this algorithm:

Bending moment and axial force

```
Do[ M_LCk := γ_k M_ElLCk + Sum[ X_j M_Xj , {k, 1, n_LC} ] ;

Do[ N_LCk := γ_k N_ElLCk + Sum[ X_j N_Xj , {k, 1, n_LC} ] ;
```

Section ultimate carrying capacity without CFRP reinforcement

```
M_up[ Nu_] := ( Nu - b h γ_oc ) ( Nu - b h γ_ot ) / ( 2 b ( γ_oc - γ_ot ) ) ; M_low[ Nu_] := - M_up[ Nu] ;

Do[ C_LCk := Table[ M_low[ N_LCk[[ i]] ] ≤ M_LCk[[ i]] ≤ M_up[ N_LCk[[ i]] ] , { i, 1, n_CS} ] , { k, 1, n_LC} ] ;
```

Section ultimate carrying capacity with CFRP reinforcement

```
M_upR[ Nu_] := Nu^2 / ( 2 b ( γ_oc - γ_ot ) ) + b h^2 γ_oc γ_ot / ( 2 ( γ_oc - γ_ot ) ) + Nu ( h γ_oc / ( 2 ( γ_oc - γ_ot ) ) - h γ_ot / ( 2 ( γ_oc - γ_ot ) ) ) ;

M_lowR[ Nu_] := Nu^2 / ( 2 b ( γ_oc - γ_ot ) ) + b h^2 γ_oc γ_ot / ( 2 b ( γ_oc - γ_ot ) ) + h s_w b_w γ_oc γ_otw / ( γ_oc - γ_ot )
   + s_w^2 b_w^2 γ_otw^2 / ( 2 b ( γ_oc - γ_ot ) ) - Nu ( h γ_oc / ( 2 ( γ_oc - γ_ot ) ) + h γ_ot / ( 2 ( γ_oc - γ_ot ) ) + s_w b_w γ_otw / ( b ( γ_oc - γ_ot ) ) ) ;

Do[ C_LCk := Table[ M_lowR[ N_LCk[[ i]] ] ≤ M_LCk[[ i]] ≤ M_upR[ N_LCk[[ i]] ] , { i, 1, n_CS} ] , { k, 1, n_LC} ] ;
```

Solution of the constrained optimization problems for the limit analyses

```
Do[ SolOpt_LCk := N[ Maximize[ { γ_k , C_LCk , { γ_k , X_j , { j, n_SE} } } ] ] , { k, n_LC} ] ;
```

Solution of the constrained optimization problem for shakedown problem

```
SolOptShakeDown := N[ Maximize[ { γ , { C_LCk , { k, n_LC} } , { γ , X_j , { j, n_SE} } } ] ] ;
```

Fig. 7: Static and shakedown theorems implemented in Mathematica

where:

- M_{LC_k} (N_{LC_k}) are the n-dimensional array of bending moments (axial forces) in the control sections yields by external actions for each different load case (LC);
- $M_{\mathrm{El\,LC}_k}$ ($N_{\mathrm{El\,LC}_k}$) are the n-dimensional array of bending moments (axial forces) elastic solution in the control sections for each different load case (LC);
- $\hat{M}_{X_j}$ ($\hat{N}_{X_j}$) is the n-dimensional array of self-equilibrated bending moment (axial force) in the control sections in the frame made statically determined ($j \in \{1, n_{SE}\}$);
- X_j are multipliers of the self-equilibrated stress distributions $\hat{M}_{X_j}$ ($\hat{N}_{X_j}$) ($j \in \{1, n_{SE}\}$
- C_{LC_k} are the inequalities chain representing the yield conditions in the control sections for axial force-bending interaction in the natural structure and in the retrofitted one;
- $SolOpt_{\mathrm{LC}_k}$ is the solution of the constrained linear optimization problem, of the load case LC_k, which makes the load multiplier, s, a maximum.

The collapse and shakedown load multipliers for no strengthened structure are listed below:

$$S_{C,LC_1} = 2.17 \quad S_{C,LC_2} = 20.53 \quad S_{C,LC_3} = 2.24$$
$$S_{SD} = 2.17$$

and next Fig. 8 shows the collapse mechanism associated with each load conditions:

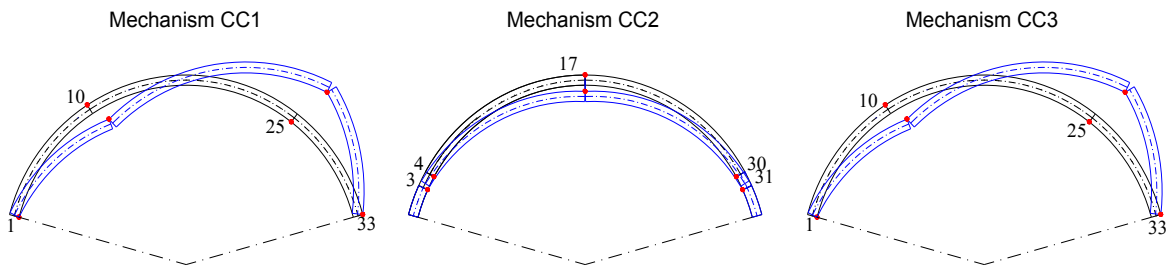

Fig. 8: Collapse mechanism

5. Outcome for retrofitted stone arch

The same procedure has been employed for the determination of the collapse and shakedown load multipliers in the case of CFRP strengthening application, for the reasons mentioned above, at the extrados of the arch. It has been suggested that the reinforcement consisting of six strips of 0.40 m width at the extrados of the arch and placed at uniform offsets will be effective. For the installation the entire filling must be removed by hand, because equipment vibration may cause damage to the bridge. The filling is then reapplied by hand after installation. The filling creates a bond for the CFRP strips which reduces the risk of the dangerous phenomenon of delamination.

As shown in the following pages, through the application of the CFRP strips, a significant increase of the collapse multiplier of 150□ for horizontal and combined loads and 340□ for vertical loads occur.

The nonlinear boundary of the yield domain of the reinforced section is given by the following equations:

$$\begin{cases} M_{upR} = \dfrac{P^2}{2b(\sigma_{oc}-\sigma_{ot})} - \dfrac{P\,h(\sigma_{oc}+\sigma_{ot})}{2(\sigma_{oc}-\sigma_{ot})} + \dfrac{b\,h^2\sigma_{oc}\,\sigma_{ot}}{2(\sigma_{oc}-\sigma_{ot})} \\ M_{lowR} = \dfrac{P^2}{2b\,(\sigma_{oc}-\sigma_{ot})} - \dfrac{P}{2(\sigma_{oc}-\sigma_{ot})}\left(h\,\sigma_{oc}+h\,\sigma_{ot}+2\dfrac{s_w\,b_w\,\sigma_{otw}}{b}\right) \\ \qquad + \dfrac{b\,h^2\sigma_{oc}\,\sigma_{ot}}{2(\sigma_{oc}-\sigma_{ot})} + \dfrac{h\,s_w\,b_w\,\sigma_{oc}\,\sigma_{otw}}{\sigma_{oc}-\sigma_{ot}} + \dfrac{s_w^2\,b_w^2\,\sigma_{otw}^2}{2b\,(\sigma_{oc}-\sigma_{ot})} \end{cases} \tag{5}$$

A representation of the reinforced ultimate domain M-P is provided in Fig. 9. By making a comparison with the yield domain of the section without reinforcement, it can be observed that the presence of the CFRP strips enlarges the plastic domain in the tensile zone and in the bending part that involve the compression of the lower fibers and the tensile of the upper ones.

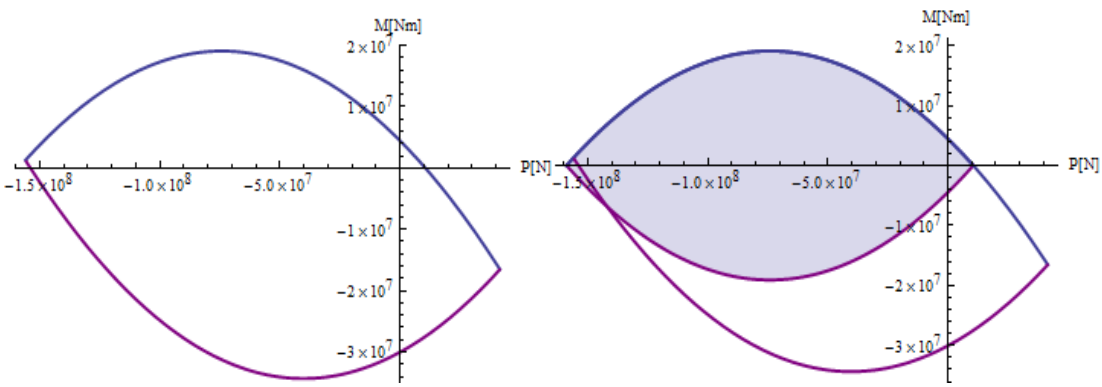

Fig. 9: M-P domain with CFRP's strips and comparison between CFRP and no-CFRP strips domains

The collapse and shakedown load multipliers for retrofitted structure are the following:

$$S^R_{C,LC_1} = 5.49 \quad S^R_{C,LC_2} = 90.66 \quad S^R_{C,LC_3} = 5.63$$
$$S^R_{SD} = 5.49$$

which considers the relevant increases of every multiplier; the result ensures the effectiveness of the adopted retrofitting strategy. The correspondent collapse mechanisms are similar to real case (see Fig. 8).
Furthermore, the values of the collapse multipliers are confirmed by the direct application of the kinematic theorem to every previous collapse mechanisms.

6.Analysis of St. Martin Bridge, if located in a most dangerous seismic area

A parallel analysis of the St. Martin Bridge, with the variable that the bridge was located in a seismically hazardous zone of Italy, such as Irpinia, Campania, southern Italy. Irpinia is located in one of the most hazardous seismic regions of Italy, at the juncture of the Eurasian and African tectonic plates.
Fig. 10 illustrates the vertical and the horizontal spectra for Irpinia, Campania, obtained by the seismic risk parameters for the collapse ultimate limit state:

$$F_0 = 2.431 \quad a_g = 2.82\, m\, s^{-2} \quad S = 1.5 \quad \eta = 1$$
$$T_B = 0.172\, s \quad T_C = 0.517\, s \quad T_D = 2.73\, s$$

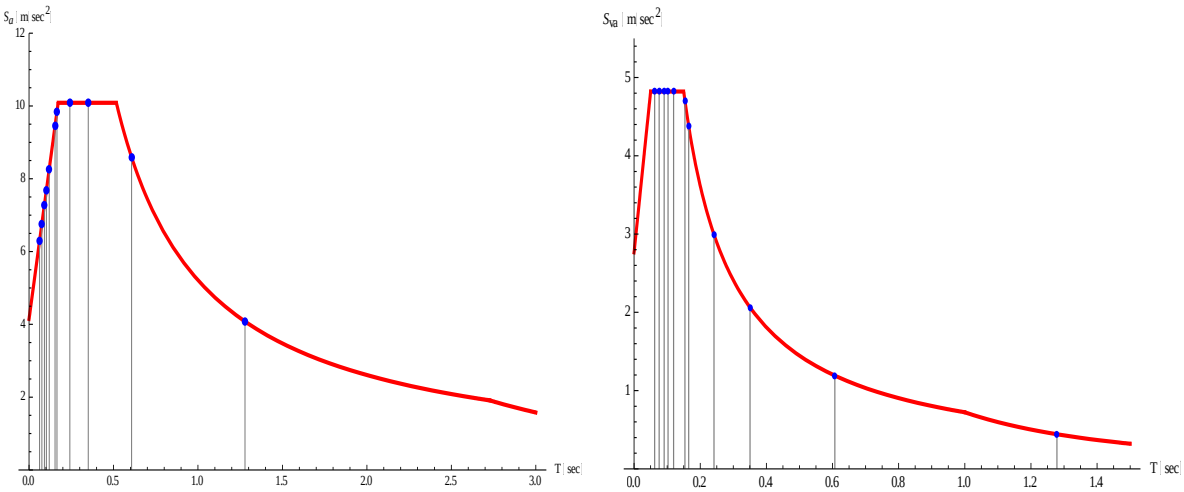

Fig. 10: Elastic response spectra for horizontal and vertical seismic action in Irpinia.

In this last case, the yield and shakedown load multipliers, for the structure without and with CFRP reinforcement, are as follows:

$$S_{C,LC_1} = 0.47 \quad S_{C,LC_2} = 2.45 \quad S_{C,LC_3} = 0.61$$
$$S_{SD} = 0.47$$

$$S^R_{C,LC_1} = 1.45 \quad S^R_{C,LC_2} = 3.79 \quad S^R_{C,LC_3} = 1.53$$
$$S^R_{SD} = 1.45$$

Two natural considerations are initially apparent; the large increase of the multipliers by application of the considered retrofitting technique; second, the reduction of the multipliers in a more dangerous seismic area. These factors may explain the lack of Roman bridge in the area of Southern of Italy.

7.Conclusions

This study demonstrate the results of the limit and shakedown analysis for different seismic load conditions obtained by a DFEM modal analysis, considering the participation of the modal shapes that excites 85 of the global mass of the structure. The analyses are applied on the real structure and on the retrofitted one with a set of CFRP strips on the extrados of stone arch. The dangerous phenomenon of delamination of the CFRP strips is avoided by bonding of the filling. The lower bound theorem of the limit analysis and the shakedown lower bound theorem, also known as the Bleich-Melan theorem, endorse the efficacy of the technical solution of retrofitting adopted here. Another important result of this study is the observation that the seismic shakedown multiplier coincides with

the minimum of the collapse load multipliers. This means that the nonlinear behavior of the structures is always stable, otherwise the incremental collapse cannot occur. An interesting extension of the paper can be made taking into account the anisotropy as shown in [15].

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An Experimental Facility for the on Site Characterization of Smart □ indows

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Abstract
A "smart window" is a transparent element that enhances the interaction between the inner and outer environment and can be considered as the most promising type of window in terms of energy saving and visual comfort. Differently from standard windows, smart windows allow for the reduction of heat losses together with the control of solar radiation. In order to increase the diffusion of this emerging technology, its on-site assessment and characterization upon varying internal and external conditions is necessary.
In order to evaluate the performances of different types of smart windows, an experimental station was set up; the facility consists of a "spinning" structure placed on a turntable that can vary the orientation of the walls and window. Three of the four walls as well as the window can be easily removed and changed with the aim of characterizing different types of walls and windows.
For a complete assessment of the tested windows, the experimental station is equipped with several sensors. The outdoor sensors measure the external climatic conditions, whereas the sensors installed inside collect data on daylighting distributions.
The main purpose of this paper is to describe the set-up of the experimental station and present the results of preliminary experimental tests performed on smart windows with the aim of validating the measurement procedures.

Keywords: Electrochromic window, full scale experimental station, internal daylight illuminance distribution, daylighting performance, external daylight conditions.

1. Introduction
For many years, the light of the sun represented the most important source of light, capable of influencing everyone's whole life and activities. Today, daylight does not limit peoples' activities, but it is still the most important free source of light and energy. In particular, its correct use allows to reduce energy use in buildings and improve visual comfort [1-5]. To this aim, windows play a very important role in controlling energy consumption (controlling heat loss and solar gain) as well as the visual and thermal comfort (controlling solar and sky vault radiation) in new and existing buildings. Since about 4□ of the total European energy consumption is associated to heat loss across windows [6], a great deal of effort has been made to improve the thermal and optical performances of windows. Thus, more research projects focused on the development of new advanced windows, in particular based on the use of electrochromic (EC) film, have been funded by the European Commission. In fact, EC windows can be considered the most promising technology for controlling solar radiation and improving the environmental quality inside a room.
EC materials can modify their colour, as well as their optical and thermal characteristics by applying an electric field with a transition from a clear to a tinted state; depending on the material used to assembly the EC film, a different number of intermediate states are permitted. Considering the

structure of an EC film, it is realized with five superimposed layers. A transparent electrolyte is placed between two EC layers. The three-layer film obtained is enclosed between two transparent electrical conductors [7]. The EC layers can be divided into two main types: the so-called “cathode” oxides, which change colour when the ions are extracted, and the so-called “anode” oxides, which change colour when the ions are inserted. Figure 1 shows an example of an EC window [8] in the clear (left side) and tinted (right side) states.

Fig. 1: Example of an electrochromic window [8] in the clear (a) and tinted (b) states.

Nowadays, EC windows available on the market were generally based on tungsten oxide (WO_3), even if, at laboratory scale, new EC materials, with improved performances, were continuously developed.
The complexity to scale up new EC materials can be ascribed to the strong dependence between the characteristics of EC layers and their size. To this aim, several experimental and theoretical studies [9-14] were conducted to assess the behaviour of large area EC windows and their real effects on the energy saving potential as well as the ability to guarantee the visual and thermal comfort to the occupants. The results of these studies highlighted, on one hand, the importance of EC windows in the European energy framework and, on the other, the fact that the real benefits due to the use of EC windows were strongly influenced by the type of building considered, the load profiles of the building, the orientation of the windows as well as the climate conditions of the place where the building is located.
From the same studies, it can be deduced that, further experimental and numerical studies are needed in order to understand the physical behaviour of large area EC windows as well as to define their real benefits under different operating conditions.
The present paper aims to describe an experimental station for the on-site characterization of full-scale EC. The facility has been equipped in order to acquire external and internal physical quantities; in addition the preliminary experimental measurements obtained using a conventional double low-emittance glazing, performed to validate the measurement methodology, were presented.

2. Description of the experimental station

Starting from the need for additional experimental and theoretical studies on full scale EC windows as well as to assess on-site the performances of all "smart" solution for windows, an experimental station was designed and set-up at the Department of Engineering of the University of Sannio. The station consists of a main supporting steel structure, with an external size of 6.00 m x 6.00 m and height of 5.50 m that support three removable and one not movable wall. The fixing systems of the removable walls and window were realised with the purpose of allowing their easy substitution, and then the characterization of different types of walls and windows. The cooling and heating control systems as well as the experimental data acquisition systems were installed on the not movable wall. Figure 2 shows the internal and external views of wall where can be installed the window to test. The test facility structure was placed on a turntable with the purpose of adjusting the orientation of the experimental station.
The standard window considered for the measurement system set up, has a wood frame with a total size of 2.000 m x 1.200 m, ratio between glass area and total window area equal to 0.59 and a distance (from the middle point of the window) to the ground of about 2.750 m. Two conventional

double low-emitting glazing panes filled with Argon (each with size 0.785 m x 0.900 m), produced by Saint-Gobain [15] were installed. According to the technical data declared by the manufacturer, the glass was characterized by a visible solar transmittance (T_{vis}) equal to 80□, a thermal transmittance (U_g) equal to 1.1 W/m^{2}K and a solar factor (SF) equal to 0.63.

a) b)

Fig. 2: Experimental station: internal (a) and external (b) views of window.

3. Measurement set□up

The surfaces of the room and furniture were experimentally characterized recording the reflectance values with the spectrophotometer Konica Minolta CM – 2600d (size of integrating sphere: □52 mm, wavelength range: from 360 nm to 740 nm and spectral reflectance: standard deviation within 0.1□). The reflectance measurements were performed on three measurement points for each room surface and their values were evaluated considering the standard illuminant D65 and the Specular Component Included (SCI). The reflectance value on each measuring point was obtained as the mean value of three measurements, while the reflectance values assigned to the surface were calculated as the average value of the data recorded on the three measurement points.

In order to evaluate the real availability of daylight, the external values of the horizontal global illuminance were acquired. The horizontal global illuminances were acquired on the roof of the experimental station using an illuminance-meters LP PHOT 03 (manufactured by Delta OHM [16], cosine correction, measuring range from 0 lx to 150 klx, relative spectral response (f_1')□6□ and accuracy □4□), reported in Figure 3a.

The measurements of internal daylight illuminance distribution were performed with the window south oriented; both the external and internal photometric quantities were acquired with a time step of 10 minutes. The internal daylight distribution was evaluated in nine measurement points arranged inside the room, through nine illuminance-meters Konica Minolta T-10 [17] with cosine correction, measuring range from 0.01 lx to 300 klx and accuracy of □2□. By means of suitable support structures, the illuminance-meters were placed at 0.85 m from the floor level in horizontal position. In Figure 3b, it is possible to note the position of the luxmeters and the supporting structures used to adjust the arrangement of the luxmeters.

Figure 4 shows the layout of the experimental station and the position of the illuminance sensors (indicated with a number from H1 to H9) used to evaluate the internal daylight distribution. The measurement points were identified considering a grid subdivision of the total area in a 3 x 3 array with single cell 1.410 m x 1.540 m each; the sensors were placed at the centre of each small area.

a) b)

Fig. 3: Detailed view of the external sensor for horizontal global illuminance measurement (a) and internal view of the test room with positioning of the illuminance sensors.

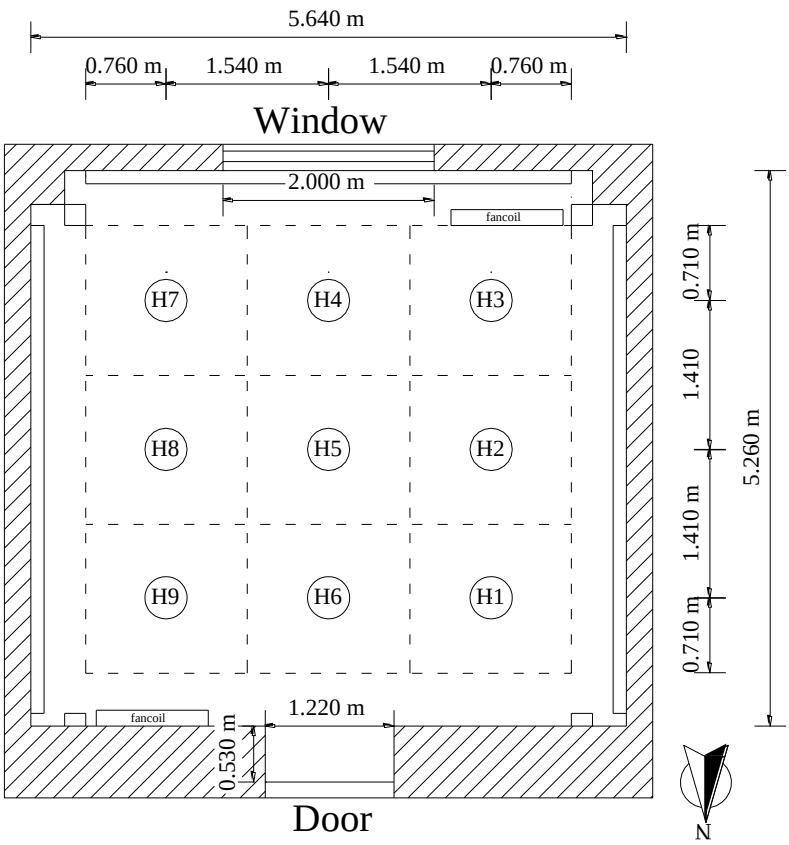


Fig. 4: Layout of the experimental station as well as the position of the illuminance-meters (from H1 to H9).

4. Results and discussion

In Figure 5, the spectral reflectance values of the internal surfaces experimentally acquired are reported, while the reflectance values of the internal main surfaces of the station are listed in Table 1.
Referring to the layout of the internal sensors reported in Figure 4, Figure 6 shows the comparison between the external horizontal global illuminance values and the daylight illuminance distribution inside the test room measured on April 18th 2016, from 10:00 to 17:00.
With the purpose of obtaining information about the internal daylight distribution along a line parallel to window upon varying of the distance from window, the external horizontal global illuminance values were compared with the internal illuminance values acquired by the sensors: (i) H3, H4 and H7 (Figure 6a), (ii) H2, H5 and H8 (Figure 6b) as well as (iii) H1, H6 and H9 (Figure 6c).

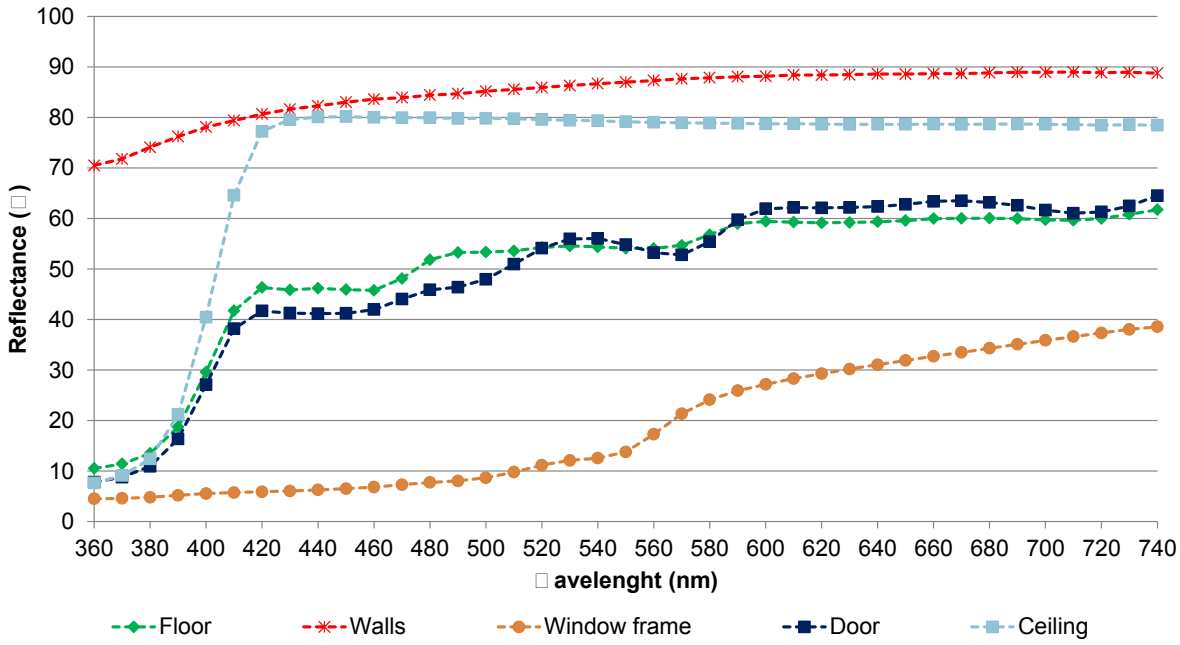


Fig. 5: Spectral reflectance values of the internal surfaces of the test room.

Tab. 1: Reflectance of internal surfaces.

Surface	Values of D65 reflectance SCI ( )
Floor	55.1
Walls	86.8
Ceiling	79.2
Window frame	17.2
Door	54.6

Comparing the daylight illuminance values reported in Figure 6, it can be seen that the highest illuminance values were observed for the sensors placed close to the window (H3, H4 and H7). In particular, the sensor placed in front of the middle point of the window (measurement position H4) reached the maximum illuminance values.
From Figure 6a, it can be noted that while the daylight illuminance values acquired by sensor H4 vary following the external illuminance, the data acquired by sensors H3 and H7 depend on the sun position; during the morning (sun moving from east) the illuminance values acquired by sensor H3 were greater than those acquired by sensor H7 while in the afternoon (sun moving to west), it can be noted an opposite trend.
From Figures 6b and 6c, it is possible to see that:

1. the values of the internal daylight illuminance distribution acquired by other six sensors vary upon varying of the external global illuminance;
2. increasing the distance from the window, the internal daylight illuminance distribution values decrease;
3. whatever the distance from the window is, the greatest internal daylight illuminance values were reached by the sensors placed in front of the window (H4, H5 and H6).

Figure 7 shows the internal daylight illuminance distribution for all the measurement points acquired on April 18th 2016 at 10:00 (Figure 7a), 12:00 (Figure 7b), 14:00 (Figure 7c) and 16:00 (Figure 7d). The results were represented according to the reference system shown in Figure 4 and follow the typical illuminance distribution that can be expected for a side-lit office room.

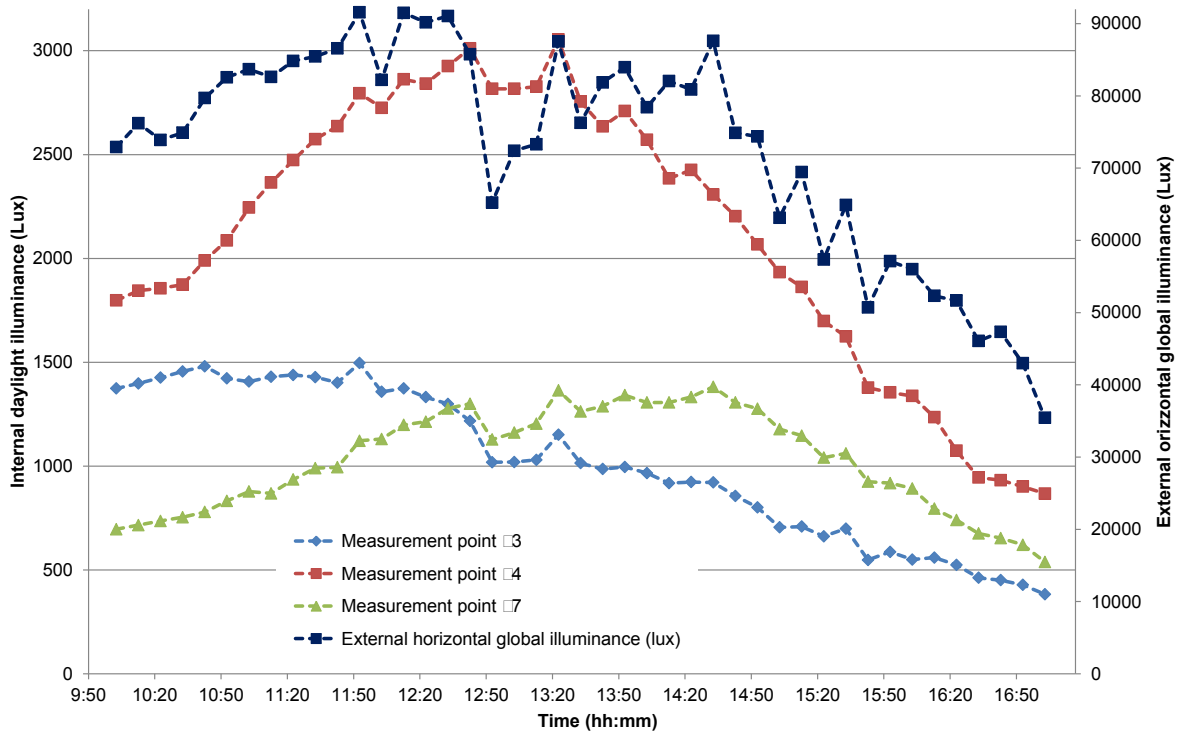
4. Conclusions

EC windows represent one of the most promising solutions for improving thermal and visual comfort in buildings but, with the purpose of evaluating their actual benefit, further experimental and theoretical studies have to be conducted. With the aim of allowing the on-site characterization of full-scale EC windows, an experimental station was set-up at the Department of Engineering of the University of Sannio.

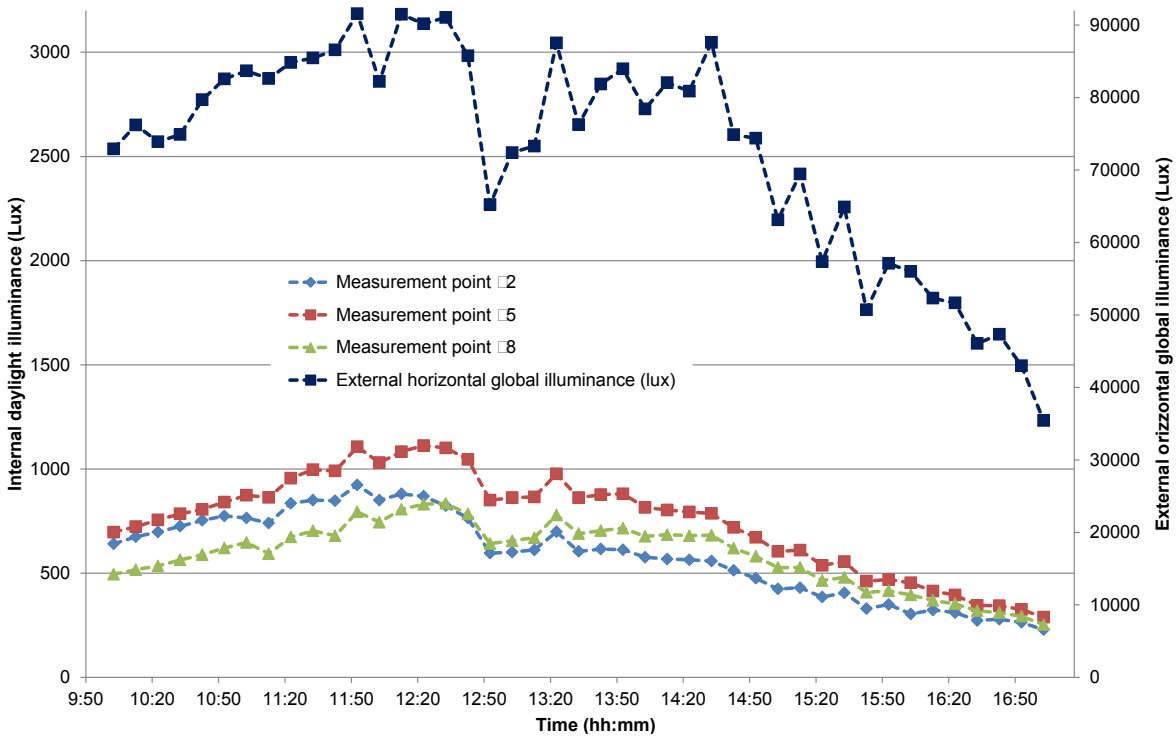
With the purpose of characterising the experimental facility and validating the measurement methodology, preliminary experimental measurements were performed with a conventional double low-emittance glazing.

After the experimental characterization of the facility from geometrical and photometrical points of view, a first test measurements of the external horizontal global illuminance and internal daylight illuminance distribution were performed.

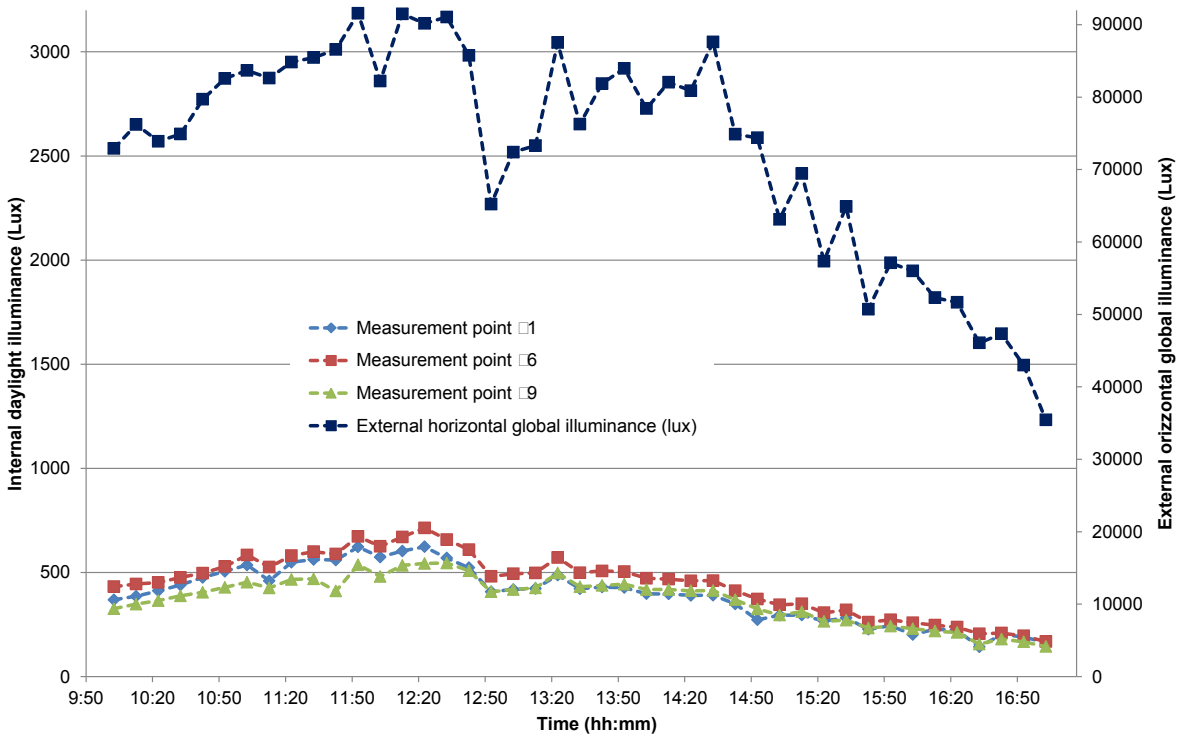
In this paper, the experimental station was exhaustively described and the results of the preliminary measurement performed were reported.



a)



b)



c)

Fig. 6: Comparison between external horizontal global illuminance and internal daylight illuminance distribution

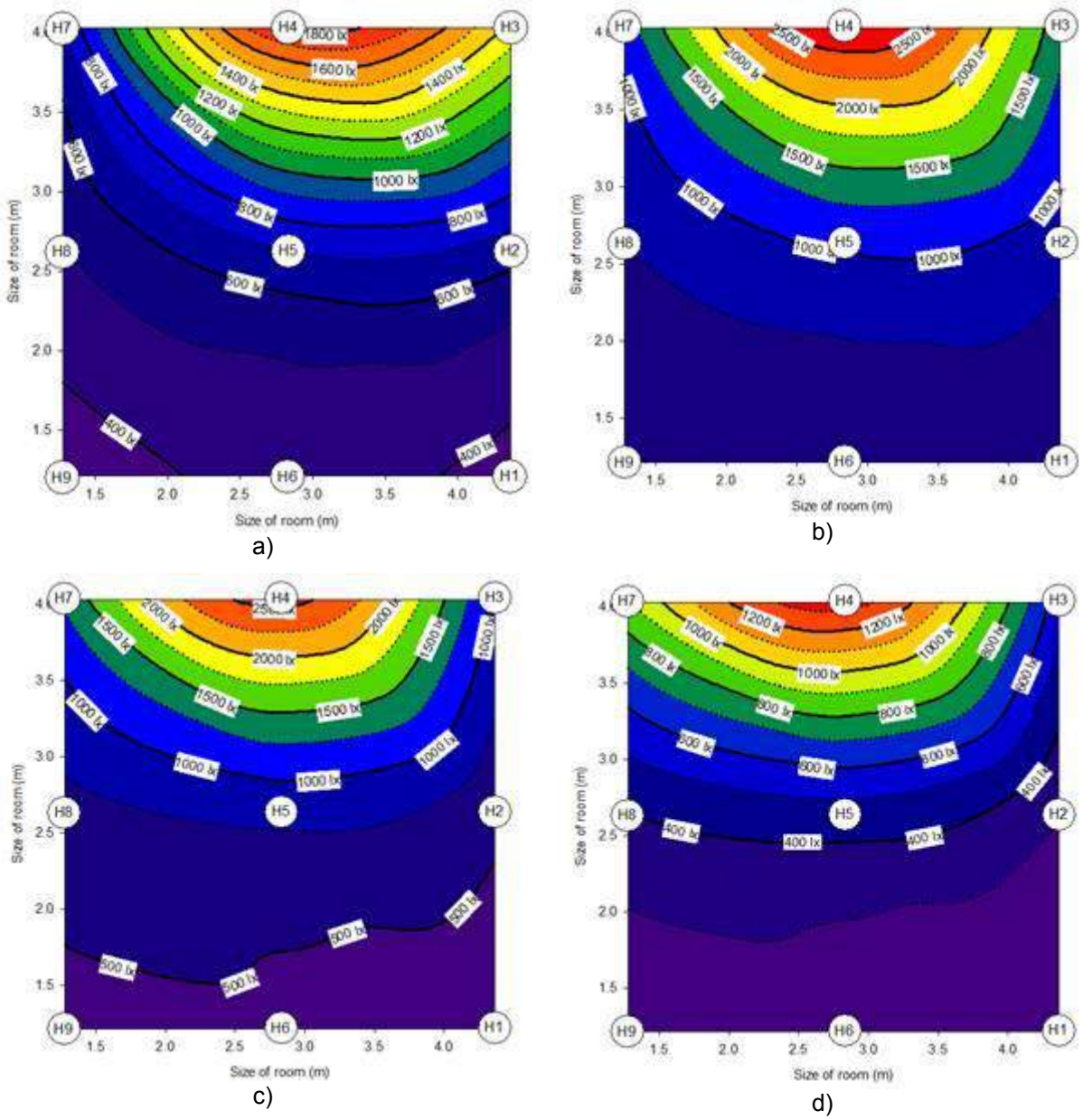


Fig. 7: Daylight illuminance distribution inside the office measured on April 18th 2016 at different hours of the day, (a) 10:00; (b) 12:00; (c) 14:00; (d) 16:00.

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THE VILLA DEL CASALE, REPRESENTATION AND GEOMETRY TRICLINIO TREFOIL

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Abstract: THE VILLA DEL CASALE, representation and geometry Triclinio trefoil

The Villa del Casale in Piazza Armerina, is a the top of the regional museum in Sicily for its number of visitors. It declared a World Heritage Site by Unesco since 1997. The interest is due to the effect of the images evoked by the mosaics notable for diversity and conservation. Following the gradual opening of the various environments of the Roman Villa Casale, it has been addressed to the study and the survey with laser scanner, of the triclinic triapsidal, with the ovoid peristyle, and graphic rendering of the corridor of the great hunt. The two rooms belong to the environments of the public part. The triclinium consists of two parts, the square hall trefoil, and the front porch elliptical. The formal differences of the geometry of the two parts, leads to the assumption that they are not synchronous. It is performed graphical analysis of the hall, with regards to both the geometric organization that the relationship with the ancient measuring units. For elliptical porch in front of the hall, which is also detected by the laser scanner, it looked for the geometric construction of the curve that interpolates the graphic restitution. The corridor of the great hunt, environment-largest museum site, it has defined the plant and grid reference of the subject to subsidence of the southern side. So using the graphical tool, has investigated the modulation and composition in order to compare and correlate the different environments and establish synchronicity.

Keywords: survey, representation, geometry, villa Casale

1. Villa Romanna del Casale and it's history

Below, we would give some historical information targeted, that help us to understand the parts, on which it developed the present work. For more accomplished research on the historical part of the villa, you can see other studies, that they faced problems of dating.

Fig.1, 2: Villa Romana del Casale. The Villa and quadrangular peristyle

It’s established the thesis according which Villa of late fourth century A.D., fits over a rustic villa dating back to a period between the first century and the second half of the III A.D.. The Villa Romana del Casale was constitutes of " pars dominicia ", the administrative center and office of a large estates connected to it, placed in Contrada Sofiana. The presence of the various public and private environments gives us information on the importance of its owner, certainly it belonged to the Roman aristocracy.
Gino Vinicio Gentili [1] tell us, about it, that was an important construction, maybe the country residence of the imperial family of Massimiano Erculeo [2]. The emperor ordered the construction of the Villa in the middle of a large land served as a rural village. The same Gentili says that the emperor Maximian Herculean, built a luxurious mansion after 293 A.D. and the same set in since 305, when he was deprived of power, by the same Diocletian, and from there he carried his attempts to resume the empire direction.
Now we know that the mansion was inhabited after the period of great splendor, that goes from the year of its construction to the fifth century A.D., until the Muslim-Byzantine period. We things that was devastated during the Vandals and Gothics invasions, but in the period before the first Norman domination, the palace had renewed splendour, and became the reference of the surrounding territory. The first studies about Ruins were initiated since the early nineteenth century, while the archaeological area was explored in 1881, reporting at the light some parts of the mosaic floor. In 1928 was conducted a second campaign of excavations , we mentioning peoples like Biagio Pace and Paolo Orsi. Was in this phase , the discovery of the large mosaic depicting the “Labours of Hercules”. While the elliptical porch and also the triclinium were brought to light in the years between 1935 and 1939, only in the ‘50’s was revealed the whole plan of the vast building, and then, in the early ‘60’s the work of Vinicio Gentili. Since 2006 the Villa has been engaged by a conservative intervention designed to mosaic works, the polychrome murals, but mainly to the replacement of existing coverage, with the current one in wooden material. Functional organization of space is typical of the late-Roman architecture, the provision of a wide area of a set of buildings , arranged in a fan . Access was through the monumental entrance of the arcaded courtyard, had a total fifty rooms, grouped into four complexes distinguishable by their functions: the gym with the part of the baths, the peristyle, various rooms used to living with the guest, the environments private with the basilica and the tricora room or triclinic with the front courtyard defined elliptical. The site's value comes from the extraordinary extent of mosaic flooring, in the words of Cesare Brandi "the biggest series full of mosaics ever discovered in a single monument, and mosaics in a state of preservation, if not perfect, some very considerable" [3]. While it is almost total the loss of the architectural structures of the high. Has been evident since

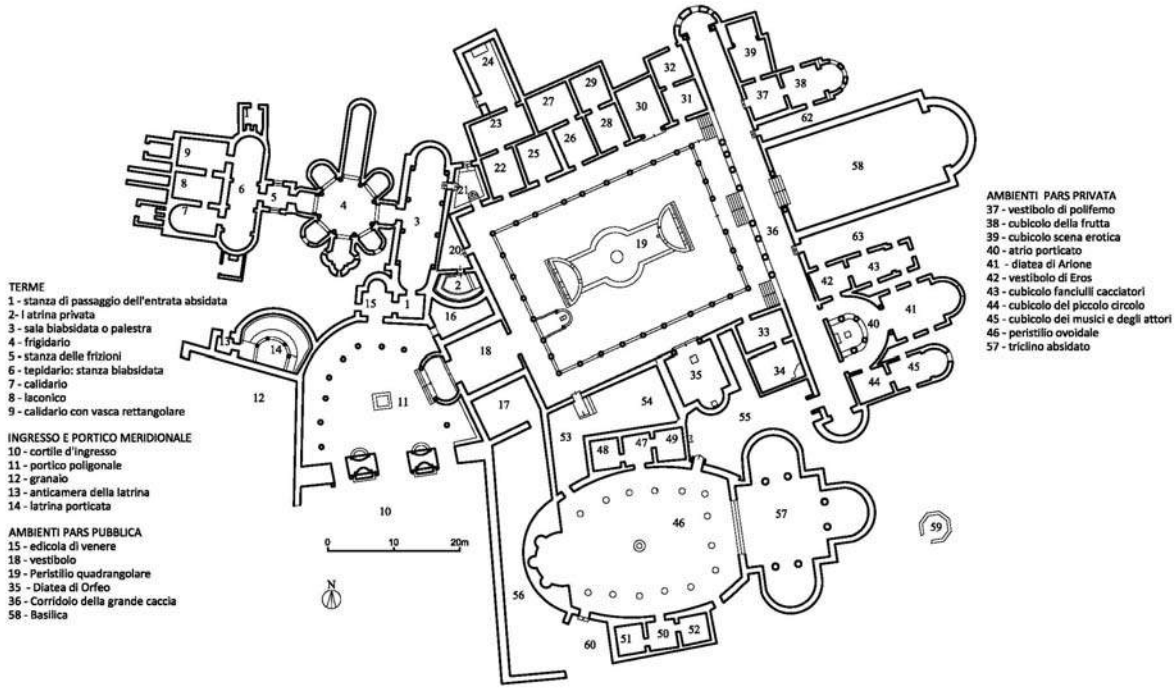

Fig. 3: The Villa Romana del Casale. The plan.

the early findings, the impracticability of any traditional separation hypothesis, between museum and the mosaics. But even more impractical on the level disciplinary, the termination of any hypothesis of the vital link between the mosaics and their architectural context, as well as between the extraordinary architectural structures surrounding and the landscape. Finally impractical on a cultural level, any possibility of distortion of the identity recognition of the Piazza Armerina community. We can understands the value that assumes the problem of protection of archaeological, finds since the early episodes of nineteenth-century discoveries. The release, which occurred between 1950 and 1955, of 4,000 m² of mosaicaded surface, had raised the issue in all its dramatic urgency. With regard to the long process of safeguarding coverage that lasted until 2006 with the current level, that leaves just the triclinium and the part opposite findings, see the study made by Fausto Carmelo Nigrelli and Maria Rosaria Vitale [4] .

1.1 Triclinium With Ovoidal Peristyle

Through two rooms: one with a public nature, from the southwestern angle of large quadrangular peristyle, the other of a private nature and the corridor of the " Great Hunt", that from the master apartment, give access to a unitary complex, consists of two parts, a oval peristyle cut at one end by a square-shaped room with three apses (trichora). On the two sides of the peristyle in turn overlook groups of three environments, accessible from the central compartment. To conclude the ovoid peristyle, from the opposite side of the room with three apses, there is a nympheum with apse.

The presence of two granite columns, on one of the four sides of the room tricora, indicates what was the entrance, almost certainly without any closure, and punctuated by four steps, which affirmed the height difference and hierarchy than the peristyle. Inside the tracks on three sides, of rectangular bases, suggest the presence of the pillars to compose three serlianas of access to the three apses. It also seems plausible that the room (hall) height was equal to its plan dimensions. Appears evident geometric difference of the two parts leading to the hypothesis that the two structures are not synchronous, a hypothesis supported by the fact that there is no evidence connection between the two forms. Even analysis of formal elements, leads to the same conclusion, for examples the foundations of rectangular pillars that are found in elliptical peristyle are rustic, have nothing to do with the brilliance of the two columns at the entrance to the triclinium. Internal mosaic devices represent the myths of Hercules, Daphne, Ambrosia and Cyparissus. The Labors of Hercules cycle is depicted on the central hall mosaic: remain recognizable, on the top the Bistoni knights, with in the middle Nemean lion, while on underlying register is identifiable the bull of Marathon , the Hydra of Lerna, Geryon, the boar of Erymanthian and hind Cerinitride. On the lower register there are eventually, the dragon of the garden of the Hesperides, the mares of Diomedes and Cerberus. In the apse of the left, one to the north, it shows the scene of the triumph of Hercules, Olympus introduced by Bacchus and crowned by Jupiter. On the threshold there are two

Fig. 4: The Villa Romana del Casale. The tricora

Fig. 5: The Villa Romana del Casale. The ovoid peristilio in front the tricora

scenes of metamorphosis: Daphne is transformed into a laurel, Cyparissus in Cypress. In the apse of the right (south) shows the myth of Lycurgus and Ambrosia, or the birth of the vine. Apse cross (east) has narrated the myth of the Giants slain by Hercules; the area in front of: the metamorphosis of Hesione (or Andromeda) and Andimione in the stars. Recent studies have focused on the reconfiguration of the roofing system, the opportunity offered insights to review the relationship with the elevation. At least four trusses could support the roof covering the presence of a countertop that could conceal the roof elements, as was usually made for large spaces of representation [5].
The apses roof to was type basin, while the central part is not excluded that had a roof with four slopes. Orange [6] confirms the hypothesis of the Gentile, having detected in the '50, that the distinctive architecture as well as the iconography, was the tipical dwelling of a sovereign. Settis [7] also believes that the hall with apses assume a greater meaning than the triclinium , and that the former was the main room for the reception. It is undoubted dominance of classroom triclinium than in front of the peristyle, also as you will see later in this paper, there is no geometrical relationship between the two parties.

1.2 The Corridor of Great Hunt

This room, also known as "the corridor of the great hunt", is on the eastern side of the peristyle. Access is via five risers, organized on three sets of stairs, two side and one central, this placed on axis with the large public room of representation: the basilica, which was used for official receptions. The corridor is the only access in to basilica. Is the room, that for it's dynamism and the extension of its mosaics with its approximately 68 m in length, is the more known and admired of villa. Details are the apses at the north and south. It relates upstream of the quadrangular peristyle, and downstream of the basilica and the two apartments. The choice of most elevation is due to its function, being the zipper that leads in environments with public and private destination of the manor pars. Only access to the basilica is surpassed in height only by it, being the classroom basilica the public environment where it was allocated the throne of the owner.

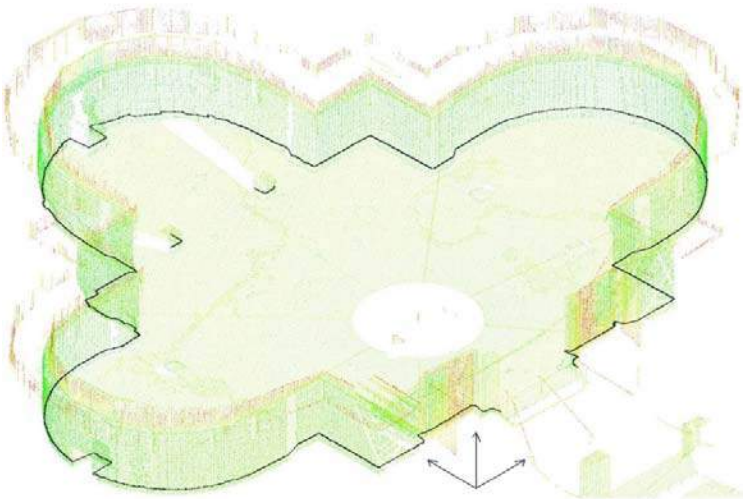

Fig. 6: The Villa Romana del Casale. The scanning of Tricora

Apses, plinths of the columns and all ambulatory are covered in grey marble veined. Paved with a mosaic from figuration glitzy, owes its name to the subject of his mosaic, depicting hunting scenes, and to distinguish it from the environment, the small hunting room, smaller which are also depicted hunting scenes. In it they play capture scenes and transport of wild animals. The hunts are set in the various regions of the empire, shown in the background on the upper register as figures landscapes, as well as by the two allegorical figures placed in the two apses [8]. It shows a total mosaic apparatus divided into seven scenes and 18 paintings: a sequence of places of Africa and India. The scene is set on three registers: the upper describes the natural landscape the built environment, the intermediate describes some of the scenes of hunting, while the lower register, the closer, describes more particular subject.

Fig. 7: The Villa Romana del Casale. The Corridor of Great Hunt

It's important to should be recognized the peculiarity that in one of the boxes shows the figure of the emperor Massimiano Erculeo, flanked by two officers of his guard, with the characteristic round shields [9]. The reading flows from the west, or from the left, towards the center and the east, that is right, toward the same center. This point is not the middle point of the corridor, or the villa, but the axis of the basilica [10].
Apses are not only framed by two Corinthian columns, but arise, to a slightly higher level than that of the entire multi-purpose function hall or disengagement from the rest of the domus, monumental entrance of the basilica and trait d' union with the triclinium [11].
As in all the mosaics of Villa the design of the human figures is almost always the front, in orthogonal projection, and this to allow power to represent the face, and those ornaments connected to it which could establish a function or feature. The represented alongside figures such as knights, always have your face rotated in front view. Pets are always represented on the side, to be able to easily distinguish between the species. The objects of furniture or the elements of architectures, are solved with frontal views to which is coupled the depth, usually according to one director to 45 degrees, nearly a three-dimensional view.

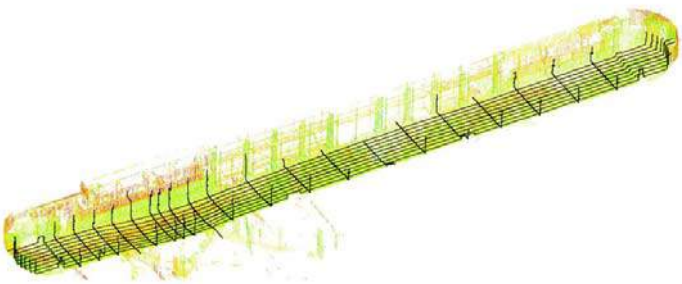

Fig. 8: Villa Romana del Casale. The Corridor Great Hunt scanning, and the sections

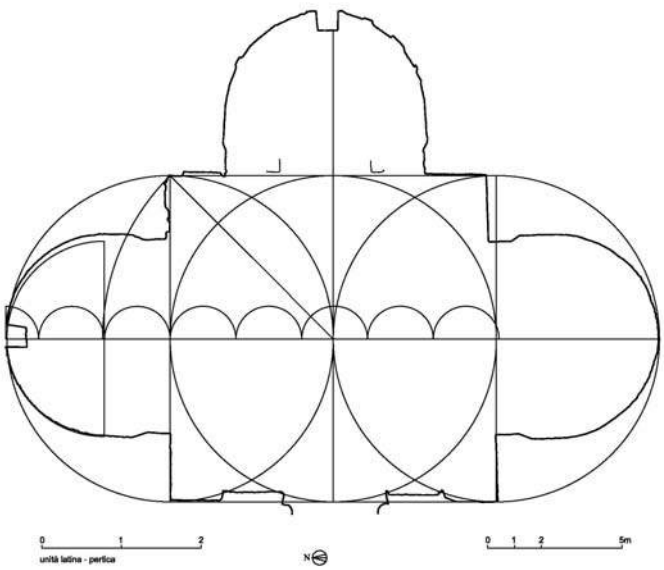

Fig. 9: Villa Romana del Casale. The Triclinio Geometry.

2. The survey of the Triclinium and Corridor

The study and the survey of the triclinium and the corridor of the great hunt, is a part of wider relief of the Villa as a whole. The survey work of the villa has been diversified for different environments, according to their specificities. It was carried the direct survey of entry environments, the quadrangular peristyle, and north sides, south and west of the same peristyle, and thermal baths. It was used a 3D laser scanner for the basilica, for private apartments on the south of the basilica, into corridor of the great hunt, triclinium, and the ovoid peristyle. The corridor of the great hunt, the choice of 3D laser scanner, was determined by the irregularity of the floor, by the irregularity of the edge between the floor and walls, the presence of two apses. The unevenness in the mosaic pavement, in the southern part, has considerable depressions of which it was decided to study the trend. The design of the mosaics was studied using photogrammetric metod, and the variation of the units, using a reference grid in both directions. The operation is more accurate and detailed of a topographic survey, because you have the option of using a grid that allows you to see changes in both directions. The grid associated with a photographic image straightened, allows you to understand at what points of the mosaic is given the dimension change.
The survey of the triclinium was executed in a single scan, in almost central position of the site. The slight eccentricity of the acquisition point, is dued to the necessity to place the instrument away from mosaics which appear partially swollen and detached. It was executed only one scan, in order to have a single cloud, which has been characterized by an average acquisition accuracy equal to 0,5 cm x 0,5 cm resolution. Regarding the peristyle three scans has been performed to cover 360° horizontally.

The results of restitution allowed to get the horizontal sections of triclinium at different heights, which whom has been used the one at the height of twenty-seven centimeters to the floor, the best to represent the site profile. The graphical analysis has been oriented to research the geometrical matrix of composition and, later, the dimensional search, starting from the ancient unit of measurement. The underlying geometry shows that everything is set up on the circumference enclosed in the central square, and the repetition of the radius on the median axis extremes, defines the apses. The overturning of the semi diagonal with center in circumference on the diameter locates on the same axis the center of the semicircle of each apse. The diameter of the enclosed circumference is defined by five submodules, about which the part that concerns the apses has dimension equal to two and a half modules (fig 9). Regarding ancient units of measure, the regulatory element is the “pertica” (rod) equal to ten feet. It is assessed that the radius of the enclosed circumference, is equal to two rods, as well as the extension of the apses. The geometry of peristyle in front of the triclinium has led to an oval curve, regarding which has not been found dimensional and geometric similarities to the triclinium. Is not far wrong the thesis that the two sides are not synchronous and, therefore, disconnected in their design.

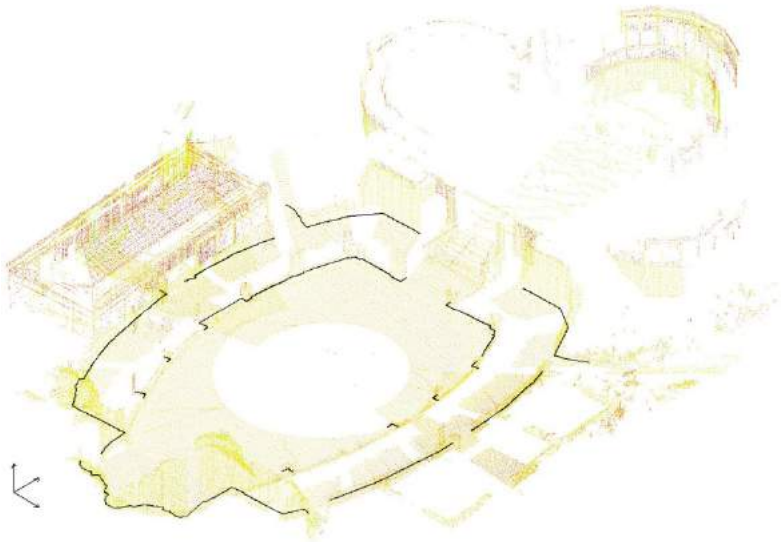

Fig. 10: Villa Romana del Casale. The scanning of peristyle.

The survey of corridor was set to three point of stations and as many scans. In union step it has maintained the average residual error below 3 mm. The research of the geometric modulation of the corridor has not led to significant results, confirming that has been sized to serve the upstream site, whose aggregation leads to a clear geometric irregularities. While as intended, the study of the decking level of the corridor was of particular interest with different sagging present, which effects relate to the laying surface of the mosaics. The maximum soil depression is amounted to 1.08 m, is located along a line in the direction of southwest, this result is in line with the results in the other environments. The extraction graphic profiles showed that the outer walls do not present failures, confirming that foundations were built with special care, and who are independent from the insole of the various environments.

In conclusion, using the graphical tool has been possible to investigate and examine different aspects and areas of the Villa Romana del Casale, whose initial results have led to some interesting conclusions on the aspects so far not investigated the important archaeological site.

Fig. 11: Villa Romana del Casale. The triclinio in front peristilio.

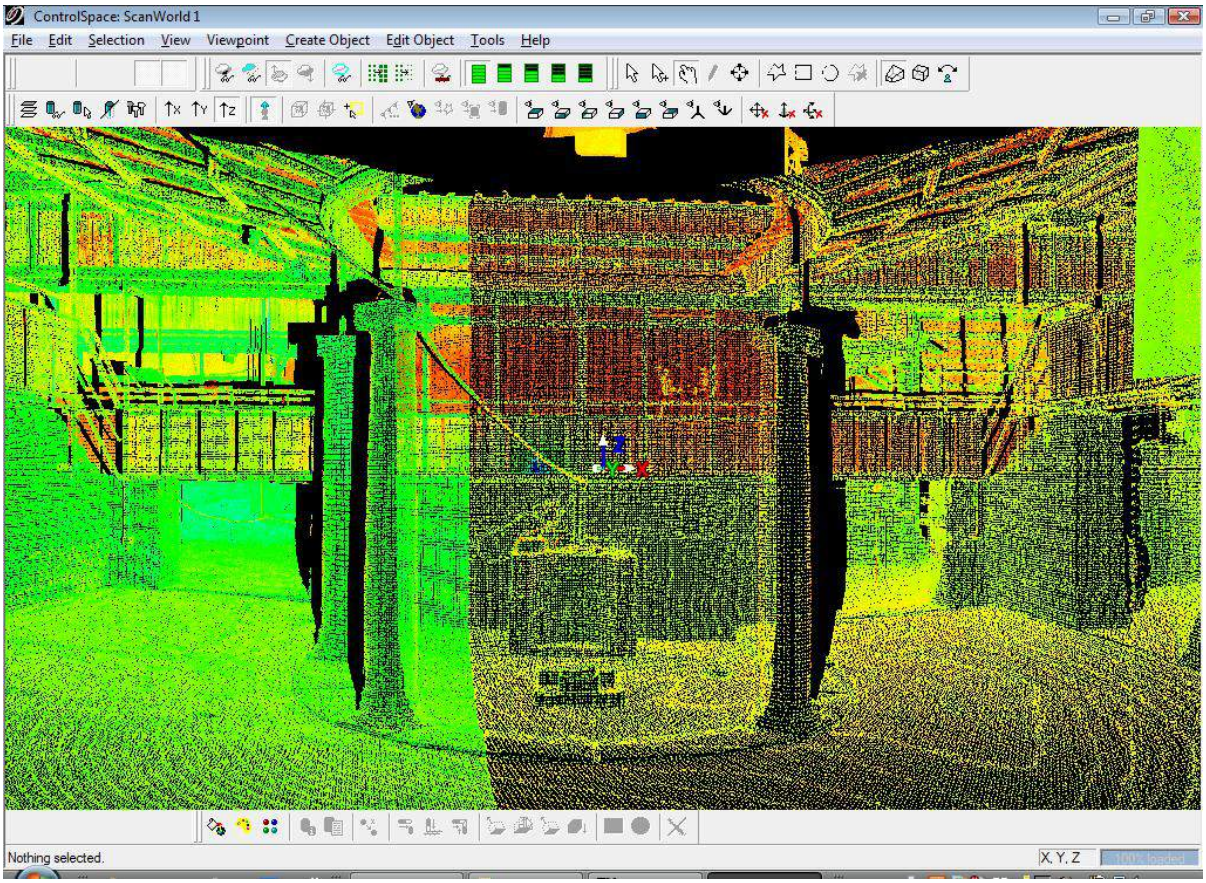

Fig. 12: Villa Romana del Casale. The appartment called “pars private”. Range data in 3D.

Fig. 13: Villa Romana del Casale. Excellent state of health of the mosaics, the vestibule of Polyphemus, Ulysses offering the wine to the cyclops.

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Materials and garbage architecture: emergency or potentiality?

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Abstract

In the last ten years, the so-called "garbage architecture" has been often used to build temporary structures, or however to cover housing emergencies after natural disasters, especially in those Countries and/or areas in the world where using traditional building materials becomes extremely onerous, if not inaccessible.
It is in these cases that waste becomes a resource and potentiality. Instead in those Countries where garbage is in excess, it becomes a social criticality to solve.
This scientific contribution aims at a different approach to the problem, starting with what can be considered domestic waste which is more difficult to dispose of, conveying it to secondary raw material for the construction industry. In fact, the current study has started with the process analysis of selection and transformation of the main materials differentiated in the Solid Urban Garbage Collection such as, glass and plastics, and to check which ones were to be incinerated, therefore with disposal costs.
Probably the international comparison in which Italy has been called on about being a smart community capable of transforming into strength what is weakness today, with greater respect on the sustainability and the environment-friendliness of the products.
The proposal put forward by this contribution, should also present considerations on smart innovations themes linked to architecture topics and the materials connected to it.

Keywords: garbage, materials, architecture.

1. La tradizione e l'innovazione dei materiali

La relazione tra materia, forma ed architettura □ sempre stata forte ed indissolubile. Tale legame ha una duplice natura: di tipo estetico e di tipo funzionale; infatti, a differenza della scultura dove le venature dei marmi, la loro lucentezza, spesso sono stati fonte di ispirazione per numerosi e geniali artisti, in architettura □ la costruzione della forma a dettare la ricerca del materiale pi□ adatto. Ripensando alle fasi precedenti alle "epoche costruttive" con cui la Storia dell'Architettura è solita individuare degli *stili*, le architetture erano considerate quelle opere realizzate per l'eternità, che fossero i simboli del potere, della religiosità, della vita sociale comunitaria, e pertanto erano realizzate con un materiale adatto: la pietra, sia essa naturale che artificiale, in base alla cultura locale. I templi, le piramidi, le terme, gli anfiteatri, le fortezze, i palazzi del governo di antichissime culture, sono rimasti inalterati nei secoli proprio grazie a questo principio di conservazione. Interessante □ anche il caso della città di Pompei arrivata fino ai nostri giorni poiché completamente plasmata dalla lava che

raffreddandosi ha reso scultura l'intera città, ma questo è solo una conferma a quanto descritto sopra riguardo le proprietà di durevolezza del materiale roccioso. Abitazioni umili o elementi destinati alla sostituzione, quindi di una certa temporaneità, erano costruiti in legno. Il legno inoltre utilizzato per gli elementi leggeri, quali infissi, porte, solai, per ridurre il peso proprio della costruzione. Anche se culture particolarmente sagge e sapienti, per secoli hanno costruito anche i loro edifici pi rappresentativi in legno: sono un esempio il Giappone, che ha saputo ottimizzare l'elasticità di questo materiale in risposta ai frequenti terremoti. Dunque inizialmente i materiali da costruzione erano pressoché ridotti a due: pietra e legno, spesso usati insieme.
Nella nostra cultura, il rapporto tra architettura e materiali impiegati, rimasto immutato per secoli.
A seconda delle risorse locali, ogni regione ha sviluppato tecniche costruttive e di lavorazione dei materiali tali da permettere la costruzione di strumenti e mezzi da lavoro, abitazioni, centri abitati, in maniera indistinta, applicando a tutti gli aspetti del vivere umano, lo stesso bagaglio conoscitivo di materiali e tecniche. L'esperienza di lavorazione con i materiali disponibili in loco ha generato nei secoli, dall'autocostruzione alla specializzazione di maestranze dedicate, le quali hanno consolidato nel tempo tecniche costruttive all'altezza del pregio a cui il fabbricato era chiamato. Questa saggezza stata tramandata come tradizione costruttiva, proprio perché si dimostrata duratura, resistente, non solo staticamente ma anche in relazione al tipo di clima e condizioni ambientali circostanti. Altra considerazione da fare riguardo la relazione tra tradizione costruttiva e materiali impiegati, che questi ultimi non avevano "produzione standardizzata" e dunque progettisti e architetti hanno dovuto esprimere le proprie capacità creative, e anche estetico - decorative, conoscendo e comprendendo estrinsecamente le proprietà e le prestazioni dei materiali disponibili. Questa conoscenza dei materiali è stata acquisita attraverso l'esperienza e l'osservazione, con approccio sperimentale il quale certamente, ha portato a disastri ed errori, ma anche ad interpretare la cultura sociale ed il gusto estetico del tempo, con una risposta linguistica e formale talvolta associata allo *stile architettonico*.
Con l'introduzione del ferro e della ghisa in edilizia, la risposta stilistica diventa snella e versatile, e favorisce l'abbinamento a materiali non opachi che aprono l'architettura al concetto di trasparenza ed apertura visiva tra interno ed esterno e viceversa. I metalli, che dopo la pietra hanno misurato e scandito l'evoluzione dell'essere umano, hanno iniziato a dominare gli orizzonti costruttivi europei, proprio grazie alla ricerca (a partire dal 1709) di combustibili differenti dal legno, necessario a fondere i minerali di ferro, che in quegli anni scarseggiava. Così, tra le innovazioni portate dalla rivoluzione industriale, anche il settore dell'edilizia ha attinto nuove applicazioni di materiali, confermandosi come il settore di ultima ricaduta delle innovazioni provenienti dalla ricerca di altri settori. Infatti, nessun materiale applicato in edilizia è stato prodotto per l'applicazione in questo specifico ambito, anzi più spesso, in edilizia si raccolgono e perfezionano "i superflui" di altri.

2. Il riciclo innovativo dei materiali

Per materiale si intende ogni sostanza che, immessa in un processo produttivo, diviene parte integrante del bene prodotto: questo può essere un bene finito destinato al consumo o ad un prodotto intermedio, utilizzato poi come materiale per una successiva lavorazione[1]. Nell'ambito dei cicli produttivi della trasformazione industriale il materiale costituisce l'aspetto fisico più evidente: determina la struttura e il peso del bene prodotto, ne condiziona la tecnologia di lavorazione e spesso ne vincola il disegno.
"Tutti i materiali immessi sul mercato sono destinati, presto o tardi, a trasformarsi in rifiuti e tutti i processi produttivi generano rifiuti. Anche i processi di recupero dell'energia o dei materiali contenuti nei rifiuti producono residui non ulteriormente recuperabili che devono essere smaltiti"[2].
In Italia l'attività di riciclaggio dei materiali può considerarsi un fenomeno consolidato in vari settori, quali il siderurgico, i cartari, quello della trasformazione dell'alluminio e, più in generale, nella cosiddetta fase *pre-consumo* di produzione e trasformazione industriale di manufatti, intesa come recupero e riutilizzo degli scarti di lavorazione. Essa riveste invece una caratteristica di innovatività quando coinvolge, nella cosiddetta fase *post-consumo* (cio nel momento in cui il prodotto, perdendo l'originario valore d'uso, esaurisce il proprio ciclo di vita), specifici settori e materiali: tra i primi, principalmente, l'imballaggio e l'automobilistico, tra i secondi, le materie plastiche. Questa nuova tendenza dovuta soprattutto alle crescenti difficoltà, registrate in tutti i principali Paesi industrializzati, di smaltimento dei rifiuti solidi. Sia a livello nazionale che in sede sovranazionale, l'ostilità verso l'installazione di nuovi impianti di trattamento dei rifiuti, unita in taluni casi alla saturazione della capacità di smaltimento con le tradizionali discariche, ha portato a riconsiderare la normativa anche in un'ottica di prevenzione. Ampliando lo spettro di valutazioni dell'impatto ambientale dei singoli materiali a tutto il loro ciclo di vita, secondo la formula *from cradle to grave* ("dalla culla alla tomba", produzione, distribuzione, uso e smaltimento) si tende ad orientare abitudini dei consumatori e processi produttivi industriali in modo da favorire il riciclo, o quantomeno la rivalorizzazione, dei materiali stessi[3].
Più recentemente, la teoria del riuso è stata dettata anche dall'aumento della sensibilità ecologica, talvolta invece solo come tendenza ma, il concetto di riuso dei materiali inglobato dal Legislatore

Europeo nei criteri dell' *End of □ aste* (*Eo□*), finalizzati a garantire il risparmio di risorse naturali, la salvaguardia dell'ambiente e della salute umana, ponendo le premesse affinché gli interventi di riuso possano diventare delle strategie, ripensando direttamente ad un'applicazione successiva dei prodotti dopo l'uso e quindi la generazione di "*msp*" come strategia di riuso[4].
Stabilire il confine tra *rifiuto* e quello di *merce□non rifiuto*, definire cosa si intende per *sottoprodotto* e *materie prime seconde*, sono questioni fondamentali per costruire i paradigmi di un'economia fondata sulla valorizzazione dei materiali: in questa prospettiva assume un'importanza centrale la distinzione tra il riciclaggio, recupero e riutilizzo. Per *riciclaggio* si intende qualsiasi operazione di recupero attraverso cui i materiali di rifiuto sono ritrattati per ottenere prodotti, materiali o sostanze da utilizzare per la loro funzione originaria o per altri fini. Questo concetto si caratterizza per il reinserimento del materiale nel ciclo produttivo e per la specifica finalità di recuperare materiali dai rifiuti per riutilizzarli invece di smaltirli. Il riciclaggio in sostanza, riduce il consumo di materie prime, dell'utilizzo di energia e di conseguenti emissioni di gas serra. Il concetto di *recupero* risulta invece pi□ ampio dal momento che si intende: qualsiasi operazione il cui principale risultato sia di permettere ai rifiuti di svolgere un ruolo utile; le operazioni di recupero generano materiali, sostanze, combustibili o prodotti che altrimenti andrebbero perduti. Il *riutilizzo* invece non comporta mutamento chimico-fisico dell'identità della sostanza originaria e si pone al di fuori della normativa dei rifiuti. I sistemi di riutilizzo e di riuso prevedono che una volta terminato l'utilizzo di un oggetto, esso non vada ad aumentare la mole dei rifiuti ma, dopo un semplice processo di pulizia, venga utilizzato nuovamente senza che i materiali di cui □composto subiscano trasformazioni.
Tra i primi esempi di riutilizzo "*tale e □uale*" di oggetti di rifiuto in architettura, sono da menzionare le ormai numerose costruzione realizzate dall'architetto Michael Reynolds dal nome "Earthship", che da alloggi per fronteggiare velocemente ed economicamente le emergenze abitative, hanno dato un cospicuo seguito a questa forma espressiva, denominata "garbage architecture". Inoltre l'impiego di bottiglie di vetro o lattine interamente immerse nella terra cruda, fungono da vere e proprie camere d'aria, favorendo il mantenimento del microclima interno ed evitando ulteriori integrazioni con impianti di riscaldamento o raffrescamento, rendendo gradevole anche da un punto di vista estetico l'uso di questi elementi.

Fig. 1: Earthship Phoenix, *Garbage Architecture* by Michael Raynolds.

Fig. 2: Earthship Indonesia, *Garbage Architecture* by Michael Raynolds.

Le architetture in carta e cartone pressato progettate e realizzate dall'architetto Shigeru Ban, derivano comunque da un processo di recupero e riutilizzo di materiali cartacei. Impensabile, fino alla loro costruzione, sarebbe stato l'impiego di tali materiali anche con funzione strutturale; eppure, nonostante la temporaneità di tali costruzioni, questi materiali hanno comunque proprietà elastiche paragonabili al legno, che quindi in luoghi ad alto rischio sismico, riduco i danni a persone e cose.

Fig. 3: Paper Log House, by Shigeru Ban.

Fig. 4: Paper House, by Shigeru Ban.

La progettazione di questi ambienti è comunque legata all'osservazione e allo studio dei processi di autocostruzione che si verificano in quei contesti di povertà al limite della sopravvivenza, dove i mezzi economici sono chiaramente inesistenti e ciò che rimane mantenere un tetto sotto il quale dormire.
Unito al sentimento ecologista che da qualche anno le nere cronache ambientali continuano ad alimentare, la garbage architecture sta diventando il manifesto di una società consumistica che produce talmente tanta immondizia da poterci costruire case, templi e forse intere città… .
In altri casi, aziende lungimiranti hanno realizzato un nuovo ciclo di recupero e produzione di mps (materia prima seconda) dai rifiuti, in particolare per quanto riguarda le materie plastiche, in quanto questi polimeri se ben differenziati, possono ritornare ad essere materia prima per nuovi oggetti. Nello specifico, vengono realizzati dei granuli di diverso diametro, a seconda dell'impiego che se ne vuole fare, variando dalla dimensione di una breccia fino ad un granello di sabbia. I campi di applicazione di questo genere di mps (materia prima seconda) molto ampio ed in edilizia spazia dagli oggetti da arredo per il giardino alle pi recenti applicazioni come aggregati in blocchetti cementizi. Situazione simile anche per quanto riguarda la carta, il cui reimpiego della pasta macerata stato studiato dall'Istituto Nazionale di Tecnologia di Nagpur come eco-mattone.

Fig. 5: Wat Lan Kuat, tempio buddista interamente costruito con bottiglie di vetro, Thailandia.

3. Responsabilit□ ambientale ed estetica

Come illustrato nei precedenti paragrafi, i rifiuti sono spesso impiegati soprattutto nell'autocostruzione, ma oggi, un impegno sociale verso un minore dispendio di risorse ambientali ed energetiche, sembra quasi impongano il reimpiego di quegli elementi di cui decretiamo la fine del ciclo di vita, destinandoli alla discarica. L'impegno ambientale assunto da architetti sensibili alle tematiche cogenti, porta alla definizione di uno stile *metropolitan trash*, povero in termini di materie prime impiegate, in cui i rifiuti recuperati e riutilizzati offrono spunto alla creatività nelle nuove funzioni, e stimolano alla riflessione su cosa sia realmente un rifiuto. Inoltre, la ricerca verso un'estetica quanto pi□ gradevole possibile, sembra "*suggerire la possibilità di ottenere, da una montagna di rifiuti, una risposta estetica appagante, e sotto certi aspetti 'oscena', dove l'atto stesso dell'ammassare materia rimossa, che non ha pi□ nessuno scopo, diventa un atto estetizzante basato sulla serialità dello scarto materico, la sua riproposizione continua, la ripetizione esponenziale delle sue caratteristiche e l'esposizione di infinite variazioni sul tema*"[5].

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Archaeological Landscape of Death. From Sutri to Tuscania. Proposals for development and use of Etruscan Rock-cut Tombs? Necropolis in the Viterbo region.

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Abstract

The Etruria of territory of Viterbo keeps an exceptional historical, archaeological and naturalistic heritage; it's represented by its Etruscan and Roman Rock-cut Tombs. Sutri, the Via Amerina, San Giovenale, San Giuliano, Grotta Porcina, Norchia, Castel d'Asso and Tuscania were a fine proof, where history and nature perfectly merge. But this inheritance that is in a difficult, unstable and neglected condition, except for special cases, should be preserved, protected and enhanced with great attention, and it would also represent an important opportunity for a responsible tourist development, with resulting job implications. Paper proposed here wants to highlight the importance of promotion and protection of these archaeological sites to realize an only one Provincial Park, with its peculiarity. This project must be careful both nature and archaeology, merged in a perfect bond, doing the "Sistema Parco dell'Etruria Viterbese", the focus of the archaeological landscape of Etruria Viterbese.

Keywords: Viterbo, Tuscia, Archaeological Landscape, Rock-cut Tombs, Necropolises

1. Introduction

"Nessun rumore turbava la scena. Solo il frinire delle cicale, che si sentiva distintamente, metteva in risalto il silenzio solenne dei luoghi. Nessun segno di vita umana si notava dintorno, ad eccezione di una colonna bianca di fumo che si innalzava dai boschi, lontano".
George Dennis, *The Cities and Cemeteries of Etruria*, London 1848.

In Italy, the safeguard and the promotion of the cultural heritage are a hard couple, not only for the value that the two words have in order to fruition of community, but also and especially for economic and political reasons. In archaeology, the tangible and intangible cultural heritage is considered sometimes as a static and defenceless object in its historical and archaeological materiality; its protection occurs, if occurs, only when the cultural heritage is in danger, as in deterioration or collapse. This happens for reasons related to natural events or to human responsibilities.
In these cases, a policy, focused on resetting of resource for the development of cultural heritage, destroy our patrimony from negligence and cement casting; a patrimony that almost always joins nature and archaeology. In Italy, any place, not yet built, preserves the ancient proofs of the past; these are often intact and create a unique habitat where the story blends with its ancient ruins and with the nature. This extraordinary heredity should be considered a

precious resource, but the Government, the Provinces, the Municipalities and the local corporations redirect a tiny part of their funds in actions of shelter and restoration of the cultural heritage that are in their administrative districts. Unfortunately this is not always so. The territory is only understood as a "land" to be exploited for the building and for infrastructures but not for its protection and cultural enhancement; in this way the natural and archaeological landscapes are destroyed.
The Archaeological Landscape, that joins the tangible and intangible evidences of territory between nature and culture, is the instrument which allows to evaluating and to expose everything that characterized an ancient landscape: monuments, cities and roads. This definition is not enough to complete the general context. The archaeological and naturalistic sites are not the unique elements that define a landscape as "archaeological" or "cultural"; the landscape can have this meaning if the landscape is not abandoned to itself or if it is less of supervision of institutions. When this is not, the archaeological landscape loses its value. One can talk of "*Archeologia Etica ed Estetica del Paesaggio*", since the presence of ancient human activities and of archaeological sites are not enough to define the landscape as archaeological, but also its cure, its respect and its safeguard. "An archaeological landscape must also be beautiful". Unfortunately, in Italy, a real social and moral culture of landscape does not exist; in this period of crisis, which scaring the history of our country, the tourism should be an extraordinary source of economic upswing, as for example the numerous tourists that swarmed Viterbo and its suburbs during the festivity.
This paper want to focus on the current situation of the territory of Viterbo, which stands out by the presence of Etruscan and Roman Rock-cut Tombs. They are a precious "*unicum*" (as for example in *Pitigliano* e *Sovana*, in Tuscany) which is fading because there in not a culture of landscape. The Rock-cut tombs are located in the territories of *Sutri*, *Via Amerina*, *San Giuliano* and *San Giovenale*, *Blera*, *Grotta Porcina*, *Norchia*, *Castel d'Asso*, *Tuscania*, near Lake *Bolsena* and in *Cerveteri* and *Tarquinia* (these last two are inscribed on the UNESCO World Heritage List, but they are also several problems of safeguard). Sutri, San Giuliano and some sites of Bolsena Lake are organized in Museum Centres. The realization of Parks and Museum Centres allows managing as the best one cans the archaeological and naturalistic sites.
The "*Parco Naturale Regionale Marturanum*" was born in 1984 and includes the necropolis of *San Giuliano* and the area near *Biedano* river. In 1988 the "*Parco Naturale Regionale dell'Antichissima città di Sutri*" opens and in 2000, Bolsena brings together the neighbouring villages and it realizes the "*Sistema Museale del Lago di Bolsena*", creating a net of little museums : the "*Parco Archeologico della Necropoli di Pianezze a Grotte di Castro*" is located inside the "*Sistema Museale del Lago di Bolsena*". In 2009, a Protocol between *Viterbo*, *Corchiano* and the "*Gruppo Archeologico Romano*", ratify the creation of route of ancient *Via Amerina*. Despite these positive experiences, that show as the archaeology e the promotion of cultural heritage create opportunity of economical and social development, Viterbo don't have a real Preservation Planning of Cultural Landscape. Viterbo has several sites of cultural and naturalistic interest, but these are almost abandoned and some necropolises are used as landfill (Fig. 1).
The creation of an "*Archaeological Park of Etruscan and Roman Rock-cut Tombs*" would be the solution to safeguard the landscape, through the realization of a naturalistic-archaeological road that crosses the necropolis of Tuscia, thank to the use of existing ancient viability.

2. Through the Rock-cut Tombs of Etruscan Tuscia

From *Sutri*, through a tract of *Via Cassia* and visiting the sites of *San Giuliano*, *Blera*, *Norchia*, *Castel d'Asso* and *Tuscania* through the *Via Clodia*, is possible to observe what can be called the "Archaeological Landscape of Death of Etruscan Rock-cut Tombs" (Fig. 2).
Sutri is a Roman city that is located on a tuff hill, along the *Via Cassia* to the NW. Its necropolis (Fig. 3) is one of the most interesting examples of Roman cut tombs in tuff; they have a clear Etruscan influence. Today, about 64 tombs are accessible and they are organized on different levels. One of cut tombs was transformed in a *Mitreo* in the third

century BC and later in a hypogeal Christian church. The most important monument of Sutri is the Roman amphitheatre that is placed near the necropolis.

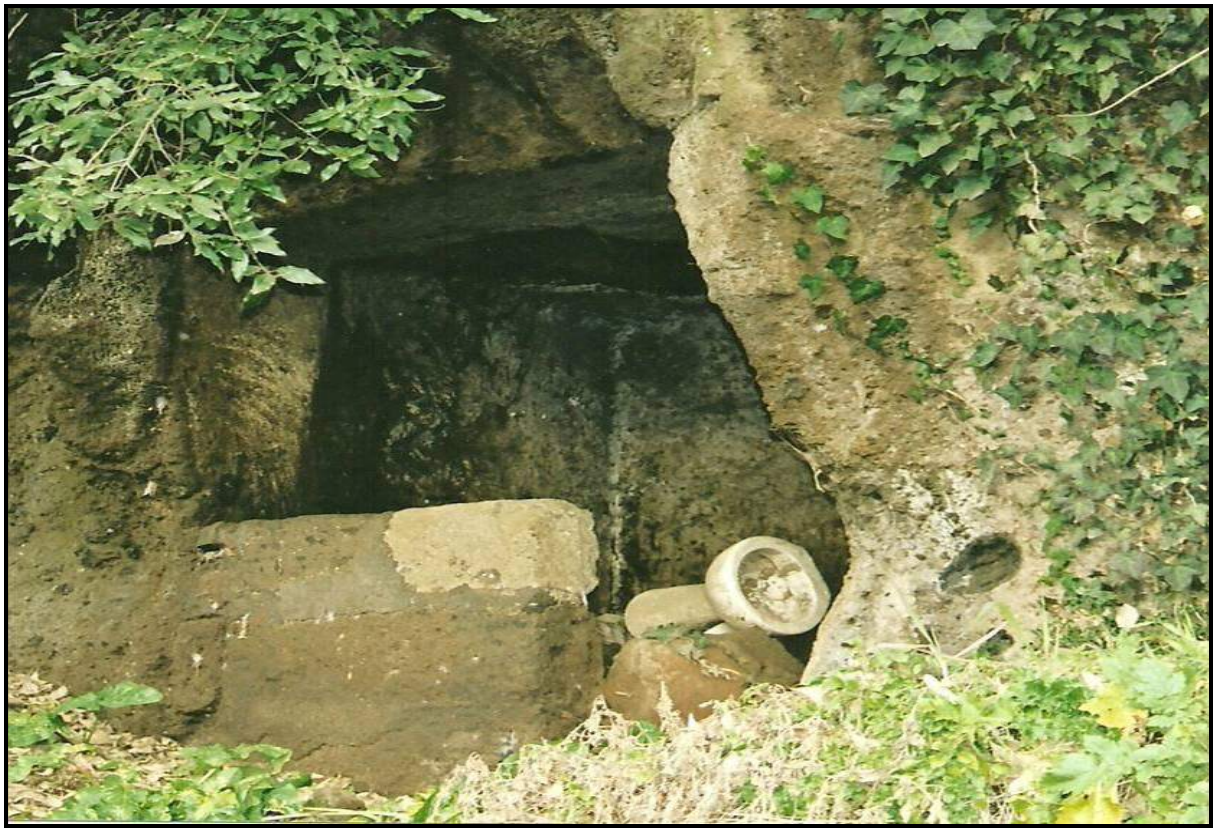

Fig. 1: Rock-cut tomb used as landfill. In the photo is possible to observe a WC. (Photo by F. Ceci)

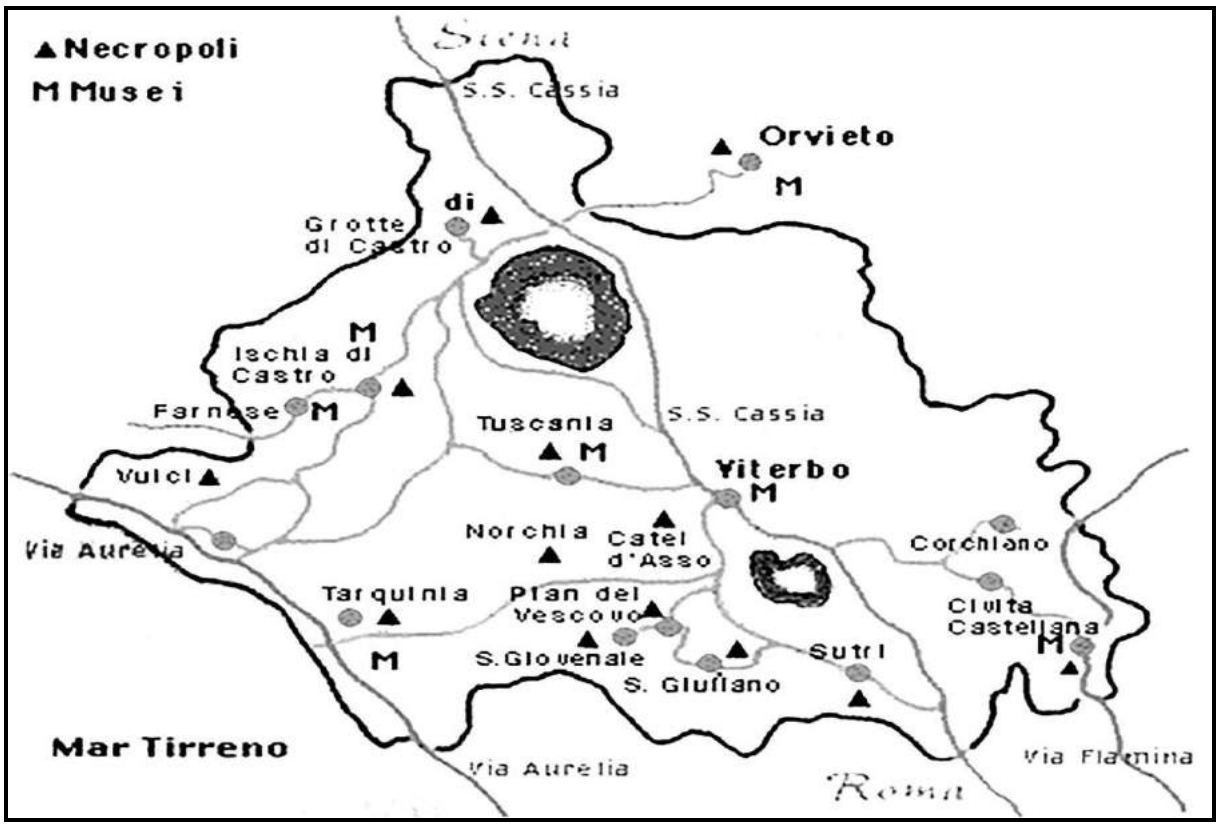

Fig. 2: Topographical asset of necropolises and of ancient roads (Image rielaborated)

After Sutri, the *Via Clodia* forks the E from the *Via Cassia*. The *Via Clodia* is located between the *Via Aurelia* and the *Via Cassia*. It is the ancient intermediate road of internal southern Etruria and connects the numerous villages of Caeretan and Tarquinese hinterland.
Continuing toward N, the *Via Clodia* passes through Barbarano Romano, near the extraordinary rock cut tombs of San Giuliano (Fig. 4) within Marturanum Regional Park. The ancient town is situated on a plain and the numerous necropolises are distributed on the six hills around the early settlement. The necropolises of *Chiusa Cima* and *Caiolo*, and the so called *Tomba Costa*, *Tomba Gemini*, *Tomba Rosi, Tomba Cuccumella*, *Tomba dei Carri*, *Tomba del Cervo* and many other date between the seventh century and the fourth century BC. S. Giuliano is characterized from the existence of several ancient secondary roads cut in rock tuff and they are: *Cava delle Cer□uete*, *Cava di Sarignano*, *Cava del Castelluzzo, Cava del Pisciarello* and *Scalinata di Greppo Castello*.
The *Via Clodia* continues in Blera through "*Ponte del Diavolo*" on Biedano river and "*Ponte della Rocca sul Ricanale*"; this last one is a monumental entrance to the archaeological site of *Pian del Vescovo*. Blera as Barbarano has different evidences of possible ancient roads as the so called *via tar□uinese* and *Cava Buia*. Also, Blera has numerous necropolises: *Grotta Porcina, Pian del Vescovo* and *San Giovenale* (Fig. 5)
The archaeological site of *Grotta Porcina* is located near Vetralla; the site has different tombs which date between the sixth century BC and the fourth century BC, but the most important is the so called *Grande Ruota* or *Castelluzzo* of the sixth century BC. The rock-cut tomb has a large interior room, used as a stable in recent times; for this reason, the hypogeal room is called *Grotta Porcina*.
The rock tombs of Blera are very numerous and date from the seventh century BC to the fourth century BC; the largest necropolis is in *Pian del Vescovo* and the tombs are organized on two level. In the upper level there are the oldest and the latest are located along the cliff.

Fig. 3: Sutri. Roman necropolis ((Photo by F. Ceci)

Fig. 4: Barbarano Romano. San Giuliano (Photo by (P. Di Silvio)

Fig. 5: Blera. Tomb so-called “a casetta”. Sixth Century BC. (Photo by P. Di Silvio)

The so called *Tomba della Sfinge* is the most important; it is s a tumulus of sixth century BC and is situated on the plain near *Pian del Vescovo*. Blera has also different necropolis: *Tomba Graziolo*, *Tomba Terrone* and *Tomba Casetta*. The Etruscan site of San Giovenale is located on the ruins of homonym Church and it is to three km from Civitella Cesi, near Blera. The necropolises are allocated around the ancient settlement and they are: *Grotte Tufarina*, *Porzarago*, *Grotticelle*, *Le Poggette*, *Cammerata*, *Montevangone*, *Terzolo* and *Casale Vignale*. The last one is most accessible and it has different types of tombs: hypogeal room, semi square and square rock tombs.
After Blera, the *Via Clodia* passes through the archaeological site of Norchia that it is famous for its rock cut tombs and in particular for two of these (Fig. 6). The two tombs, dated between the fourth century BC and the third century BC, have a facade similar to Doric temple and they are located along the right side of *Fosso Ac□ualta* and *Fosso Pile*. Originally the tombs had six columns to the left and four to the right. Those supported a Doric trabeation with triglyphs and metopes decorated by Gorgons. Other tombs are placed to the north of Fosso Acqualta and to the south of Biedano river. Near this last one, the *Via Clodia*, through the *Cava Buia*, a secondary road cut in the tuff, reaches Castel d'Asso and Tuscania. The necropolis of Castel d'Asso dates between the fourth century BC and the second century BC (Fig. 7). The entrance to the tombs, which are organized on multiple levels, is through an ancient road; this runs along the right side of *Fosso Freddano* and goes down to the valley.
The name of the owners is engraved on the tombs. Those are the families: *Tetnie*, *Urinates Salviae* and *Ceises*. The most important tombs of Castel d'Asso are situated along the ancient way that arrives at the end of the valley: *Tomba Orioli* (Fig. 7), *Tomba di Arnth Ceises* and *Tomba Grande*. Other necropolises are located on plain of *A□ia,* where there is a *pagus*.
Tuscania was an ancient Etruscan village, after a roman town and finally a medieval settlement, is placed on *Colle San Pietro*. The necropolises are numerous and they are placed throughout the territory. The shaped tombs house of the fourth century BC are the most important of ancient Etruscan settlement.

Fig. 6: Rock-cut Tombs of Norchia. (Photo by L. Storri)

Fig. 7: Castel d'Asso. Necropolis (Photo by F. Fiorentini)

Fig. 8: Castel d'Asso. "Tomba Orioli" (Photo by F. Fiorentini)

The *Via Clodia* is a route that crosses a landscape full of history, nature and archaeology through what you could call an “archaeological landscape of death”. The necropolis of *Sutri*, *Blera, Norchia*, *Castel d’Asso* and *Tuscania* are part of this open-air museum system.

3. Conclusions

This is a short summary of the extraordinary beauty of territory of Viterbo, where the necropolises, the related Etruscan and Roman settlements and the nature coexist. The difficult issue of safeguard of archaeological and natural landscape is current and its can be included in a context of absence of environmental protection. The problem is connected with the gradual dissolution of administrative organ regarding the safeguard of cultural heritage by the Soprintendenza Archeologica. This was the last defense, through the excavation and the restrictions, against the savage exploitation of landscape.

The territory of Viterbo suffered serious damage with the main road “*Orte-Civitavecchia*” and actually with the construction of new roads, for example those of “*Valle del Mignone*” (Fig. 9) and in different areas near the Via Cassia, that will have a considered effect on natural environment; indeed the forests are disappearing. Why these sites are not protected

The archaeologist and the citizen are the principal actors of safeguard of our landscape, because we live in it. The landscape is a place of our cultural identity and of our future and it is most important economic resource.

Fig. 9: View of “Valle del Mignone” (Photo by https://illaziodeimisteri.files.wordpressc.com/2012/11/mti-della-tolfa-fiume-mignone-presso-luni-b-ridhdr.jpg)

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The Voice of the Sea: Sagres, an european heritage in search of identity.

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Abstract
With this paper we intend to emphasize the significance of Sagres promontory recently awarded with the European Heritage brand, in the context of our research project on *Al□ezur "between vision" of the place and memor□*. We want to extend our approach to the neighbouring areas of the so called Infant Lands which honours Henry the Navigator who promoted from this beautiful place the Portuguese period of the Discoveries a precursor of globalization in modern era. This communication will reflect not merely on the assertion of the cultural and immaterial heritage richness of a place that over the centuries has nurtured several legends and some speculation, but also about the diverse interventions that over the past decades have transformed it. Sagres is one of the most visited places of the Southern Portuguese territory, attracting visitors from across the world, perhaps most concerned in the contemplation of nature than by the essence of a monumental complex that not always has fulfilled his function.or meaning. We also will focus our attention on the most recent intervention in Sagres: The Voice of the *Sea* a project authored by the portuguese architect Pancho Guedes under the comission of Pedro Ressano Garcia, which promotes reflection on the power of nature in a mixed of architecture and conceptual Art. With this approcah, we intend to alert the international scientific community to the richness of the cultural heritage of a place seeking its identity.

Keywords: Sagres, European heritage, identity, history, myth, voice of the sea

1 Introduction

This paper is part of the it is part of the dissemination and promotion of the on-going research project *Al□ezur: "between vision "of place and memory" - safeguarding the material and immaterial heritage of an □un□protected municipalit□* which is intended to extend to the neighbouring counties the so called Infant lands the places traversed by Henry the Navigator in the fifteenth century. We intend to question about the identity and safeguarding of the cultural heritage, one of the most mythical places of the Atlantic Coast of Western Europe: Sagres, one of the places / monument most visited in Portugal and that for centuries is looking for the affirmation of its identity not without controversy, especially regarding to the architectural interventions that have been made there over the last centuries. This reflection is of particular relevance in the present context in which Sagres since December 2015 has assumed the European Heritage Label [1]

This reflection is of particular relevance in the present context in which Sagres since December 2015 has assumed the European Heritage Label[1], which underlines its key role in the History and European culture. This label "intended for sites that not only have made a contribution to European history and cultures and/ or the buildings of the Union, but also promote and highlight its European dimension and demonstrate their operational capacity to carry out these activities (…)

.These are special places that symbolise ideals, values, history and European integration. Thus is very important to promote this reflection about not its symbolic value, but mainly about its preservation as a place of memories and myths"[2] The territory of the Promontory of Sagres located in the southern Portuguese municipality of Vila do Bispo, expresses a remote, continuous and intense magical – religious vocation since the beginning of its human occupation until nowadays. However it needs urgently a new quest for its identity, for its interpretation, between menhirs, the cult of St Vincent and mainly Henry the Navigator and its legacy for Portugal and for the all Europe. An everlasting milestone for science, culture and commerce for both the Atlantic and the Mediterranean Sea and a contribution to shape the modern world

Fig. 1: St Vincent Cape view from Sagres Promontorium
Author: Maria Jo□o Pereira Neto, December 2015

2 Sagres between myth and reality

Myth and memory is history in ceaseless transformation and reconstruction". Bo Sträth□□□

Sagres is the official designation of a place located in Vila do Bispo in the extreme of the south western Portuguese coast, a territory that includes the St. Vincent and Sagres Capes. Sagres as site constitutes a very rich cultural landscape that contains traces of the origins and development of European civilization daring back to the megalithic period. It was known in Roman times as the *Sacrum Promontorium*, the place where the known world finishes, behind which lived the evil gods of the abyss and the hellish world of darkness and sea monsters. So, we can find within this place memories of ancient sanctuaries dedicated to Baal / Saturn, or to Melkart/ Hercules, as well as to rites, cults and pilgrimages to this divinities as said 7referenced by authors like Strabo and Plinius in I century a. c and also Avienus IV century A. C. This sacred status continued throughout the Middle Ages. The southwester extreme of the Iberia peninsula was also since the IV century A. C, a place of pilgrimage and devotion to several Iberian Christians that went there to visit and worship St Vincent's tomb whose body in 1173 were translated to the city of Lisbon under the 1st Portuguese king orders. In late 13th century (1279) the space where the body was laid was transformed in a Coenobium known as the Crow Convent and all the cape area where the religious community was located grew and the entire area has also grown to be a key place for the strategic defence of the southern territory of the Portuguese Atlantic coast.

As we saw above the site comprises a series of very significant archaeological remains, structures and several monuments from different periods that justifies its strategic relevance over the millennia, notably at the time of Henry the Navigator (1394 – 1460) that *settled there (m□th□)* the headquarters for his projects of maritime expansion. Sagres and its surroundings became a privileged stage and scenery for the Portuguese quest of discoveries of the 15th century, also a key moment in the History of Europe.

2.1 - Sagres and Henry the Navigator - a lasting myth of Portuguese and European History

M□th is neither a lie nor a confession: it is an infle□ion. Barthes □□□

The memory of Henry the Navigator in Sagres is the most appropriate by the Portuguese and European modern historiography and by doing so people all over this last six centuries tried to maintain and emphasize these memories to the detriment of an ancient cultural heritage whose memories draw back to the beginning of times.

The hypothesis/ idea, of a school / academy tutored by Prince Henry devoted to studies of astronomy, geography and nautical studies that supposedly housed the great European scholars and where they would have prepared and scientifically validated the Portuguese sea voyages of exploration, was a phenomenon that has lasted in the imagination of many generations, and that despite having been demystified by recent historiography, remains in the collective national imaginary. According to Baudrillard [6] *"*The simulacrum is never that which conceals the truth--it is the truth which conceals that there is none. The simulacrum is true*".* The scepticism of contemporary Portuguese historiography [7] regarding the mythical school of Sagres is primarily based on two factors: first: the absence of documental sources, and secondly the historical context : the first half of the fifteenth century, after the first Portuguese overseas voyages.

But also, we cannot overlook, the devastating effects and consequences of the massive 1755 earthquake in the lack of information / documentation. However, we know nevertheless of some references to an Infant village, although with inaccurate location.

According recent bibliography, such as the above mentioned, Zurara (1410- 1474) the royal historian from the 15 th century, only mentions a fortress and some houses nearby. Nevertheless there is a reference to the intention of the Infant to create in the region a warehouse of support to navigation and commerce similarly to Cadiz. The same historian states that the Infant in one of his testament letters only states that the purpose of the Infant Village was to provide sustained "consolation supplies and other things" to the vessels passed by.

It´s also to consider that this *school* would have little productive purpose for the preparation of maritime travels. Thus, the bookish / theoretical knowledge based on the writings from antiquity would not solve the challenges of real and concrete navigation in the Atlantic, already experienced by Portuguese navigators. We know for sure, that Henry, the Infant, toured and inhabited these territories, especially from 1437. Lagos was rather the main headquarters of this entire maritime gestated place which gathered craftsmen, cosmographers.

Pilots, carpenters and many others that have allowed the navigations of the caravels start to sail the high seas using the guidance of stars through the adaptation of instruments like the quadrant. Sagres and the uninhabited area of Cape Saint Vincent was officially outraged to the Infant in 1443, the year of the Papal Bull *Etsi Suscepti* which trusted the spiritual of newly discovered lands to the Order of Christ. Since the 1450s Henry the Navigator spent increasing amount of time in the Algarve, particularly in the domestic spaces close to Sagres, donated for life, by the king his brother and continued to drive from those stops the ocean exploration and promoting the settlement of territories such as the Azores.

There are historical references to an encounter between Henry the Navigator and the Venetian Cadamosto in Sagres, summer of 1454 (as professor Borges Coelho wrote) from which he will leave to his first discovery and trade voyage, which reinforce the idea and substantiates and enhance Sagres as a place of some importance in the Discovery age of 15 th century. Sagres will be also present in the toponymy of some discoveries, such as cape of Sagres in Guinea [8]. The Infant´s name will be forever associated to this lands and surroundings which include Aljezur and Lagos city where he will die in 1460.

2.3 – 16th to 20th centuries: a history of neglect and degradation

After Henry the Navigator´s death and according to Zurara, the royal historian, the infant village never flourished, yielding its place to Lagos. It is worth recalling a certain wholesomeness of the place, too buffeted by the strong winds of the Atlantic and also some lack of interest by peasant populations that have always seen arriving the dangers from the sea and always remained with their backs turned to the ocean. □et we know for sure, that at the beginning of the 16th century the bishop of Silves:

Fernando Coutinho, built the first houses in the place that served to guarantee the defence of the cable, donated to the monks. In 1519 the king Manuel I officially create the municipality of Sagres [9] from Santa Maria da Aldeia do Bispo, upheld by Bishop D. Fernando Coutinho. Later, in the realm of Jo□o III, a fortress was raised in this cable, whose work was finished in the reign of the King Sebasti□o and was destroyed by the English Corsair Francis Drake in 1587 that ravaged the south coast of the Iberian Peninsula and attacked Sagres fortifications provoking immense damage.

Some of the older drawings of the fortress were made by a man in Drake´s armada and in them we distinguish one cistern, the dwellings of military quartering, the governor's residence surmounted by a bell ringer niche. On the right an alleged dwelling of the Infant continued for the walls of the Holy Mary church. Outside the walls we can see Saint Catherine´s Chapel and we also notice the Balieira and Beliche fortresses, the Castle, the convent and the lighthouse of St. Vincent Cape. Part of the still existing structure results from the amendment carried out in in 1606 by order of Philip III (II of Portugal).
The various interventions that we are aware up to the twentieth century merely took into account utilitarian and functional aspects of the site and it was only in the seventeenth century that was regarded its recovery as a priority following the severe assaults committed by pirates and corsairs . During the turbulent sixty years of Spanish occupation was emphasized the strategic role of this place and the constant insecurities of coastal communities.

Almost doomed to abandonment, without support and military equipment, the military defence of these places was almost impossible. Therefore were carried out a few improvement works on the cistern and also on the fortress walls from 1638 to 1642

. It is merely in the eighteenth century, June 1764, by the order of the Marquis de Pombal that is assumed the willingness express of providing the site of a new defensive system. However everything falls apart with the devastating earthquake of 1755. After years of neglect the ramparts are modified according to the Vauban system in 1793, which is proved with the inclusion of a coat of arms above the door. However, the history of abandonment repeats and the early nineteenth century evidenced the marks of a sharp deterioration of the all site.

The first half of the 19th century in Portugal was troubled not merely by the Napoleonic invasions, but also by a civil war that remained active with anti-guerrilla very active in the South. Therefore it will not be strange the progressive abandonment and little care with this and other similar places that will degrade a lot mainly in the South.

In 1834 with the extinction of religious orders the remains of the convent and of the church in St Vincent Cape were completely gone, and by order of the queen Mary the II, in 1846 in the reign of Queen Maria II inaugurates a major lighthouse. In 1904 the remains of the church and of the convent were adapted to new quarters of the Navy and merely the fortress has remained although damaged.

2.4 – Salazar and the restoration project and patrimonial recovery

With Salazar´s rise to power in the early the 1930s and, under the aegis of a nationalist ideology which was based on the motto: God, Country and Family, the propagandistic machine of the New State in Portugal appropriated the figure of Henry the Navigator, as a legitimating figure of the heroic achievements of Portugal. They are therefore somewhat confused, and not fitting in this text, the various public tenders (1935, 1937,1956) for the restoration and recovery of Sagres heritage including the fortresses, with debugger character, as Neto (2010[9]said without neglecting the symbolic and asset value of the landscape and its mysticism, promoting, but not daring to build a panegyric monument. The accessory has been destroyed, but its essence remained, the fortress and the architectural ensembles of its interior closely following the drawings left behind by the time of Francis Drake invasion.

The house of the Governor was adapted to a □outh Hostel, and the central building adapted storehouse, tourism centre, the lighthouse keepers picket ... and above all there was a major restoration of the walls and the overall consolidation and widening works of the main entrance of the fortress.

The 17th century walls were completed with complemented resorting to the consolidation of the foundation. This restoration also includes restoration works both inside and outside the Church and the recovery and adaptation of the vaulted building - south of inner wall (an ancient military warehouse

for the construction of an auditorium and also the procedure for cobbled street layout around the promontory).

Between demolition and the consolidation of ruins and minor buildings, it was also important the cleaning of a major Compass Card a "strange" and controversial radiated geometric figure, drawn with rough stones, which was discovered casually in the early 1920s with 51 meters in diameter and radius of 32.

It´s origin remains a mystery, but it´s supposed to be of the fifteenth century (Infant contemporary). However, this is another not sure that feeds the myth of the place over the centuries. According to several sources consulted including legislation, we believe that the various plans of restoration and heritage revaluation, as well as the delayed restoration of Sagres was timed to coincide with the commemoration of the 4th centenary the Infant´s death in 1960 may only be explained by the fact that the political regime intend somewhat much more complex and not feasible for the Sacrum Promontorium.

Indeed, the various plans and public competitions are contradictory and almost utopians, assuming a certain insistence / resistance to a monument to infant the figure of though not intending to substantially alter the mystic vision of a place. However this does not mean that there had not been a non-appropriation by the regime of a But this does not mean that there had not been a non-appropriation by the regime of a nationalist apology and somehow a reinvention of a place that has always remained imbued by mysticism and mystery. Sagres was assumed to be a place where it is promoted a cult of Henry the Navigator and also of his mythical school that was never more than that: a myth.

It is also appropriate not overlook the fact that the most southern region of Portugal, the Algarve, remained marginal to the rest of the country until the mid-60s of the twentieth century, when it began to be a tourist destination of some relevance until the boom of the 80s with mass tourism and concrete excesses.

2.5 Sagres in the late 20th century.

With the consolidation of democracy after the Portuguese Revolution of 1974 and the country's integration into the European Union in 1986 Portugal enters into a public works and constructive euphoria cycle. The Algarve region, with its mild climate and its beautiful and peaceful beaches, it´s going to be transformed mischaracterized and severely ravaged by the excesses of a mass tourism based on the premises Sun, Golf and Beach.

It will be therefore in this context that in the late 1980s came again the possibility of rise up in Sagres a new monument to the discoveries, and was opened by the Portuguese State a public competition for the redevelopment of the surrounding area as well as tourist facilities that dignify the image of Sagres and once again reminded the Portuguese discoveries, in a new ideological, social, economic and European and international political context. Thus, in 1988 it launched a public tender procedure for the restoration of Sagres´s fortress with the support of EU funds and a clear objective of tourist adaptation. The winner project was from an Oporto architect,Jo□o Carreira. The architectural intervention to improve the Fortress included the construction of a module for temporary exhibitions and a multimedia centre reusing the existing row of houses, some shops to promote cultural goods, and a cafeteria, thus making it possible to introduce order and maintain the whole historic ensemble. The services in the Sagres Fortress also work as a technical support group to the official institute that promoted archaeological interventions in the Algarve, the IPPAR.

However, this project was only completed in 1997 after several vicissitudes and under the harshest criticism and polemics that extravagated to civil society for several years. For many the intervention was overly intrusive and full of allegorical and redundant explanations highlighted on a short description. This immense controversy gave rise to a pioneering written opinion made in 1994 by the scientific commission from the Art History Department of the New University of Lisbo n[10] appealing to the cancellation of the project. In addition to a controversial intervention[11] in the fortress walls that were covered with cement and also the inclusion of commercial equipment and a multimedia centre, the project comprised a wind tunnel to be constructed on the promontory on the plateau towards the South.

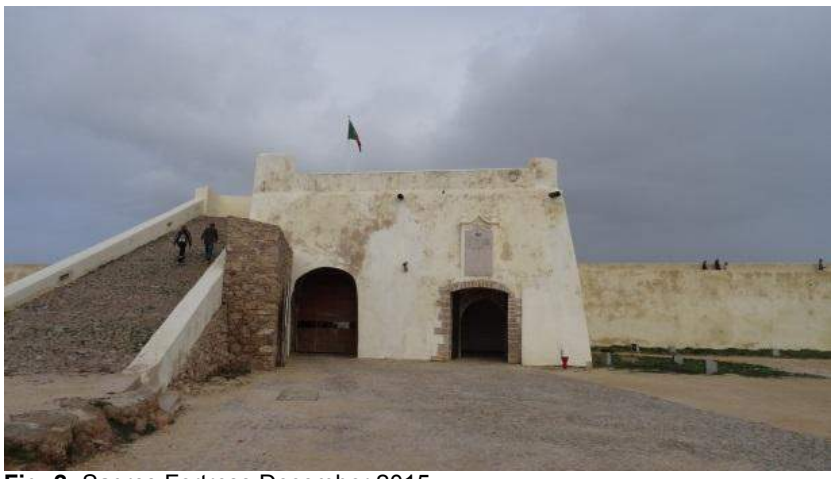

Fig. 2: Sagres Fortress December 2015
Author: Maria Jo□o Pereira Neto

Fig. 3: Sagres details
Author: Maria Jo□o Pereira Neto

This tunnel that it would be made up of two concrete walls several meters high would have its interior decorated with allusive relieves to poetic and mysterious themes elaborated by several fine artists, who allegedly also would not have agreed to participate, increasing and even more stoking a controversy of a project which was never done. This debate pioneer in Portuguese contemporaneity, was however necessary for the promotion of interdisciplinary collaboration within the approach on Heritage and its safeguarding, between the exercise of architecture, fundamental to the recovery and restoration of historic buildings, and also on the relevance of Art History and its methodologies for the defence and preservation of authenticity.

Polemics a part we believe nevertheless that this intervention was not the most appropriate, and nearly two decades after that polemic and controversial intervention, consolidated what is a supposed touristic project which emphasizes the visits to Sagres as a beach/surf interval for several hundred thousands of visitors, it remains a profound emptiness and once more a new competition that raises new doubts concerning the identity of the place.

The walls cement plastered remains there, in very poor condition, whitewashed of a controversial white, presumably to match presently the lack of colour that was understood to be the Algarve and the tourist resorts. The "new" infrastructures are deteriorated and closed. The construction site is a constant and supportive infrastructure such as toilets and even a tourist office are temporary

Fig. 4: Sagres 1990s intervention. December 2015.
Author: Maria Jo□o Pereira Neto

In 2009 the regional Cultural authorities started a new program of requalification and enhancement of the Sagres promontory. The main goal [[14]] of the work would be therefore "the rehabilitation of the coatings of the walls panels, the conservation of the portal façade and sundial, the rehabilitation of the outer and inner coverings of the Church of Our Lady of Grace, the preservation of the guns, the replacement of support cars of the guns, the rehabilitation of the pavement in the battery areas and the scenic enlightenment of the monument. The intervention contemplates equally the installation of a power generation system through photovoltaic panels, which will substantially improve the energy performance of the Fortress.

Once again it turns out and assumes the active participation of Tourism of Portugal in this requalification project blistering the role of tourism for the maintenance / preservation of a unique cultural and natural heritage. Framed with patrimonial, environmental and economic values, the Promontory of Sagres will be transformed once more in a political manner, in a visiting tourist pole of reference that in accordance with the promoters shall contribute significantly towards the enrichment of the cultural offer in the region Algarve.

3 – The Voice of the Sea – Sagres: present and future

It will be therefore in this context, and as well at the core of a polemic Programme / tourism promotional campaign Algarve - "Allgarve", created in 2007, which in 2010 emerged the order from an artistic and architectural intervention, temporary, to the great architect of Portuguese modernism Pancho Guedes (1925 - 2015) curated by the architect Pedro Ressano Garcia (1967).

Fig. 5: The voice of the Sea, Sagres 2015.
Author: Maria Jo□o Pereira Neto

Fig. 6: The voice of the Sea, Sagres 2015.
Author. Maria Jo□o Pereira Neto

This acoustic design in a very good hour named The Voice of the Sea intended to make known a place where the sea is literally felt beneath the feet through the rhythmical presence of the sounds produced by tidal forces and walls climbing up tall developing a route that takes us to the discovery of the local core. This project was commissioned with the regional authorities of Culture and, was supposed to be temporary – only from July the 3rd until November 30th 2010.

However, coinciding with the candidacy for European heritage and as an attempt to whittle new paths for cultural and nature tourism, we can still hear and feel the sea voice beneath the feet, right now with a structure with less ephemeral character (10 years plus□) and that has been publicized in the major national media. The sound of the raging sea coming off of the earth entrails passes in a whirl through a grotto with more than one hundred and fifty meters to impress the most unsuspecting visitors, impacting by the its ability to thrill us and give us back memories of a place and a sea which is more than the various political regimes have attempted to impose over the centuries.

This structure a sonorous chamber, active by tides, an implanted ear pinna of labyrinthian shape where one can feel the vibration of the sea, summons the assumption of the sacredness of this place. Being indeed a landmark: "a successful one that transcends an image of feeling" accordingly to Tuan[1□□

They built a labyrinth to be walked through in between silent walls until hearing the powerful voice that comes from the sea". The shape of the lariat evokes symbolical aspects in a place which, from antiquity, has been view as the end of the world (…) The Sagres labyrinth is also said by Pedro Iamas its co-author, as a memory of Pancho Guede's childhood. Charmed by the mystery of sinuous drawings.

*"*The memory he once drew as a child comes close to an instinctive knowledge which he pursues, resumes and reinterprets. The layout sets out from his personal concerns and it launches into a more comprehensive reflection on the relevance of Sagres. It speaks with the stones in order to listen to what has been important for generations of Portuguese. It demonstrates that in order to design the intervention he has based himself on his memory, which is rare for being absolutely encyclopaedic, and integrates the symbolic charge of the mystical School of Sagres. By blending both national myth and his own personal life experience life experience, he does not favour an approach of longing to the past. He seeks above all to pay homage to the place, to value its experience and simultaneously project a window into the futures According to Garcia[13], "the labyrinth layout contemplates Sagres where the land comes to an end and the sea extended itself. It is the corner of Portugal the salient angle formed by two surfaces"

As Tuan said: "if a piece of sculpture is an image of feeling then a successful building is an entire functional realm made visible and tangible (…) Art and architecture seek visibility. They attempts to give sensible form to the moods, feelings and rhythms of functional life. Most places are not such deliberate creations. They are built to satisfy practical needs *(…)* □*1*□□

So, we questioned about the real practical needs of a place like Sagres that remains magical over the times. What could or should be changed by a label□ What is the real meaning of this label□ What remains of it's truly *spiritus loci*□

The wealth of Sagres is supported by its immense tangible and intangible heritage, a true testimonial of Portuguese culture and history but also of Europe. However, we fear that all this is no more than another mystification and that the place could be mischaracterized and, once more, degraded.

In this place still coexists the strong presence of Henry the Navigator and his domain of an endless horizon, but also the modern spectacle of tourism and its paraphernalia. Looking at Sagres and around all the Infant lands domains we should question about the role of natural and cultural heritage and its preservation in the second decade of the 20th century. How can the authorities integrate restoration, heritage safeguarding and also tourism□ What is the real meaning of labels such as the European Heritage□ A new strategically approach to more tourism disguised of cultural approaches□□□□

Where should we put this wonderful piece the Voice of the Sea: a mixed of architecture, contemporary art and poetry□ Should it be provisory□ Why□

As we saw Sagres was throughout history several times reinvented, but also neglected, abandoned, devastated by nature and men. However still seeks its identity strongly marked by its location: the mystic Promontorium sacrum, the endless sea, a sacred place since ancient times. A place of contemplation and quest. This wonderful piece (Voice of the Sea) that is also quite neglected and vandalized, appeals to our senses, to the complexity of this wonderful place, to respect and feelings of freedom and also to respect nature and its powers. It has a narrative and also a strong symbolic meaning [14] that should be enhanced in Sagres, assuming its potentiality to go further beyond its culture., so, it must be preserved and protected.

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Claudio and Marcio-Felice aqueducts: archaeological traces and continue signs in the residual spaces of the contemporary city

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Abstract
The development of cities and the transformation of the aggregate settlement have gained a series of reflections on the relationship between the urban dimension and the environmental nature of open spaces present in them. The growth of the city in a less and less compact way has produced a series of spaces whose role, at times, is not well identified and consciously recognized. Often these are places that in the past had a strong and clear identity value, but that at present appear to be marginal or residual spaces.
In this regard, this time we want to refer to questions of the aqueducts Claudio and Marcio-Felice in Rome and to the system of the spaces connected to them, around which the city contemporary built has spread relentlessly modifing and consuming them, and resulting portions, fragments, interstices.
The value of these works, in the sense of cultural heritage, can be understood only if it is read by taking into account the different levels of meaning. In fact, the aqueduct is understood here as archaeological evidence, the result of rational engineering times, as historical memory, in order to strengthen the sense of identity, and as linear water infrastructure, highly dependent orography of soils. In addition, it is perceived as artificial water line, whose monumental strength is at times overwhelming and at times latent, and as continuous sign from which to start, together with the spaces that it holds together, for the foreshadowing of a possible future city.

Keywords: anthropic sign, archeology, structure of the city, aqueducts

1. Background and description of the scope of the study
The expansion of the city of Rome, which took place in a radial pattern along the consular roads, resulted in an urban structure in which large bands of open space weave in a more or less evident way within the building fabric characterized by the soil, vegetation and archaeological elements. The great wedge of the Appia Antica Park easily comes to mind, and yet one cannot help but take into account the neighboring area on which the Claudio and Marcio-Felice aqueducts stand.
They wind through the area between the Via Appia Nuova, Via Tuscolana and Via Casilina arterial roads, and the Capannelle area and into the Aurelian walls. They intercept the districts of the fortified city such as Appio-Tuscolano, but also more fragile districts like Tor Fiscale and Quadraro Vecchio. The building fabric approaches them while leaving buffer bands, which are sometimes quite wide and sometimes narrow. When read as a whole together with the water infrastructure, they appear as a linear system crossing within the contemporary city.
From the morphological point of view, they stand on the volcanic plateau which stretches from the Alban Hills to the Tiber delimited by the Almone trench on the west and by the Acquabulicante trench on the east. Outlined along the plateau, they meet other archaeological infrastructural and punctiform discoveries, including Via Latina, a stretch of paved service road to the same aqueducts, the suburban villas of Vignacce, Sette Bassi and Tor Fiscale, witnessing the richness and complexity of the natural elements, the articulation of the anthropic elements and the heterogeneity of the recent transformation procedures used in the contemporary urban context.

Fig. 1: Current urban location in Rome, in which are included the Marcio-Felice and Claudio aqueducts in the residual spaces open within the urbanized territory between Via Appia Antica, Via Latina and Via Casilina.

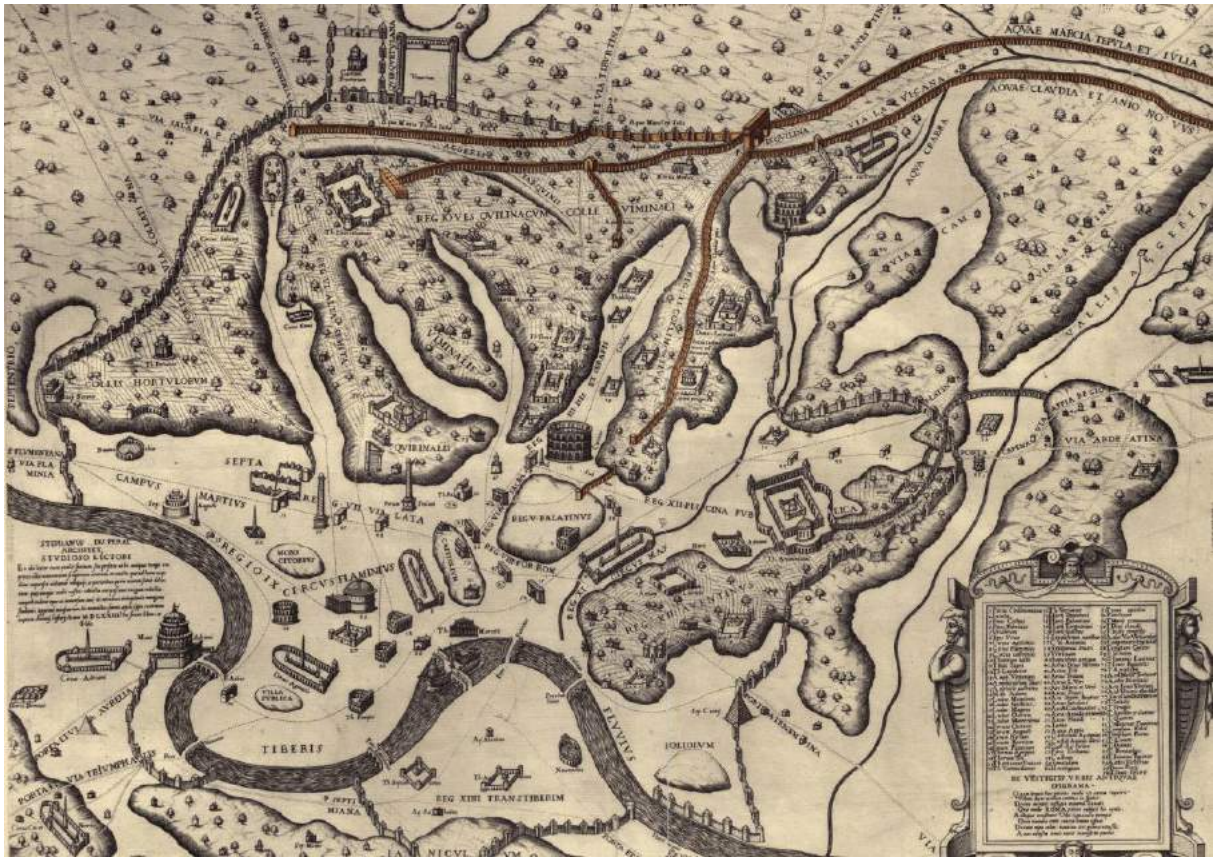

Fig. 2: Stefano Du Perac. Map of ancient Rome. 1573. The ancient Claudio and Marcio aqueducts are highlighted near the *urbs*: parallel ridge lines on the main plateau, converging on Porta Maggiore, dividing into secondary arches along the top of the plateau up to the Palatine, the Quirinal and the Viminal hills.

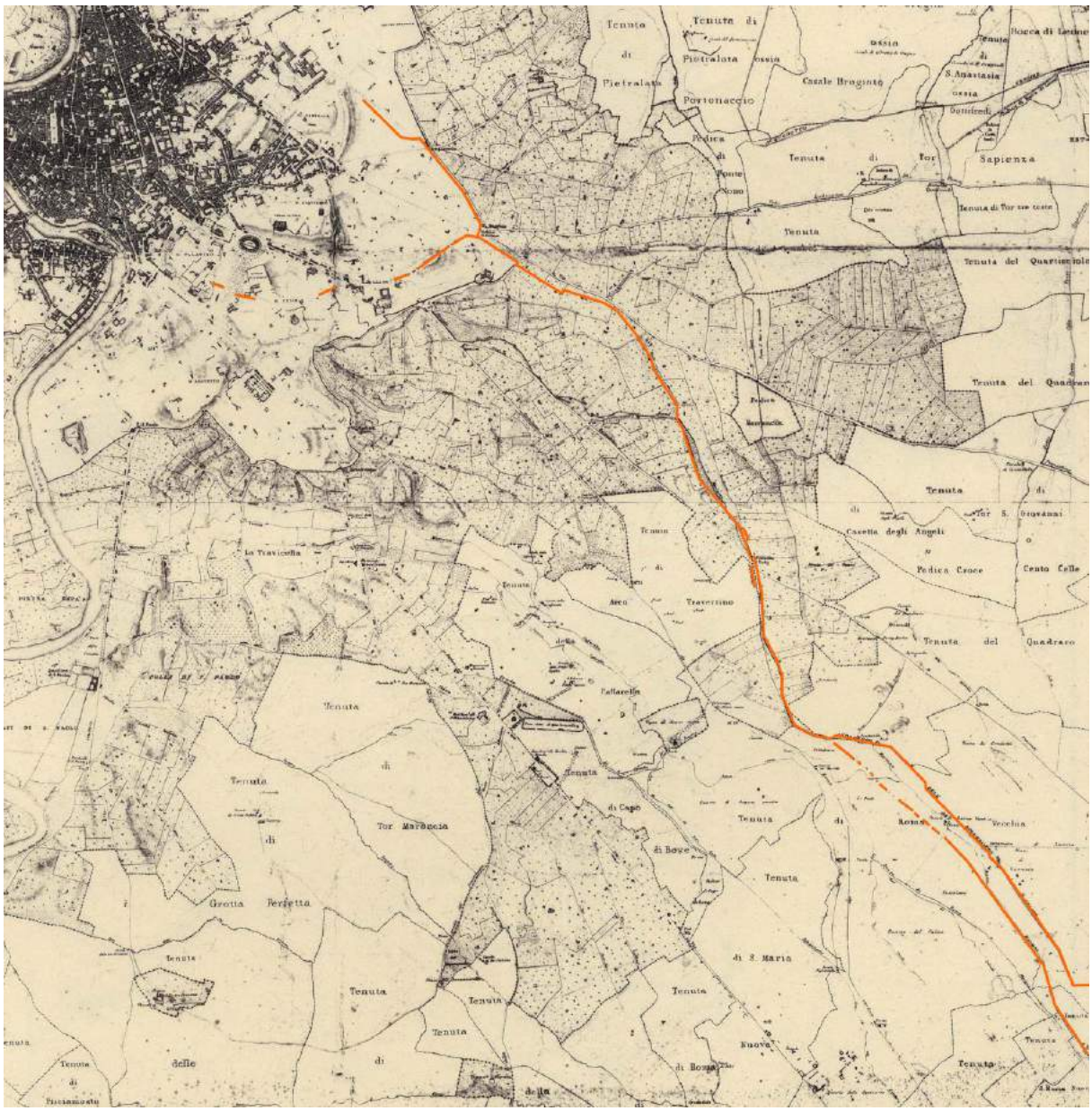

Fig. 3: Congregation of the Census. Map of Rome and suburbium in Via Appia, Via Prenestina and Via Tiburtina areas. 1839. It highlights the ancient Claudio and Marcio aqueducts in the Roman countryside: they arrive in the Capannelle area by the various reservoirs and then wind along the plateau.

2. Knowledge of water infrastructure lines through historical maps

The use of historical maps for the purpose of research, analysis and knowledge of the anthropic factors was necessary to understand the water infrastructure lines as a whole: that is, as passage through the territory, as a link with the morphological structures, as the mutual relationship between the various aqueducts, as the connection to other systems put in place by humans, and as related to the land use. Moreover, the cartographic representations of the different historical periods have clarified modern parts of the city where significant portions of arcades are no longer present or are no longer recognizable. Examples of cartography from the second half of the sixteenth century, such as Du Perac and Cartaro, show the *urbs* within the Aurelian walls, from the Tiber to the higher altitudes of the volcanic plateaus, and part of the *suburbium*, namely the agricultural land around the walls intended for vineyards, orchards and productive activities. These depictions show the operation of the aqueducts as roughly parallel linear infrastructures on the main plateau and, in particular, the Marcio aqueduct, which in the present state entails the greatest difficulties of recognition, since there remain only a few arcades in the Park of Aqueducts on Via del Mandrione and in the area of the Bank of Italy. It includes the junction at Porta Maggiore near which was found the *castellum* (i.e. the structure that ended with the public fountain) and the ducts in the side arches that branched out through the different areas of the city up to the Palatine, the Quirinal and the Viminal. A fundamental piece of data provided by these images is related to the connection with the hydromorphological and orographical trend of the

territorial structures, namely the volcanic plateaus and valleys etched by trenches. In this regard, one can understand the close connection of the aqueducts with the plateaus. This is justified for several reasons: the use of the highest altitudes that make it easier to reach the urbs, the use of the volcanic soil that is more stable, the ability to shelter the natural waters from flooding because of a higher position with respect to the valleys and the possibility of locating construction material.
Although cartography has been an invaluable tool for analysis and knowledge, aimed at recovering those anthropic structures and now extremely rare archaeological traces, it should be specified that the means of representation in use over the centuries have had significant repercussions on the survey made. In fact, it was only in the eighteenth century that the maps of Rome concerned the city and included in any meaningful way also the territory beyond the walls and thus provided the opportunity to study the infrastructure in the *suburbium*, in the countryside and, therefore, in the area of the study. To the dimensional factor and scale not limited to the vicinity of the walls but rather including the whole plateau and the *suburbium*, one may add the geometric and zenithal means of representation, which includes objectively the territorial location with respect to the three-dimensional views made empirically in the previous centuries.
In this regard, the map of Rome made by the Congregation of the Census of 1839 is significant. It shows the arrival of the Claudio and Marcio-Felice aqueducts in the Capannelle and Roma Vecchia areas, their twisting and turning along the plateau up to the Aurelian walls, the connection of a section of the Marcio with the same walls, the branch of the Felice up to the thermal baths of Diocletian and the Neronian arches up to the Palatine. The map highlights their relationship with the natural trenches (Almone and Acquabulicante), which delimit the plateau on which they rest and the relationship with the artificial trench of Acqua Mariana, which passes close to the aqueducts and beyond Porta Furba to then use the natural depression that leads it to Porta San Giovanni, Porta Metronia and the Tiber River. The territory appears as a *continuum* characterized by the intense and continuous relationship between the built city, the green interior of the walls, the band of vines, orchards and productive activities surrounding the walls and the large estates of arable land, in which the crossing of the aqueducts and consular roads is an integral part of the landscape. The presence of the city, or rather an anthropized territory, was noticeable even from a distance along the ancient consular roads due to the existence of the millstones, the houses, the suburban villas, the road network, the aqueducts and cisterns responding to certain distributive, functional, agricultural, productive and economic requirements. Therefore, it was an area inhabited and used with an identity value aimed at the best quality of uses, that is a far cry from the image of the “deserted urbs” caused by the subsequent centuries of neglect and disrepair.

3. The aqueducts: signs of history and function

Undoubtedly the birth, development and greatness of Rome had a connection with the territory on which it was founded, and in particular, with the natural waters which it was rich in. Since its foundation the Romans used the water of the Tiber and rainwater. Prior to the construction of the aqueducts, the collection occurred through cisterns (basins dug in the ground for storing rainwater), culvert cisterns (reservoirs dug into the ground to intercept an aquifer ground for collection and storage) and wells (basins dug in the ground for extraction). Starting from the fourth century BC, the Romans needed to increase their water supply due to the increase of the population. For this reason, in 312 BC they constructed the first aqueduct, namely Aqua Appia that started at Via Prenestina and was entirely underground. This new construction, a real engineering feat, stood out from other systems because it allowed water to be extracted also at a considerable distance from the city and accumulated in tanks. The sources were in the Aniene basin, in the Alban Hills area and the Sabatino basin. The conduit, called a *specus*, could cross the territory underground, elevated on the suitable substructures composed of arcades or on the soil surface. It conveyed the waters to *piscine limarie* for settling the impurities and to the *castellum*, i.e. the public fountain. Eleven aqueducts were built to bring water to the urbs and among them we find the Marcio (144 BCE) and the Claudio (52 CE). Given that sometimes the path of the aqueducts coincided, they could share the substructures which supported more conduits one on top of the other, as was the case of the Marcio-Tepulo-Julio aqueduct and the Claudio-Anio Novus aqueduct. According to Frontino, their aim was *utilitas,* i.e. allowing everyone to enjoy an essential commodity such as water. With the end of the empire and the beginning of the barbarian invasions the aqueducts suffered damage and the water supply to Rome was broken off. In 1585, Pope Sixtus V promoted the construction of the Felice aqueduct which had its source near Pantano and Colonna. Running from Roma Vecchia to the Fontana del Mos□, it reused the foundations and part of the structures of the ancient Marcio and Claudio aqueducts.

4. The relationship between the aqueducts and the forms of the territory

The Romans, in order to bring water into the city, used a gravity system based on the sliding of the water surface by the force of gravity with a gradient of two per thousandths from the altitudes of the springs to the higher of the urbs. The springs were located approximately 350 meters above sea level,

located in the Aniene Valley, in the Sabatino volcanic district and in the Alban Hills, while the urbs were at 55 meters above sea level at the Esquilino. Such a system could be implemented by taking advantage of the topography of the Roman countryside by using the plateaus positioned in the way. In particular, the aqueducts from the southeast sector departed from the respective basins from which they drew their water. They were constructed most of the time as infrastructural lines of anticlines, passing transversely over the profile of the plateaus. Arriving at the Capannelle area, on the other hand, they benefited from a single plateau by positioning themselves as the infrastructural lines of the ridge, following the direction of the plateau. The aqueducts, supported by it, that is to say the one delimited by the Almone trench to the west and the Acquabulicante trench to the east, converged at the most suitable altitude closest to the urbs i.e. in the place called Spem Veterem. From here other secondary arches branched along the tops of the plateau, that is, the seven hills, reaching different parts of the city. Therefore, it is critical to focus on the main plateau, that is, the one that goes from the Alban hills to the Tiber, which is the watershed between the trenches of the Aniene and those of the lower Tiber and which allowed the installation of the urban center of Rome at its mouths, while in its linear development it allows the installation of the first linear anthropic infrastructure that reflects the logic of the ridge, including the aqueducts. Its eastern portion, not occupied by Via Latina, has accommodated only the aqueducts, which found a precise and appropriate place for their conduits, i.e. on the high altitudes, away from natural waters, on stable ground and with the greatest safety possible.

This plateau has had a remarkable role in the development of anthropic signs that have characterized the evolution of the city of Rome. It was formed by the simultaneous combination of the lava flows from the volcano of the Alban Hills with the erosive action of the river network that is part of the Tiber basin. The accumulation of volcanic materials and the molding of the waters contributed to the genesis of the great geomorphological structures that characterize the area around Rome, i.e. the volcanic plateaus alternating with the valleys cut by the trenches. It shows the close relationship between the geomorphological structure and the aqueducts, between the territory and how it is used by man, and between the physical and historical aspects. The organization of the city, the presence of historical traces and the evolution of human interventions are related to territorial forms and the topographic data. The reading of the physical-naturalistic characteristics, taken as an element of order in the territorial organization, allows one to fully understand the value of anthropic infrastructural lines and the whole landscape as a signifier. The study of the natural components stems from the desire and the need to read the anthropic structures in relation to the hydro-morphological conditions, since every anthropic structure derives from an earlier natural structure.

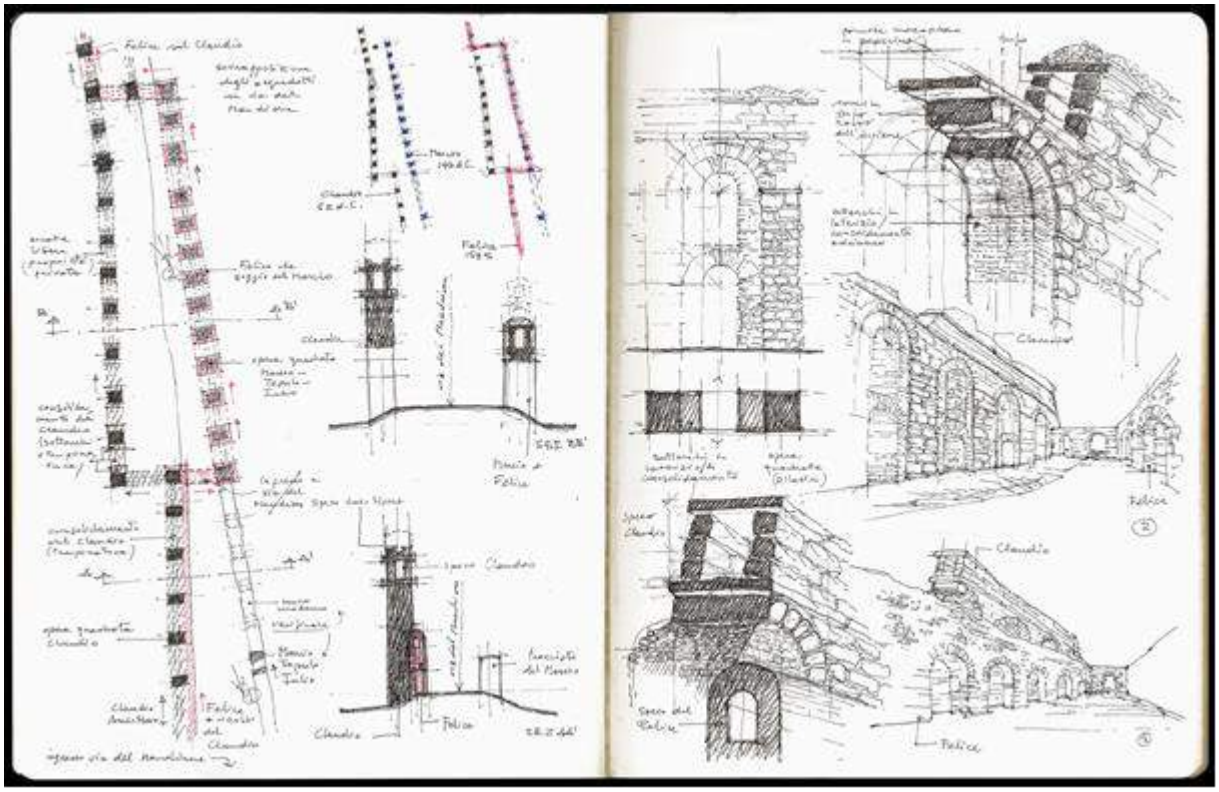

Fig. 4: Design drawings of the superimposition and the passage of the Felice aqueduct (Renaissance) on the Marcio and Claudio aqueducts (Roman), on Via del Mandrione, and diagrams concerning the operation and the altitude of the tunnels on the related arcades.

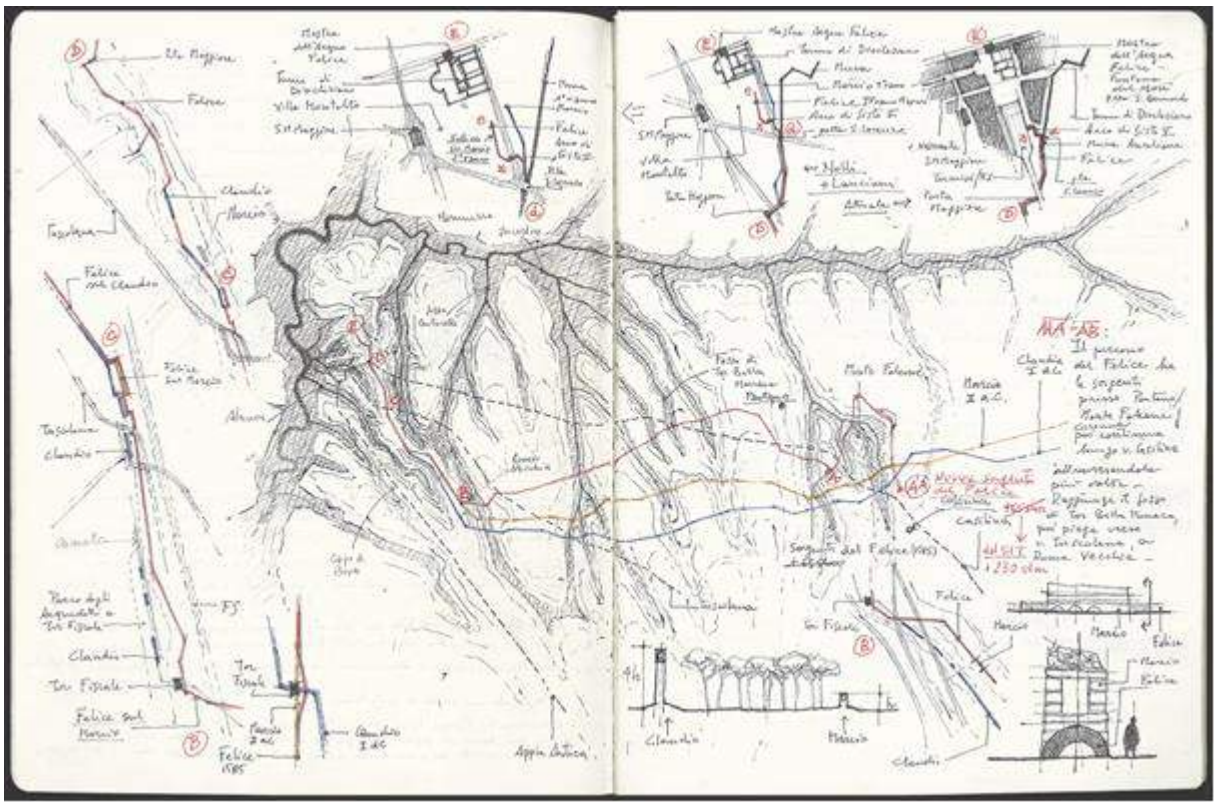

Fig. 5: Design drawings regarding the relationship between signs of water infrastructure and the hydromorphological trend and diagrams on the superimposition of the Felice aqueduct on Roman aqueducts from Tor Fisale to Porta Maggiore.

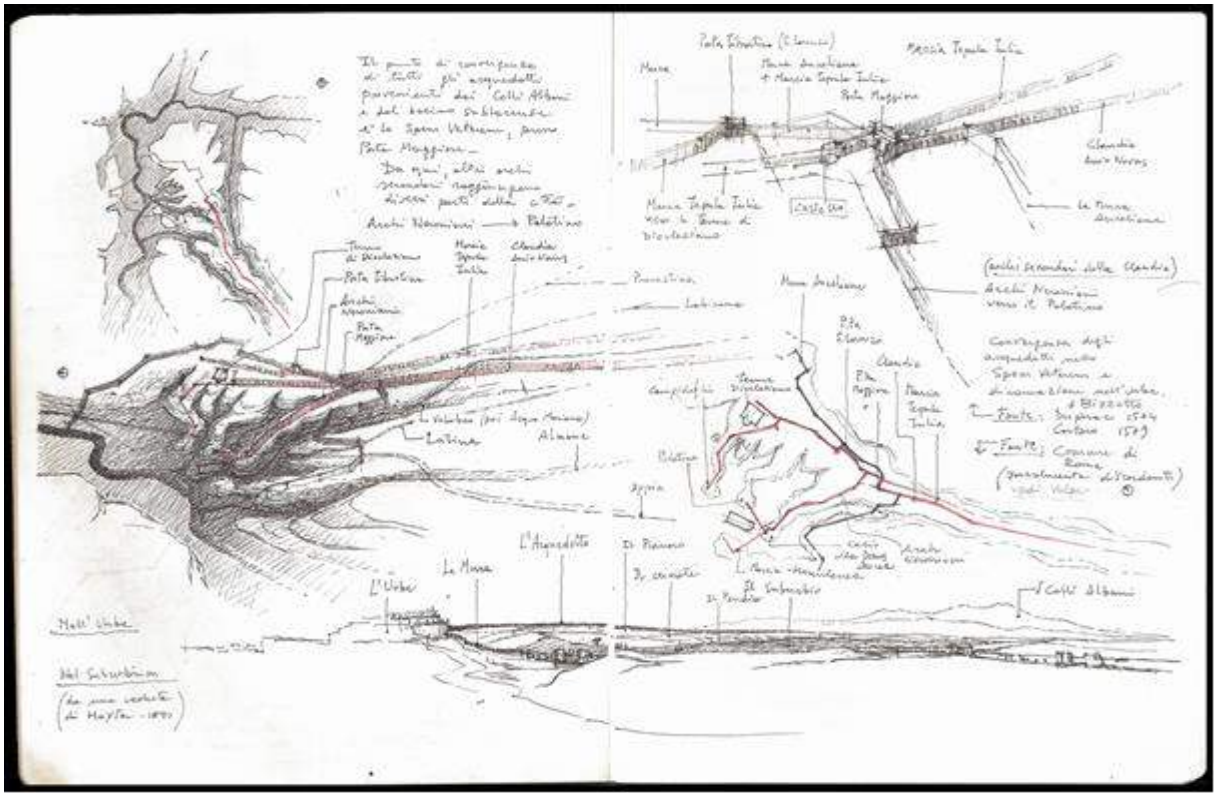

Fig. 6: Design drawings concerning the development of the Claudio and Marcio aqueducts along the main plateau between the Almone and Acquabulicante valleys, their arrival at the *urbs* and their branching out across the hills. The close relationship between the natural and anthropic components and the link between the elements of the infrastructure system can be deduced: the urbs, the walls, the aqueduct, the ridge, the background of the volcano of the Alban Hills.

5. Urban transformations from *suburbium* to the contemporary residual spaces

Until the first half of the twentieth century the aqueduct appeared and was perceived as a solid line passing through the *suburbium*. In fact, all of the images of the time show in a unified way the close relationship between the natural and the anthropic components and the link between the elements of the infrastructural system: the urbs, the walls, the aqueduct, the ridge, the counterpoint of the houses, the backdrop of the Alban Hills volcano. In this setting, the arcades do not significantly fragment the landscape but rather provide transparent elements to the scene. This perception, understood not only as a vision but as a connection of systemically interrelated elements, has changed drastically with the alternation of the urban transformations of Rome of the last century.

The invasive growth of Rome, accompanied by the disruption of the lands, has greatly affected the Roman countryside, now converted into the periphery where often the concatenation of urban centers joins with the first neighboring countries. Nevertheless, the massive presence of archaeological traces, both infrastructural and punctiform, testifies to the value of a land full of history and identity that, contrary to what one might normally think, tells us of a city not enclosed and not delimited by only walls, but rather characterized by a strong and persistent relationship between the city, the suburbs and the countryside.

The *suburbium* was an outer band to the walls, from two to eight kilometers, intended for vineyards, orchards and productive activities, i.e. an agricultural territory necessary to sustain the city. Champlin says that it is impossible to determine the fine line between *urbs* and *suburbium* and defines the latter as a kind of *"state of mind"*, that is *"a subjective and indistinct projection with confused contours".* In fact, the *Suburbium* arose as a place somewhere between the *urbs*, the city within the walls, and the *ager*, the territory of arable land, pasture, and more extensive brush within the foothills of the Sabatini and Albani mountains. This classification, which coincided objectively with a real situation, functional and essential to city life, was associated with the concept of city limits and the symbolic and sacred value that was assigned to them by man. *Urbs, Suburbium and Ager* were not crystallized containers in space and time: it is enough to think that the *urbs* was not only defined by the walls because some *regiones* such as the Trastevere exceeded them and the *suburbium* grew into several parts as evidenced by the historical maps. Pliny in 73 AD described a city with a significant building density within the Servian walls; however, it expanded even outside the walls in new *suburbia*. Just like the region of the *continentia tecta,* namely that with the houses covered by roofs joined together, it expanded beyond the Aurelian walls.

It follows, therefore, that the limits and boundaries of a city are not static, but are variable and dependent on dynamic movements and the growth of the city itself. How did Rome grow in the last century? And which consequences has its development generated in the perception and use of the territory? Maps and regulatory plans tell us much about it. If Rome before the annexation to the Kingdom of Italy appeared as a city immersed in a countryside with orchards, gardens and villas between the urban core and its walls, Rome the capital began to see its first infrastructure

Fig. 7: Ippolito Caffi. Aqueducts in the Roman countryside. 1843. The aqueduct stands out as a unique linear architectural discovery crossing the *suburbium* and as a continuous sign on the territory not yet compromised by development and urban transformations.

interventions which were decisive for the subsequent dramatic changes that occurred. The completion of the Southern Arch, a part of the railway ring, and the railway line to Frascati was the first intervention to break the continuity of the course of the aqueduct and the perception of the area. The 1909 Plan defined the expansion between the walls and the railway ring; however, it was the plan of 1931 that decreed the construction of apartment blocks and the expansion of the city towards the southeast along part of Via Appia Nuova and Via Tuscolana. These interventions irremediably compressed the urban, landscape and territorial configuration as well as its understanding and use beyond the unity of the aqueduct with it.
One cannot separate this great architectural disaster from the place where it was built and its landscape and territorial context. It is not possible to consider said anthropic sign as divorced from the territorial ground on which it was built, therefore one must be aware of this support and how it became a result of the transformations produced by man.
The aqueduct winds through heavily urbanized areas and large open spaces, between consolidated aggregates and residual areas, small built nuclei and interstitial fragments of findings. Sometimes the urban scenery forcefully and clearly appears and sometimes it is hidden from view, even absorbed into buildings erected without permits. Therefore, there is a heterogeneous sequence of urban events, a succession that becomes a broken diagram because it has lost its role of scanning the landscape between agriculture, *suburbium* and the city.
In fact, different areas with different landscape connotations can be recognized. They have real circumscribed *portions*, only marginally affected by urban episodes, i.e. areas where the *suburbium* is still recognizable in its natural and anthropic aspects, which are so obvious that they allow easy identification (discoveries of archaeological and important morphological elements). Remains can be identified, i.e. areas and stretches that have lost much of their original character due to construction; although almost completely enclosed by urban realities, elements and signs may be traced that are evidence of the *suburbium*. Although ascribed as traces that are not immediately obvious and glaring, they are definitely a demonstration of what the *suburbium* has been. The relationships between the elements (full and empty - urbanized and free areas) are present but they are not clearly and fully structured. *Interstices* stand out, fragments resulting from spontaneous building nuclei that have irremediably compromised the area where they are located, in which the relationship that is inferred is one of indifference between the preexisting and the constructed, because the latter stands upon the former or is unaware of its presence. One notices *remnants*, areas without specific connotations that appear abandoned with a character of waiting and on the verge of being built.

Fig. 8: A glimpse in the longitudinal direction: The Felice aqueduct and the Tor Fiscale park are revealed as bands that are wedged in the contemporary city.

Fig. 9: A glimpse in the transverse direction: residual spaces not explicitly and not entirely structured that go up to the aqueduct with locations indifferent to the preexisting ones.

If one takes a sideways glance at the whole, preferring the longitudinal direction marked by aqueducts and by greater distances, the free bands appear as surprising crossings of the contemporary city with potential connections between archaeological discoveries, historic structures, soil, water, vegetation. They are the elements of continuity that visually and concretely connect the farthest agricultural parts to the most central urban parts of the city. This direction is found at the highest altitudes of the plateau and allows one to rediscover the historical, geomorphological, symbolic connection with the Alban Hills; therefore, it clearly has a territorial value.
Conversely, if one prefers to gaze in the transverse direction we recognize the geomorphological articulation, i.e. the succession of the physical and natural environments: the valley, that is, the wet band engraved by the water veins, the slope, that is the area of the *pozzolans* that has been over the centuries subject to greater anthropic transformations and finally the top of the plateau, which is characterized by the highest altitudes, which not only give life to another historical directionality, but allow views over the incised valleys and the facades of the city. In addition, it allows one to identify the different types of residual spaces near the aqueduct, generating these situations of indifference to the preexisting structures and those areas not explicitly and not entirely structured. This direction is closely related to the positioning of the historical agrarian tissue and has a local value.
The result is a landscape that offers itself as an enclave in pieces of city, that is, a series of bigger or smaller fragments, which penetrates into the building fabric. The city takes on a “boundary” without enclosure and without delimitations between the inside and outside, merging the city image and the image of the countryside; therefore, we need to rethink the connection between closed/open and compact/dispersed. The reinterpretation of the historical infrastructure forces one to confront heterogeneous landscapes consisting of dense and rarefied aggregates, by huge empty areas and interstitial spaces, modern villages and historic farmhouses. If often the spaces between the building possess historical and preexisting archaeological traces, one must be aware of the value of such remains and know their meaning in order to work towards an interaction and a construction of an identity in continuity with the history.

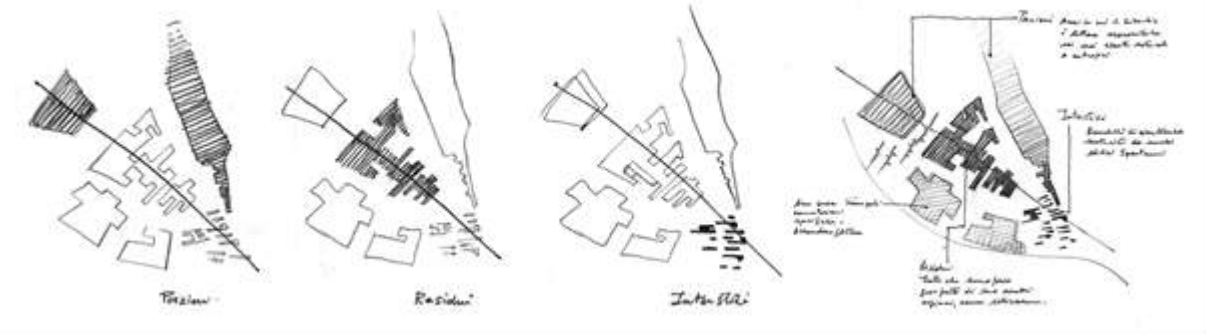

Fig. 10: Ideogrammatic diagrams relating to the free areas between the built area at the intersection of the Claudio and Marcio-Felice aqueducts in Tor Fiscale: portions, debris, interstices, remnants.

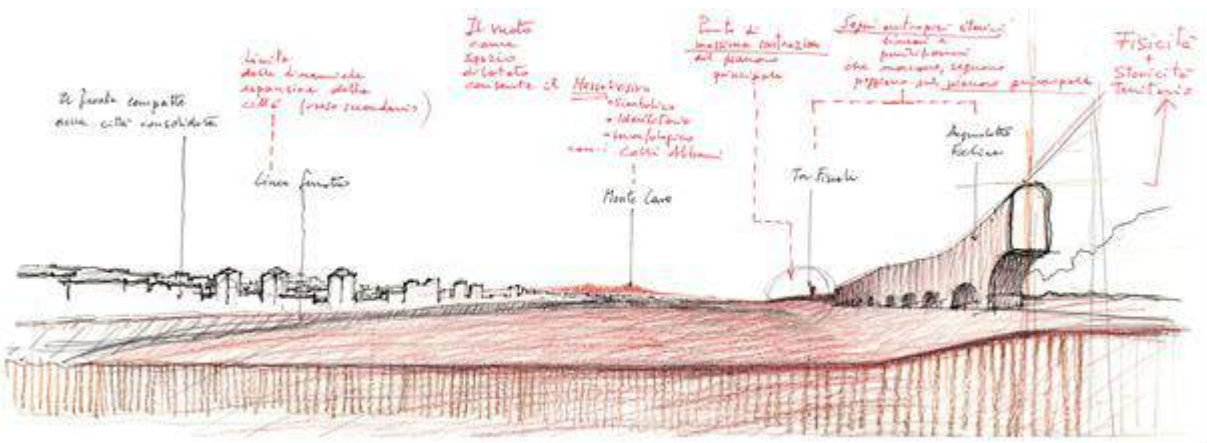

Fig. 11: The aqueduct winds through heavily urbanized areas and large open spaces, between consolidated aggregates and residual areas, small built nuclei and interstitial fragments of findings.

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The Augustan Bridge at Narni: 3D Modelling and FEM Analysis for Conservation e Restoration

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Abstract
The Augustan Bridge at Narni (27 BCE) is a key point on the Via Flaminia, which connects Rome to Rimini, and represents one of the greatest transit infrastructure realized by the Romans. It's a bridge viaduct and it grows 30 m high over the Nera River, with an arches length of about 160 m. Though having collapsed several times it retains its first arch on the south side, the head joint to the rocks on the northern side and the remains of two piers, one of which collapsed in 1885 in the central section. The second collapsed arch measured approximately 32 m, one of the biggest span of romans arches.
The remaining first arch has sustained a horizontal shift that makes it particularly susceptible to seismic events. Following an earthquake in 2000, the surviving arch was subject of restoration works (completed in 2005). A laser scanner survey has been carried out to obtain more extensive metric data and recreate a tridimensional model, useful also for structural analysis.
With the 3D FEM models it has been evaluated the structural status of the bridge, at first in its original configuration, with particular focus on the study of the fourth arch due to its characteristic ribbed shape, then in the configuration after the subsidence of the second pier, main cause of the collapse, and at last in the present one of the remaining parts.

Keywords: Narni, Augustan Bridge, restoration, laser survey, 3D FEM modeling

1. The Via Flaminia and the Augustan Bridge
The Consular Via Flaminia connected Rome to Rimini and branched out near Narni into two roads, the first one moved towards north running along San Gemini (passing through Carsulae), Massa Martana and Bevagna and reached Foligno, where it met the second one (Flaminia nova), which from Narni deviated east towards Terni and Spoleto.
On the crossing of the Nera river, immediately north of Narni, a first bridge had to be erected at a low altitude in proximity of the one built during the Middle Age (which was destroyed in World War II).
In the I century BCE, Augustus, within his policy of oversight over the eastern Transalpine regions, personally took upon himself the care of the route and, in addition to the restoration work of the eastern branch (Flaminia nova) toward Interamna (Terni), he built the Bridge that crosses the Nera River at a higher altitude, in order to create a better and faster connection of the Flamina vetus to the north-east of the peninsula. The strategic value of the intervention was sealed with the honorary arch dedicated to Augustus, built in Rimini at the end of the route restoration in 27 BCE. The city, the route and the bridge kept their strategic military role in the late Middle Ages and in the later centuries, being the obligatory transit for soldiers and troops moving from North to Rome. The Augustan Bridge represents one of the greatest transit infrastructure realized by the Romans, and, from a typology point of view, it is a "…bridge-viaduct, with abutments on its sides that lean against the rocks, and piers grounded on emerging rock banks. It consists of a majestic engineering structure connecting the land sides with a 180 meters viaducts, which dominates in that stretch an impetuous Nera River." [1].
Built with big squared travertine bossage blocks and concrete conglomerate layers on the inside, today it presents itself mostly collapsed, with its southern head arch still intact, figure 1 - from which several meters of stonework have been removed between the arch extrados and the driveway plane - the head joint to the rocks on the northern side and the remains of two piers, one of which collapsed,

in the central section. All the nineteenth-century representations suggest the driveway plane was above the bridge with a south-north incline.
During the classical age the bridge already suffered from partial collapses that demanded the reconstruction of the third pier and the last arch, which attained a much different appearance from the other three. In 1053 [2] the collapse of the Velino Lake embankment above Marmore resulted in a flood that caused the subsidence of part of the bridge, thereafter named *ruptum* or *dirutus*. Until the construction of the medieval *pons novus*, upstream to the Augustan Bridge, before 1217, the transit had to happen thanks to wooden scaffoldings.

Fig. 1: Upstream view of the Bridge (before 1885) with the second pier still in place; the first arch has a 19.57 meters span and a more than 30 meter height. The second arch had to reach 32 meters span.

2. Consolidation works

During Renaissance the bridge becomes an object of interest and study, and among the drawings realized by Francesco di Giorgio Martini, Baldassarre Peruzzi and Antonio da Sangallo, is highlighted a form substantially similar to the current one. Between the XVII and XIX century, the Grand Tour's travelers, illustrated and reproduced many times (Carot, among others) on prints the Augustan Bridge [3]. In 1819 the engineer Giuseppe Riccardi, overseer of a first major survey, studies also the possible reconstruction of the roman bridge due to the disrepair of the medieval one. In 1847 is carried out the restoration with bricks of the left shoulder and, on the extrados, the strengthening with metal brackets of the voussoir and the left arch keystone. In 1885 the second pier from the left collapses [4]. Researchers instead agree on the subsidence of the second pier as cause of the collapse of the bridge. In this regard Eroli [5] supplies a difference in height of 2,77 meters between the cornice grade plane of the second arch on the first pier and its counterpart on the second pier. In 1889 the tunneling of the right shoulder is authorized for the passage of the railroad. In 1914 is built, riverside of the first left shoulder, a riverbank containment concrete basement. In 1919, on the left riverbed, is realized a wood piling to protect the concrete basement that between 1915 and 1918 didn't withstand the river overflow.
The latest major interventions have been carried out during the 70s and concerned the strengthening of the first left piers' blocks, the extrados, the travertine blocks pointing and the strengthening of the broken arch. In 1989 the Ministry of Finance has entrusted the asset to the Archeological Superintendence of Umbria. In the second half of the 80s the right shoulder has been restored and reinforced, nailing down the unstable voussoirs and restoring the extrados. Lastly, after the earthquake of December 2000, the Archeological Superintendence of Umbria drafted a consolidation and restoration project of the first arch. The documents regarding the last two interventions have been retrieved from the Superintendence's archives and are briefly presented below.

2.1 Consolidation works of the bridge right shoulder

In figure 2 is shown, in the left image, the state of the right shoulder from downstream after the tunneling of the same shoulder for the railway passage and before the consolidation works of the arch with a brick wall. In particular, better on the left image in figure 2, is noticeable the complete removal of the right shoulder travertine cladding even if the presence of travertine blocks within the roman conglomerate is still considerable, especially in correspondence of the fourth arch springer.
In the right image (on the same figure 2) is shown the demolition of the summit of the fourth arch with the removed voussoirs on the ground and the fresh cuts of the overhead concrete conglomerate; on the background of this image is visible the Madonna del Ponte Sanctuary built upon the trail of the access road north of the bridge.

Fig. 2: Downstream view of the bridge right shoulder.

A project dated 1986 involves interventions on the following elements:
1) extrados of the structure: cleaning of the vegetation, removal of the incongruous materials and protection through a new layer of concrete conglomerate obtained by kneading the recycled stone materials with pozzolanic mortar and desalinized lime/cement, successive application of water-repellent materials finish on the whole surface and lastly, placement, both upstream and downstream, of rainwater drainage and disposal ducts;
2) upstream and downstream facing: cleaning of the vegetation, joints and cracks pointing with cement mortar, anchorage with stainless steel bolts and resins from the more unstable and exposed residual blocks of the conglomerate (exposed due to the absence of the travertine cladding), finishing with water-repellent materials like the extrados;
3) overhang portion of the arch from the shoulder: implementation of the anchorage passive tie-rods for the blocks realized through reinforced bore holes injected with epoxy resins (hole diameter 36 mm, reinforced with 20 mm diameter FeB44K type rebars with allowable stress of 2600 daN/cm^2 and variable length between 1,90 and 5,90 meters for the anchorage on the back wall; in the strain calculation test the travertine weight has been estimated equal to 2.4 t/mc) to connect all the base levels or the voussoirs joints (following this interventions it has been proposed the removal of the brick wall realized as support of the fourth arch springer, which was not carried out);
4) railway tunnel: cleaning of the intrados and successive application of reinforced spritz-beton with a welded mesh fixed with chemical anchors.
In figure 3 is illustrated an excerpt of the project blueprints showing the arrangement of the reinforced bore holes described in point 3.

2.2 Consolidation works on the bridge left shoulder and the first arch
After the earthquake of December 16th 2000, that struck several areas of the Terni district, was recognized the necessity to execute consolidation works on the Augustan Bridge.

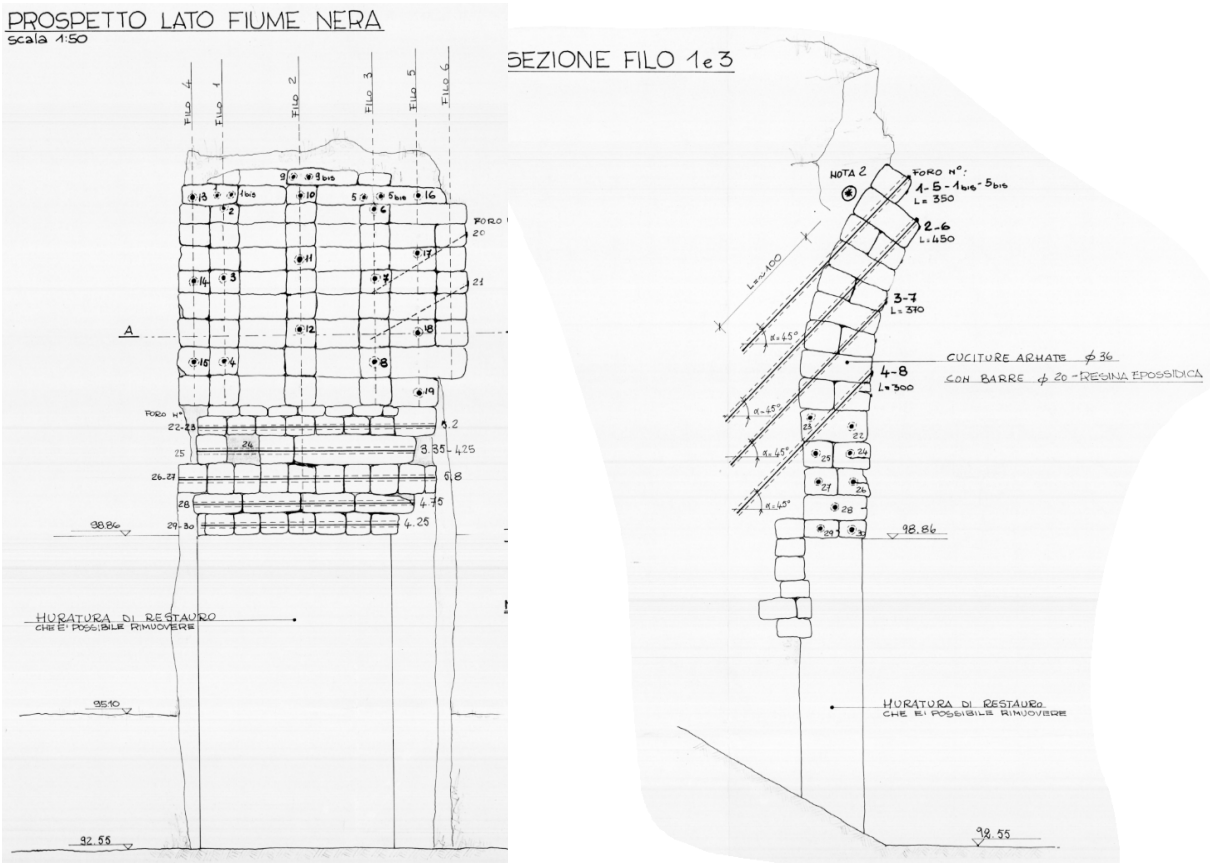

Fig. 3: Excerpts from consolidation project of the voussoirs of the fourth arch.

The successive decree of the local strategic plan, n. 59 of 28/06/2001, assigned three billion lire to the Archeological Superintendence of Umbria for the consolidation of the monument and initiated the drafting of a project, here presented in its key points.
The project focuses were the left shoulder, the first arch and the first pier still in place.
The technical report stated that the bridge "…was affected by the earthquake presumably with a slight increase of the translation towards the river, which, moreover, slowly continues … but not significant enough to lead to immediate risks. Such translation has to be considered physiological after the collapse of the central arch."
Four types of intervention have been identified within the technical report:
1) cleaning: vegetation and scaling accumulated over the centuries;
2) consolidation: pre-consolidation of the damaged elements, facing detachment risk mitigation and lesions restoration, reduction of the free thrust of the arch and enhancement of the seismic reaction;
3) restoration: aimed to restore as much as possible the original appearance;
4) final safeguard: from the decay due to weathering, and implementation of maintenance and enhancement elements.

2.2.1 Calculation Report

In the calculation report concerning the structural consolidation is described the existence of:
"… numerous visible lesions on the facing (most certainly present also inside), in the area of the arch haunch, on the key stone area and in the abutment (with subvertical course). Deformations of the arch are also present in the sense of a reduction of the curvature and evident vertical shift of the pier (towards the river) and the shoulder. The rotation around the vertical axis of the arch is evident, followed by the inclination of the pier on the perpendicular plane to the one on which the bridge extends. Crumbling and expulsion of the voussoirs and other materials are also visible in the areas of the haunch and key stone, in addition to (presumed) a downward slipping of the key voussoirs."
In regard to the "presumed" slipping of the key voussoirs the laser survey (see below) has cleared any doubt about the real vertical displacement of the same voussoirs.
The same calculation report in its structural analysis highlights how the "free" thrust would be the main cause of the remaining arch and first pier slow shift towards the river and, furthermore, how "… to this kinematic motion it is then added the translation generated by the river flow. This last evidence, highlighted by the rotation of the exiting arch on the horizontal plane and by the inclination of the pier

perpendicularly to the bridge plane, is also demonstrated in the illustrations of the late 800s; they show the collapsed pier, in the middle of the river, clearly rotated around its vertical axis. These motions have lead to all the instabilities previously described and to the necessity to intervene, in the second half of the 20th century, with anchoring tie-rods for the overhang portion of the collapsed arch."

Of the afore-mentioned interventions no details have been retrieved from the Superintendence archives, whereas for the rotation of the pier the document of reference is the scale blueprint drafted by Riccardi shown below in figure 4.

The calculation report offers "a simple numeric evaluation" of the strain status of the wall due to the thrust, without background material and employing for the various dimensions at play the following values:

specific weight (of the travertine blocks and the inner filling) of 2.0 t/m^3;

average measurement of the first pier base 10x8 meters (form north to south, along the longitudinal axis of the bridge, and from upstream to downstream, along the water flow direction) and height 32 meters;

measurement of the first arch 24x8 meters with a overhead gauge of 2 meters of masonry.

With these values it has been estimated a thrust at the haunch level of 850 t and the minimum and maximum strain for the combined compressive and bending stress at the arch springer level and at the base of the first pier equal respectively to:

arch springer: $\sigma_{min,\ max}$ = 26 ÷ 62 t/m^2;

base: $\sigma_{min,max}$ = -63 ÷ 219 t/m^2.

With these values the calculation report concludes: "From the values obtained we gather that, whereas the springer section does not hold major problems, the base section is partialized of about 6.1 m:

σ_{max} = 2x6250/(6.1x8) = 280 t/m^2.

These values are elevated, but still acceptable for the compression, taking into account the facing travertine and the inner conglomerate, whereas it is not acceptable the progression of the partialization of the section, which is cause – being always present – of the ongoing slow deformations.

The seismic activity on the extension plane of the bridge emphasizes this tensional status (e.g. considering an equivalent static activity equal to 4% of the vertical load, we have an added moment at the base of 4300 tm, a partialization on about 4.0 m and a maximum tension of 390 t/m^2). The seismic activity perpendicular to the bridge extension plane increases the tensions in the same order of magnitude."

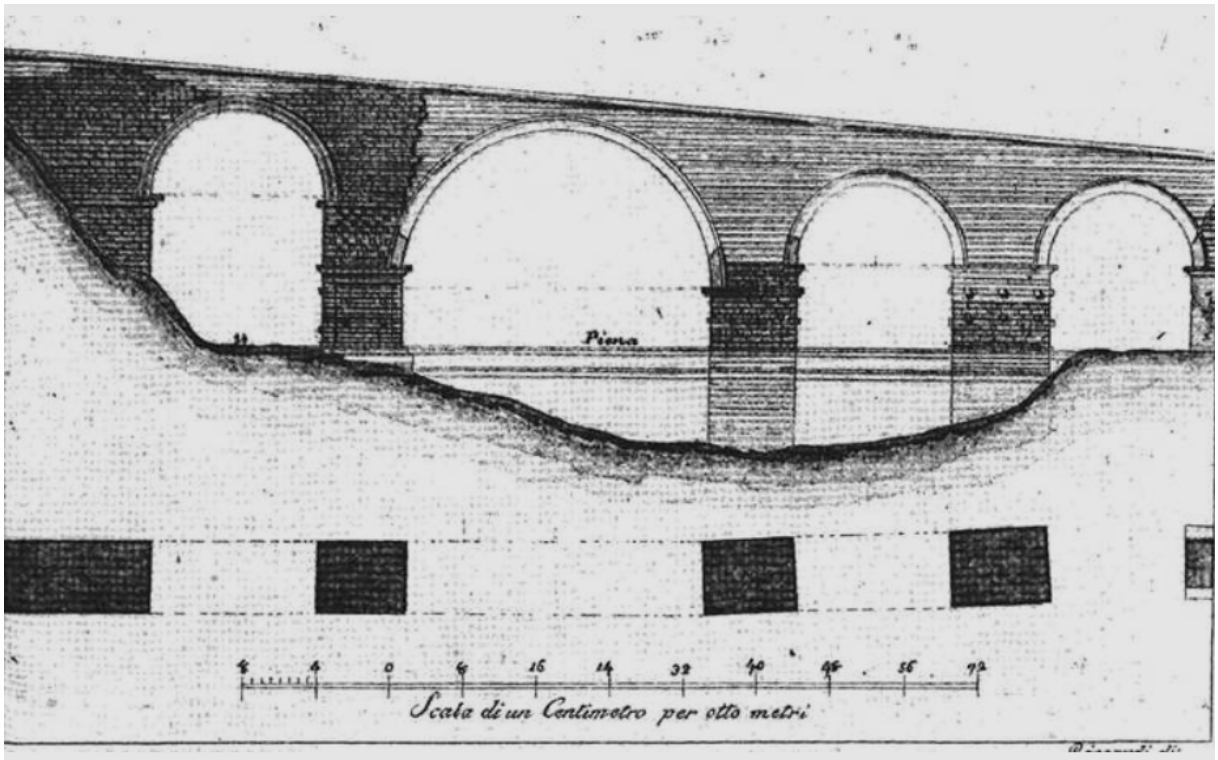

Fig. 4: Upstream view of the bridge from the ideal reconstruction of Riccardi (1828).

2.2.2 Project implementations

“Four grade 5 Ø 54 titanium vertical rebars will be installed (inside Ø 150 bore holes, with sleeves every 400 cm and with 50x50x05 cm top plates), strained to a maximum of approximately 5000 kg/sqcm, with average eccentricity of 3.0 m. Moreover, three stainless steel flat profiled (Fe510) will be placed (200x10 mm section, anchored with 40 cm long 1 Ø20/150 cm vertical stainless steel rods) on the arch extrados.”

In figure 5 and 6 are shown the project implementations and is noticeable that the right shoulder anchoring towards the mountain on the first arch springer, three Ø 32 grade 5 titanium rebars coiled for 200 cm with 1 Ø6/10 cm stainless steel with 30x30x1,4 cm plates, are not described in the calculation report.

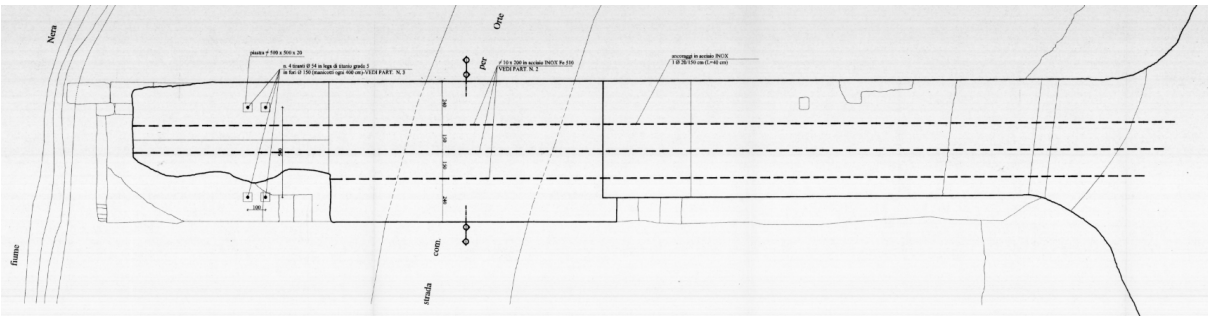

Fig. 5: Blueprint plant with the positions of the four vertical titanium rebars (on the left) and, dashed, the stainless steel plates as horizontal tie-rod.

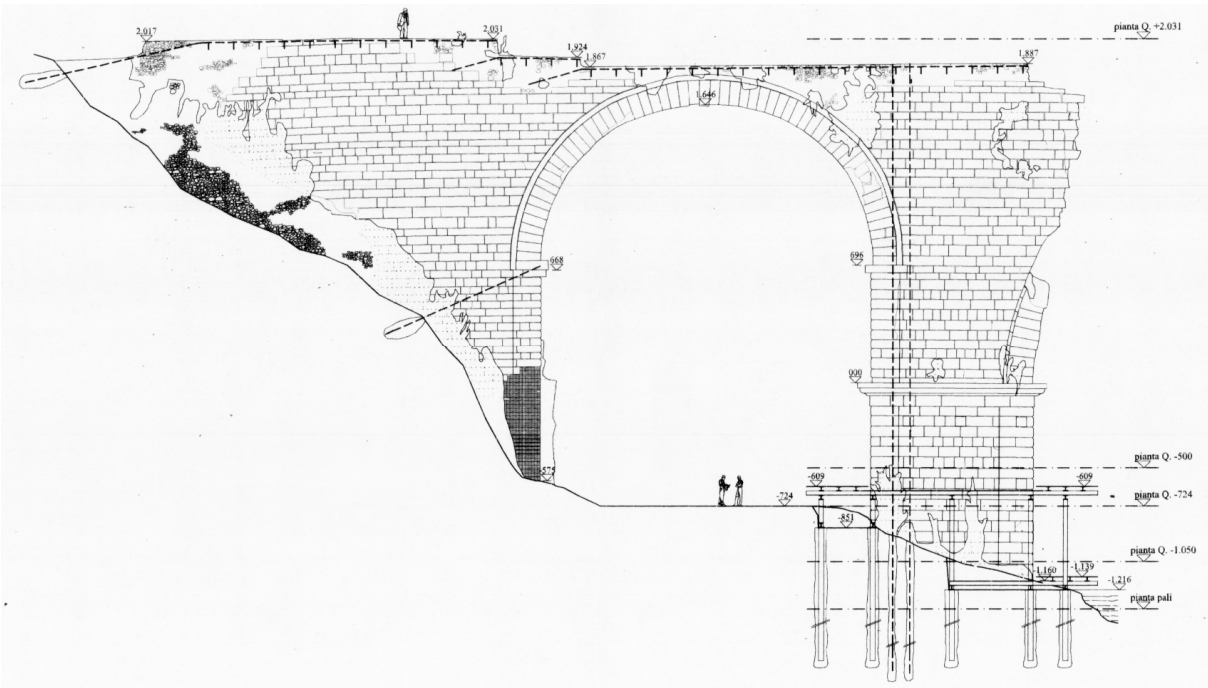

Fig. 6: Upstream view with the intended tie-rods and the temporary work around the first pier.

2.2.3 Tests at Serviceability Limit State and Ultimate Limit State

Now the main results obtained from the calculation report will be shown, which for the test section suffers even more from the absence of background material on the numeric values exhibited.

In operation, at the pier base and at infinite time, after the installation of the titanium reinforcement, for which is hypothesized a tension loss of 25%, we have a partialization of the section at 7 meters, river side, with a maximum tension of 235 t/sqm and the conclusion that “The strain does not significantly vary, but the resistant area increases as well as the flexural strength at break.”

In the ultimate state limit test for seismic events we separate a cantilever model from a supported beam model (confiding in the constraint offered by the reinforcement installed on the upper plane of the structure). In the first case it is stated that “the “equivalent static” seismic activity, in the non

reinforced conditions and in measure equal to the one expected for the third class area leads to the collapse…" whereas after the consolidation it is estimated "… with a qualitative reasoning…" a maximum compression tension close to the breaking point (120÷150 kg/sqcm) and tensile tension close to the yield point (7000-8000 kg/sqcm). "What has been said happened in the event of collapse for the cantilever model; if, vice versa, it is considered the constraint of the upper reinforcement, the strain is far lower. To the state limit the maximum moment due to the earthquake is approximately 3600 tm, as consequence of the arch thrust of approximately 5000 tm and the compression axial force of 3700 t (all the values are measured at half-height of the pier); the section is almost always reactive (even without the reinforcement of the tie-rods) with maximum compression tension around 120 kg/sqcm. In this hypothesis on the arch develops tensile tensions of approximately 400/(2.0x8.0) = 25 t/sqm (still tolerable by the conglomerate). The contribution of the plates is sizable and equal (at breaking point) to 20x3x4300/1.15 ~ 225 t. " It should be noted, anyway, how the mentioned maximum compression tension of 120 kg/sqcm is similar to the one previously indicated as close to the breaking point value.
Lastly, for a seismic activity perpendicular to the bridge axis "…the moment is 17200 tm (to be added to the moment of 18580-344 = 17550 tm on the arch plane and to the axial force of 6594 t). The collapse mechanism is mainly the combined compressive and bending stress cantilever one (since the constraint of the upper plane is not sufficiently rigid to provide an even minimum contribution to the resistance). Safety is guaranteed since the collapse condition is not very different form the straight combined compressive and bending stress on the most rigid plane. In operation (with seismic activity of 4%) the maximum compression tensions reach approximately 260 t/sqm and the minimum one (in a limited triangular area) approximately 80 t/sqm of traction, value that is considered still tolerable within the conglomerate."

3. Materials

The bridge is made up of two materials: travertine for the voussoirs of the arches and the cladding blocks of the piers and walls (with about 60 cm of average depth); roman concrete for the interior filling. The executive manners are clearly visible on site, especially in the collapsed parts: the concrete casting was realized by layers of the same thickness as a row of cladding blocks (usually two feet high for, e.g., about 32 m^3 of concrete for every pier layer).
With reference to the mechanic characteristic of the two types of materials, it has already been seen how, during the execution of the reinforcement project calculation, it was assigned to them a single value for the specific weight, equal to 2.0 t/m^3, and for the ultimate tensile strength, around 120÷150 kg/cm^2. After experimental tests [6][7][8] carried out in the RITAM laboratory of the University of Perugia (at ISRIM of Terni) it has been obtained:
- for the travertine: compression resistance, avarage on seven samples extracted from a voussoir, 21.20 MPa, bending resistance, average on six samples, 8.53 MPa, elastic modulus of 10006 MPa and density of 2117.4 kg/m^3;
- for the concrete: compression resistance, average on four sample extracted from a concrete block near the collapsed pier, 246.25 kg/cm^2, Poisson's ratio of 0.15, elastic modulus of 12.23 GPa and density of 2223 Kg/m^3. In Cecchi's work [9] for the materials, in the finite elements models, are used the following values:

	Concrete		Travertine	
Density	2250	Kg/m^3	2220	Kg/m^3
Elastic modulus (Young)	10000	MPa	10000	MPa
Poisson's ratio	0.1		0.1	
Tensile tension "cracking"	1.0	MPa	0.1	MPa
Compression tension "crushing"	20	MPa	10	MPa

After the installation of the vertical titanium rebars, from the examination of the samples retrieved (Drdàcký et al [10] that complete and expand the results of Cantisani et al [11]) it resulted the presence, in the first pier, of four different conglomerate layers (from the top) of 15, 5, 10 and 7.5 meters tickness for a total of 37.5 meters, with the last layer completely submerged into the ground and most likely missing the travertine cladding.
From the experimental tests we obtained the following results:

type (layer)	density	bending resistance	compression
1	2.64 g/cm^3	0.919 MPa	1.933 MPa
2	2.60 "	0.374 "	14.200 "
3	2.59 "	1.581 "	1.556 "
4	2.51 "	0.370 "	1.003 "

The high compression value of the second type seems to be due to travertine aggregate of great size and the analysis of the stress/displacement diagram leads back to a much more negative value of 2.8÷3.5 MPa. To this regard the authors of the article state that "It cannot be stated unequivocally that the different compositions of the Ponte di Augusto pier mortars were designed intentionally and for

changes in the load carrying capacity, from the point of view of the statics of the structure. Nevertheless, the strongest type 2 mortar, characterised by the lowest porosity, was used logically and it was probably also intentionally designed."
With regard to the hydraulics is also stated that "While the type 1 and type 2 mortars seem to be made of hydraulic lime obtained from local impure limestone (cherty limestone), the mortars from the footings (type 3, type 4) appear to be pozzolanic. In historic mortars, pozzolanic materials were commonly added. These materials contain high amounts of hydraulic oxides, which can react with lime and form water-resistant hydrated calcium and aluminium silicates. These manufacturing technologies were often kept secret, therefore, no evidence of detailed documentation has been handed down."
The data previously shown infer how the values used for the reinforcement project were approximate with opposite effects in part able to neutralize each other, whereas the data comparison of the concrete samples extracted from the first pier from those extracted from the collpased pier is quite difficult.
In view of these considerations for the finite elements modeling of the travertine and the conglomerate, we used the following mechanic characteristics:

Young's Modulus	10.00	GPa	12.23	GPa
Poisson coefficient	0.1		0.15	
Density	22.0	kN/m^3	22.3	kN/m^3

whereas the geometric measurements have been taken from the laser scanning survey.

4. Laser scanning survey, data processing and analysis

In 2009 it has been decided to use the laser scanning technology, having successfully used it in other analysis experiences [12], also for the Augustan Bridge survey, in order to obtain more extensive metric data and recreate a tridimensional model of it. It has been used a phase-based laser scanner (by Zoller & Fröhlich company): the model Z+F IMAGER 5006i. In the point clouds data processing have been used the software Cyclone by Leica Geosystems and, recently, ReCap 360 Ultimate by Autodesk. After acquiring and recording the point clouds, it was possible to examine in depth the bridge metric characteristics, thus obtaining additional data which can contribute to its study.
The results of the new survey and the comparison with the previous studies have been reported in a previous work (Custodi and Scaia [13]). In addition from the examination of the first arch, which was built as a round arch with the springers at the same height, it is immediately evident the rotation, of about 1° (in accordance with Cecchi [8]), of the first pier toward the second arch and the consequent shift of the right springer of approximately 22.4 cm. On the vertical direction the shift of the arch springer is moderate and equal to 1 cm. The inclination of the first pier toward the river is conform to what has been reported in the reinforcement project calculation report, whereas the inclination towars downstream on the upstream-downstream direction is very moderate, less than 1 cm. The inclination of the shoulder leaning on the mountain is instead practically nonexistent. In regard to the first pier rotation around the vertical axis it has been verified a clockwise rotation linked to a greater distance of the counterposed corners that measures, at different altitudes, between 2 and 5 cm. The torsion direction of the first pier is opposite to the one illustrated by Riccardi for the second pier.
The positioning of the second pier has been carried out through the orthorectification of a picture captured by Alessandro Vasari (1866-1929) and owned by the Istituto Nazionale della Grafica of Rome, with a 1pixel=2cm accuracy.
Once positioned the second pier, it is possible to identify the spans of the third and fourth arch, given the position of the existing portion of the third pier.
However the spans of the third and fourth arch, obtained from the analysis of the remaining voussoirs (through image for the third arch and the actual remains for the fourth), could be different and more similar to the first arch, proving the idea that the third pier was built at a later time.
Indeed the third pier shows, as reported also by other researchers, an undeniable different craftsmanship both for the global dimensions, with the missed alignment of the downstream plane with the same plane of the first arch, and for the dimensions and disposition of the blocks, which do not present anymore the accuracy and modularity of the first and second piers. On the third pier it is not visible the springer of the third and fourth arch, not even in the older pictures and illustrations. The small portion of the fourth arch still existing on the right abutment also shows its completely different craftsmanship in comparison to the other three.

5. FEM modeling

A series of finite element modeling (with linear and non-linear, two and three-dimensional analysis) has been carried out to evaluate the stress and strain status of the bridge in its original configuration (virtually reconstructed, figure 7), and in the one due the subsidence of the second pier, main cause of the collapse, in the present one of the remaining parts, with a particular focus on the study of the fourth arch, due to its characteristic shape, compared to the first arch.

As an example in figure 8 there is the stress status (S11 in the horizontal direction) of the first arch due to the horizontal shift of the first pier. In the keystone elements it can be observed a significant increase in stress, compared to that one in the absence of the horizontal shift, maximum in the central zone at the summit of the arch (with values in compression close to those at break, while traction in the lower surface of the arch justifies the detachment and the consequent partial expulsion of the voussoirs, with one completely expelled). About the fourth arch, the executive assembly modalities, alternatively not extended through the full radial depth of the arch, could be a relevant cause, in concurrence with the second pier subsidence, of the detachment and the consequent collapse of voussoirs, furthermore it has been seen, in particular in the keystone area, how the presence of stone ribs cause an increase of both vertical settlements and stresses (traction and compression ones), compared to the same arch without emptiness among the ribs.

Fig. 7: Virtual model of the entire bridge in the hypothesis of a horizontal road plan, to be noted the altitude of the second pier in the hypothesys of a round second arch (32.6 m span).

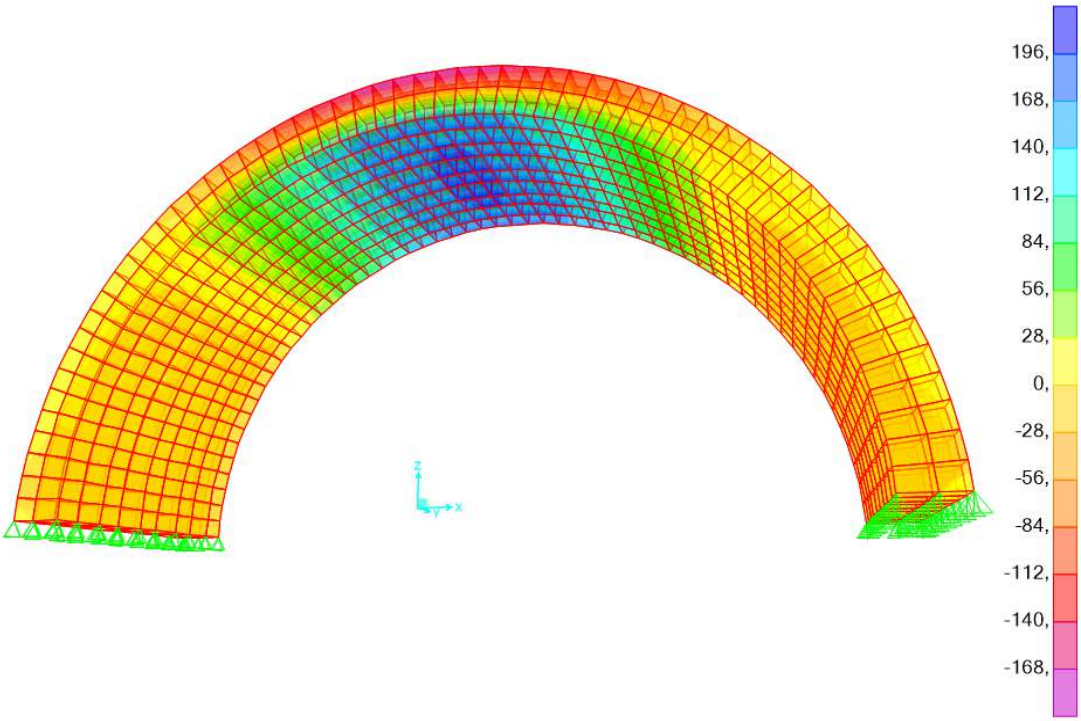

Fig. 8:. 3D finite elements model of the only first arch with stress (daN/cm^2) due to the horizontal shift.

Conclusions and future developments

The laser survey allowed for a refinement of the metric information on the Augustan Bridge. The bridge had four arches that suffered several collapses and reconstruction over time. The collapses seem to have originated from the subsidence of the second pier. The remains of the fourth arch are substantially different from the others and even the original span seems different from the simple distance from the third pier that has been also restored at a later time. Following the collapse the first arch has sustained a horizontal shift that makes it particularly susceptible to seismic events. Lately

from the technical documents, obtained from the archaeological Superintendence of the Regione Umbria, related to the consolidation of the first arch of the bridge (2003-2005), it is possible to study (still on-going) the effect of the same consolidation under the strain, even seismic, expected by the new national rules (2008) that came into effect after the mentioned consolidation works of the first arch.

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Static and numerical analysis of the ancient portal of the church of the "Riforma" in Bisignano (CS).

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Abstract

The cultural heritage is of public interest and constitutes the wealth of a place and its people. In Italy often this public good is made from the remains of the glorious civilizations present in the past in our country, an example is Rome or the archaeological excavations of Pompeii, or isolated testimonies of masonry structures remained intact after an earthquake. These ruins are stacked in rigid blocks or mixed masonry in which the original state of the elements is often compromised by crack patterns and degradation of materials. Interventions aimed made in the past to pay full regard to the aesthetics which made these structures incompatible with the concept of security and the needs of fruition.
This work deals the study and the geometric survey of the portal of the first Franciscan complex of "Riforma", the only ruin remained intact after the earthquake that destroyed the original structure. The goal of this study will be to create a numerical model to be subjected to loads acting in the plane and out of plane, to identify weaknesses and the trend of stresses generated within the structure in order to locate possible deformations and critical areas on which to intervene.

Keywords: Masonry structure, Static analysis, Cultural Heritage, Numerical analysis

1. Church history

From the earliest times in every part of Calabria, the monasteries were the center of culture and art. St. Francis of Assisi in 1217 formed the nine provinces of the religious order, including Calabria. at that time many monasteries were built, among them was that of Bisigano, example of remarkable architecture, located outside the walls of the city on a hillside overlooking the valley of the river Crati.
It was built in the early part of the thirteenth century on existing ruins. In 1225 the monastery was headed by the guardian monk St. Nicholas from Corigliano and in it were housed A. Tancredi and Leone da Somma from Corigliano and Ugolino from Cerisano. They were unlucky and they died martyred in Ceuta in Morocco in 1227 with St. Daniel Fasanella. In 1380 the monastery was administered by the "Friars Minor Conventual", in 1445 it passed to the "Friars Minor Observant" and in 1559 to the "lesser brothers reformed", they derived the name "convent of Riforma" [1].
A group of Franciscans architects and builders, led by Blessed Peter Cathin of Sant'Andrea della Marca one of the first followers of St. Francis, they began construction on an unspecified date. In 1222 they finished the monastery and the church dedicated to the "stigmata of St. Francis".[2]
Among the important people who lived in the convent we remember Humilis of Bisignano. It was a 17th-century Franciscan friar who was widely known in his day as a mystic and wonderworker. He has been declared a saint by the Catholic Church [3]. About the age of 18, Luca Antonio Pirozzo felt called to enter a religius order, but, for various reasons, did not do so until 1609. In that year, aged 27, he felt called to enter the Reformed Friars Minor, a branch of the Order following a more severe way of life, who had a community at the medieval Convento di Riforma (Friary of the Reform) in his city. He was admitted that same year as a lay brother into the novitate of those friars which was located

at Mesoraca in the Province of Crotone, at which time he received the religious habit and was given the name by which he is known. After overcoming various difficulties arising during that year of probation, he was allowed to profess religious vows as a full member of the Order on 4 September 1610.[4]

1.2 Church and convent architecture

The church and the convent of the "Riforma" are compact structures with strong symbolic particularity. The statues inside, the windows, the portal and the spaces follow a strict geometric sequence. Sideways develops the church with the bell tower, and the three remaining sides develop the cells and rooms of the convent. the convent has not undergone significant changes during the two centuries after the year 1830 to visit Andrea Pierbenedetto Bishop of Venosa. He wrote a report which says that "the church does not need to work" and that "there was a porch in front." This suggests that there was a porch that was heavily damaged in the earthquake 1638. The porch was walled, evidence of this is the design of Pacichelli where the church is represented with a facade composed of two staggered levels.

(a) *(b)*

Figure 1: a) Church of the “Riforma” b) Facade of the church.

The fifteenth-century structure are preserved Gothic traces, identifiable in the vertical development of the façade. The plaster on the walls is yellow and mortar are visible the ancient stone walls. No trace remains of the fifteenth-century bell tower, it was joined in the Pacichelli design the facade of the church. On the occasion of the tercentenary of the death of S. Humilis the bell tower was rebuilt in brick and cement near the sacristy. The church façade is characterized by axial symmetry where stands the dating portal year 1380. It is in stone with decorations "rodiane" dating back to the fifteenth century, measuring 6 meters x 3.2 meters and has a form to ongee arch resting on capitals decorated with leaves. The church inside presents two types of flooring, the aisles have a type in marble while the presbytery has an example made of brick.

The church has a rectangular plan that widens at the presbytery. It measures 23,75 meters from the entrance to the central arch. The width is 13,18 meters occupied by the central aisle to 8,18 meters, while the aisle occupies 5,00 meters including the four columns in the Gothic style.

Adjacent to the church, from the west side you enter through a wooden door in the convent, typical example of Franciscan architecture. From the entrance you immediately reach the cloister which has typological and stylistic characteristics attributed to interventions fifteenth of Friars Minor Observant. Cloister in the years he was subjected to many changes and damages caused by the earthquake, the thirteenth-century structure remains only one side to witness the ancient splendor. It is Gothic with a square base composed of lancet arches, the sides are 12 meters and 24 arches resting on stone pillars, only eight pillars date back to the thirteenth century. In 1969 the friar Pio Spadafora started restoration by the arches and pilasters, entrusting the construction of the missing elements to famous stonemasons of the area. the central well and a cistern for collecting water have been closed and the whole area was paved with brick and stone. Around the four sides of the cloister various environments develop: on the west side the staircase leads upstairs where are the monks' cells and the big fireplace, in the north are located the library and archives, to the east there are the kitchen and the refectory, and finally to the south it is located the central hall [2].

(a) (b)

Figure 2: a) Cloister during restructuring b) Cloister today

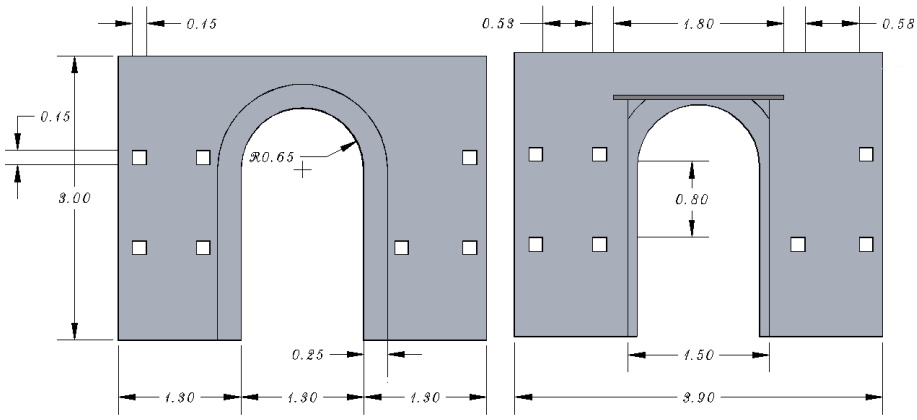
2. Case Study

The case study of this work is a portal isolated laterally placed in the parvis of the big Riforma's Square (fig. 3). That element, probably is a porch of ancient ruins destroyed by the earthquake of 1638. The earthquake was one of the strongest that hit the area, causing throughout the Calabria region more than 15000 deaths and destroying other 100 villages. The National Institute of Geophysics, has drawn up a document which attests that this earthquake has had a Mercalli intensity scale in the territory of Bisignano of 9, equivalent to a magnitude 8 [5].

(a) (b)

Figure 3: a) Frontal view b) View from behind

The structure is composed of two materials, clay bricks and mixed masonry; it is not symmetrical: a façade has a typical arched portal (fig. 4.a), while on the opposite side there is the presence of an architrave (fig. 4.b). The case study is characterized by the presence of seven holes, four placed on the left side and three on the right side, which extend for the entire depth of the wall and where once, the constructors located the scaffoldings.

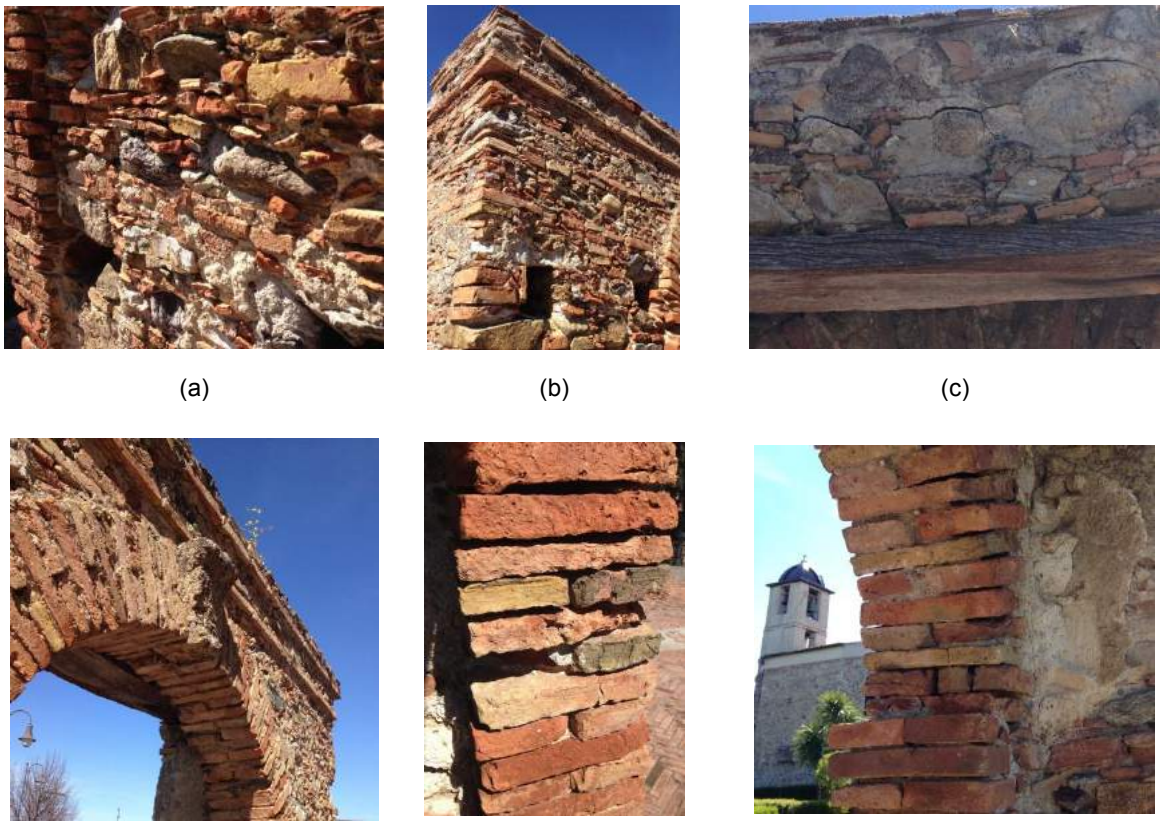


(a) (b)

Figure 4: Geometric survey in meters

3. Non-Destructive tests

Ultrasonic tests on the case study were carried out, in order to analyze the structural condition of the masonry portal. The ultrasonic tests are a non destructive tests, at the beginning of the fifties, the technician only knew radiography tests, as a method for detection of internal flaws in addition to the methods for nondestructive testing of material surfaces. After the Second World War the ultrasonic method was further developed so that very soon instruments were available for ultrasonic testing of materials. The ultrasonic principle is based on the fact that solid materials are good conductors of sound waves. Whereby the waves are not only reflected at the interfaces but also by internal flaws (material separations, inclusions etc.). The interaction effect of sound waves with the material is stronger if the wave length is smaller, this means the frequency of the wave is higher. The equation that regulate this type of test is based on wave length, that is equal to the ratio between sound velocity and frequency. [6].
This means that ultrasonic waves must be used in a frequency range between about 0.5 MHz and 25 MHz and that the resulting wave length is misured like a length (in mm). With lower frequencies, the interaction effect of the waves with internal flaws would be so small that detection becomes questionable. Both test methods, radiography and ultrasonic testing, are the most frequently used methods of testing different test pieces for internal flaws; This means that today many volume tests are possible with the more economical method, also because the element under investigated are conserved; on the other hand of particular test that many problems solve.
In this specific case, two types of materials that compose element were investigated. The first material is present in the majority of the portal because it composed largely of the structure. It is a mixed masonry composed of very irregular stones and bricks; the mortar used is made of sand and hydraulic lime (fig. 5.a.b.c). The second material studied, is a masonry built with clay bricks and mortar, they are present in the arch and the piers of the main façade (fig. 5.d.e.f).



(a) (b) (c)

(d) (e) (f)

Figure 5: a) b) c) particulars of mixed masonry c) d) f) particulars of masonry bricks

After a first inspection, it was possible to notice, that the surfaces of both materials were irregular and the mortar crumbled after a not very powerful impact. The surfaces discontinuities of the portal, are characterized by cracks running vertically; the presence of vertical cracks frequently give many problems during the experimental tests. In this case, during the ultrasonic tests the wave have

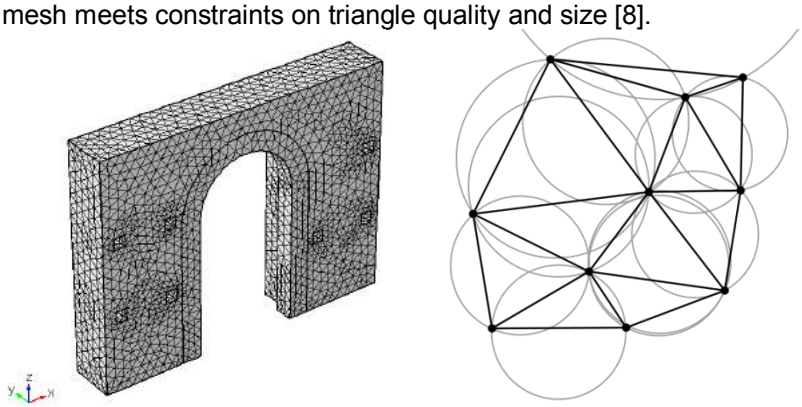
occurred in a overlapped way, due to the presence of interferences and cracks, consequently the sound wave reflection, on the side wall of the portal, seems as if the sound wave would bend with the respect to the corresponding side wall (fig. 6.a). In such cases, the probability of crack detection is very good if the angle reflection effect is used, Fig. 6b. At the 90□edge, between the crack and the surface of the test object, the sound waves are reflected back, this leads to double reflection. Use of the angle reflection effect is often useful when there are discontinuity due to the empty inside of the masonry. Often the tests carried out on thick-walled where there is the presence of vertical discontinuities, this condition cannot be fulfilled because the reflected sound waves on the discontinuity do not return to the probe. In this case, a second probe is used for receiving the reflected portions of sound, thus enabling detection of the discontinuity.
The results obtained are the following: the wall built with mixed masonry has a wave propagation speed equal to 1350 m/s while the propagation time is 481 microseconds. The masonry arch has values equal to 2500 m/s, for the velocity, and 100 μs for the time , Fig. 6c. These results highlight the state of the two materials. The propagation speed of ultrasonic waves in the mixed masonry is low, and this means that the masonry is characterized by lesions, the arch built with clay bricks masonry has a high speed so it is not damaged.

(a) *(b)* *(c)*

Figure 6: a)placement sensors b)test execution c)ultrasound specter

4. Numerical model

The creation of a numerical model requires identification of three important parameters: the mechanical strengths of the materials, the type of mesh and the yield criterion to be used in the analysis to predict cracks in the model.
The mesh used is triangular tetrahedral (fig. 7.a), it has many applications, including interpolation, rendering, and numerical methods such as the finite element method. Most such applications demand more than just a triangulation of the object or domain being rendered or simulated. To ensure accurate results, the triangles and tetrahedral must be “well shaped”, having small aspect ratios or bounds on their smallest and largest angles. Mesh generation algorithms based on Delaunay refinement, are effective both in theory and in practice. Delaunay refinement algorithms operate by maintaining a Delaunay or constrained Delaunay triangulation (fig. 7.b), which is refined by inserting carefully placed vertices until the mesh meets constraints on triangle quality and size [8].



(a) *(b)*

Figure 7: a) Numerical model with mesh; b) Delaunay triangulation

The yield criterion used is that Willam-Warnke, it is used to predict failure in concrete and other cohesive-frictional materials such as rock, soil and ceramic. Just as the Bresler-Pister criterion, it depends only on three parameter. It was developed to describe initial concrete failure under triaxial condition. The failure surface is convex, continuously differentiable, and is fitted to test data in the low compression range. The material is considered perfect elastoplastic (no hardening). The original Three Parameter Willan-Warnke failure criterion was defined as:

$$F_y = \sqrt{\frac{3}{5}} \cdot \frac{\tau_{oct}}{f_c} + r(\theta)\left(\left(\frac{1}{f_t} - \frac{1}{f_b}\right)\sigma_{oct} - 1\right) = 0$$

Where f_c is the uniaxial compressive strength, f_t is uniaxial tensile strength and f_b is obtained from the biaxial compressive test. All parameters are positive. The octahedral normal and shear stresses are defined as usual:

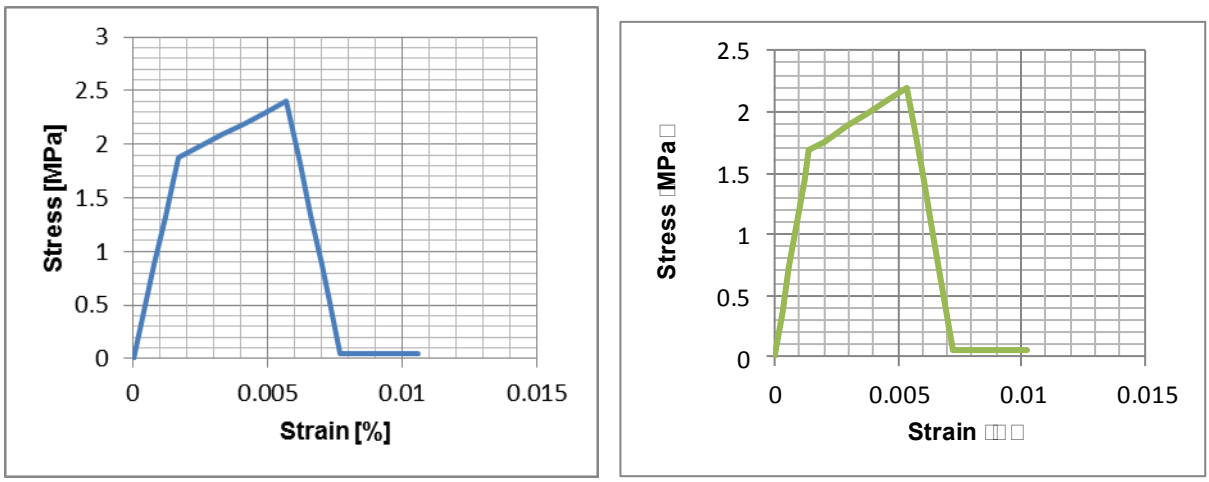
$$\sigma_{oct} = \frac{I_1}{3} \qquad \tau_{oct} = \sqrt{\frac{2 \cdot J_2}{3}}$$

Where I_1 is the first invariant of the Cauchy stress tensor, and J_2 J_3 are the second and third invariants of the deviatoric part of the Cauchy stress tensor. [9]
The last step to the creation of the model is the identification of a law Strain stress of materials. The structure is composed of two different types of masonry: mixed masonry and bricks masonry. Through experimental tests in the literature the constitute laws (fig. 8.a.b) were considered [10] and implemented in the calculation program. The mechanical properties of the materials used are listed in the following table 1.

	E [MPa]	v	ρ [Kg/m^3]	f_c [MPa]	f_t [MPa]	f_b [MPa]
Mixed masonry	2200	0.15	1800	2.20	0.36	3.30
Brick masonry	2400	0.15	1800	2.40	0.40	3.60
Wood	800	0.40	500			

Tab. 1: Characteristic values of the materials [11][12]

The analysis was carried out taking into consideration in addition to the materials listed above also the wooden lintel present in the back part of the structure. The wood, a material with more elastic behavior than the masonry was analyzed without imposing strengths characteristics, in order to lighten the analysis because the fractures will occur of a rigid material such as masonry.

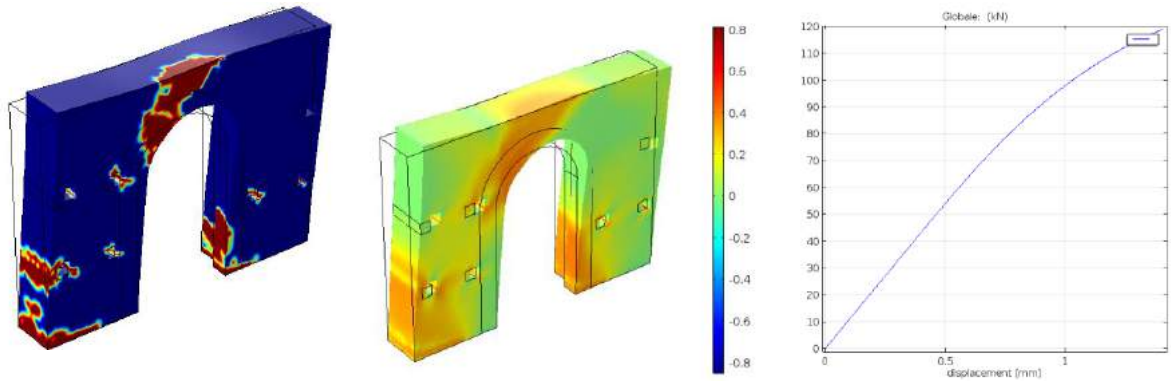


(a) *(b)*

Figure 8: a) Compressions strength bricks masonry b) Compressions strength mixed masonry

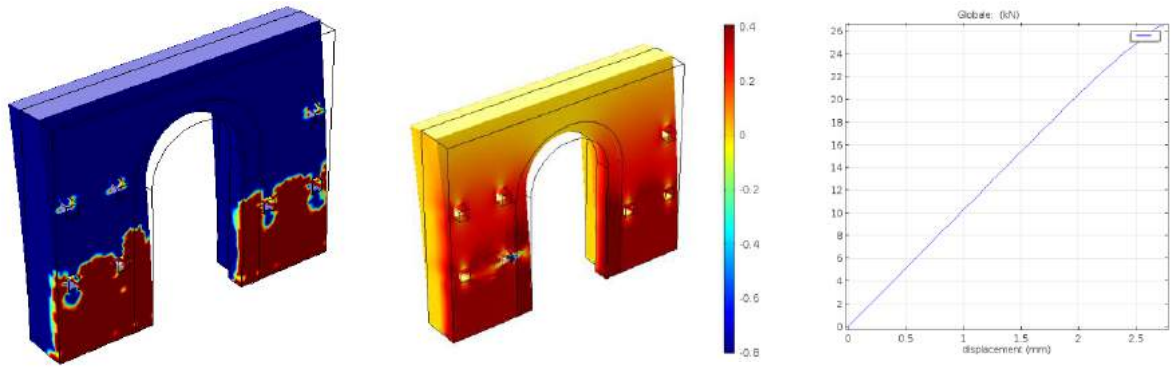
5. Results and conclusions

The results obtained from the numerical analysis, different behavior have been observed by imposing a displacement control about the principal directions. Two different models have been created: the first that completely real to the state of art , the second equal to the first but without the holes intended for scaffolding; for both the models have been carried out the same analysis in order to study the influence of the holes under out-plane force and to identify weaknesses and the trend of stresses generated within the structure in order to locate possible deformations and critical areas on which to intervene. In the following figures are reported for each model the maximum displacement in both direction (x-y positive and negative) and the force-displacement diagrams.



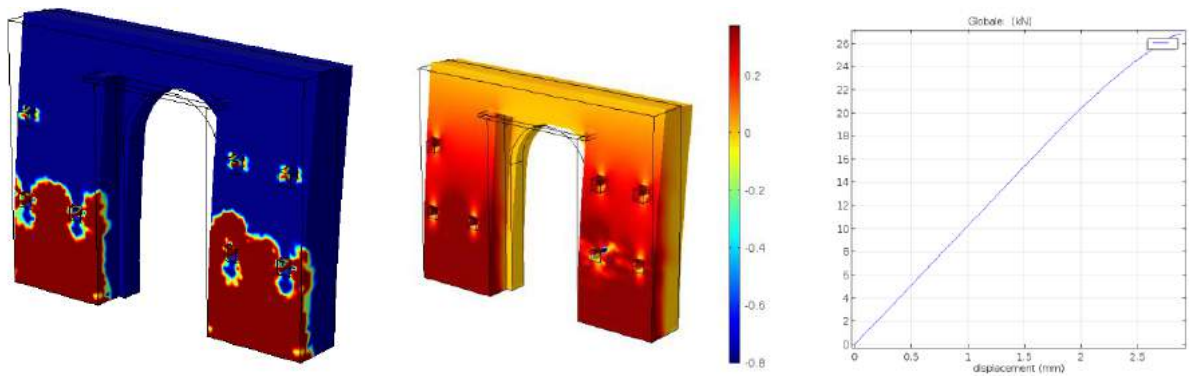
(a) *(b)* *(c)*

Figure 9: Model with holes displacement along x: a)after elastic zone; b)stress maps; c) force displacement diagram



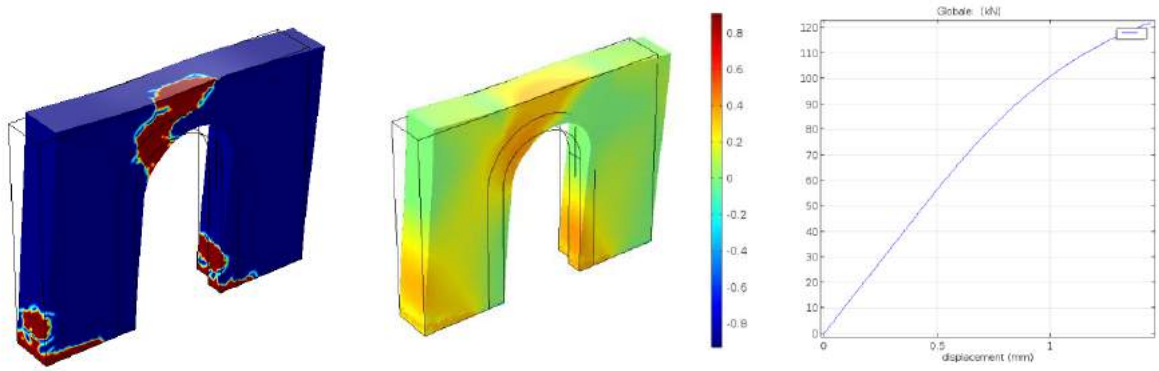
(a) *(b)* *(c)*

Figure 10: Model with holes displacement along y: a)after elastic zone; b)stress maps; c) force displacement diagram



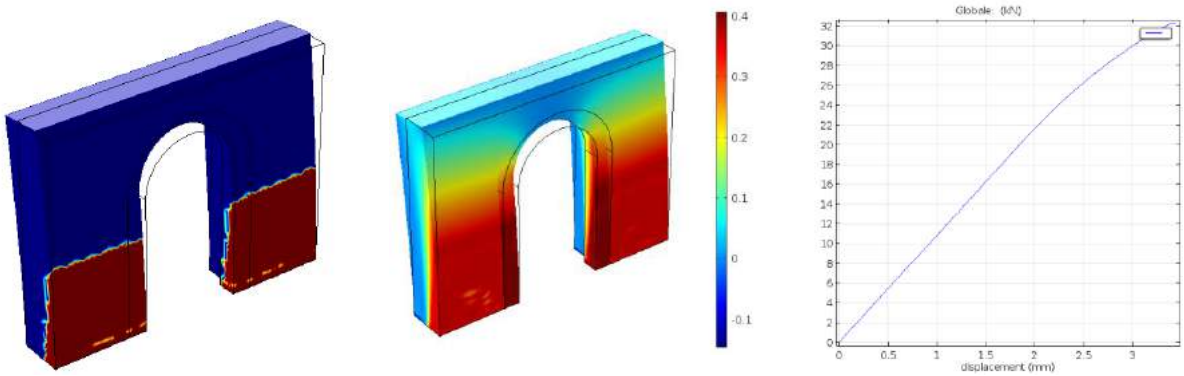
(a) *(b)* *(c)*

Figure 11: Model with holes displacement along -y: a)after elastic zone; b)stress maps; c) force displacement diagram



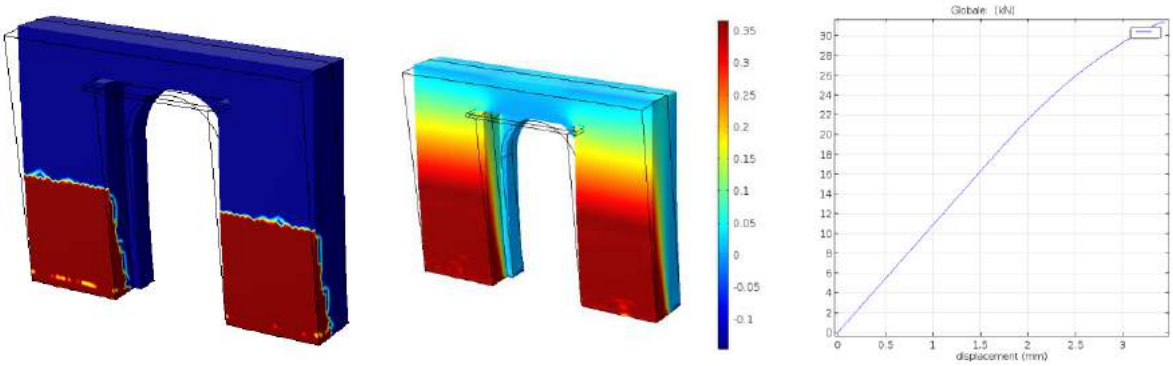
(a) *(b)* *(c)*

Figure 12: Model without holes displacement along x: a)after elastic zone; b)stress maps; c) force displacement diagram



(a) *(b)* *(c)*

Figure 13: Model without holes displacement along y: a)after elastic zone; b)stress maps; c) force displacement diagram



(a) *(b)* *(c)*

Figure 14: Model without holes displacement along -y: a)after elastic zone; b)stress maps; c) force displacement diagram

Taking into account the technical standards [13] regarding the failure mechanisms out of the plane of masonry structures [14], it was possible to see that the results obtained on the portal without the holes due to the scaffolding, guarantee minor displacements corresponding to lower forces out the plane, rather than portal as a state of fact that instead reaches greater displacement values with corresponding maximum forces. Moreover in the case of the presence of the holes the cracks are concentrated precisely in proximity of the same holes, while in the case of the portal without holes the cracks grow from the bottom part of the portal until the plasticization of the entire section.

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Le Vie dei Mercanti XIV International Forum
WORLD HERITAGE AND DEGRADATION
Smart Design, Planning and Technologies
Aversa | Naples 16 - Capri 17, 18 June 2016

Warsaw and Cracow, World Heritage sites and history presentation issue

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Abstract
Among Polish sites on the World Heritage List, there are two important towns – Warsaw and Krakow. The great difference between these city is in their history. Cracow is a great Town of medieval history with numerous historic monuments. In case of Warsaw we have a great history behind reconstructed monuments, for comparison. Between those sites is interesting, because there were two different approaches to the question of history presentation and monuments maintaining.
Until the end of the XX century most efforts and activity was spent to restoration and conservation of individual monuments. History presentation was limited to the out fashion exhibitions in historic museums. Such situation resulted in degradation of knowledge and importance of those World Heritage sites. Fortunately, in the last decade, new presentation projects were completed. These projects considerably changed the situation, contributing to this issue.
The main purpose of this paper is to present contemporary presentations of the history of using the latest technological systems, in the era of sustainable development, for examples Warsaw and Krakow. In Cracow the market square the Underground museum was open. In Warsaw restored preserved medieval cellars for cultural purposes and very interesting is a project of a special exhibition called Interpretation of the Monument, being completed lately. The new projects and exhibitions responding to contemporary problems of communication world heritage and the fight against degradation of these places.

Keywords: heritage, monument, architecture, museum, presentation

Motto:
"*To protect monuments means to constantl□provide*
the most favourable conditions for their survival
while influencing the national and the world culture."[1]

1. Introduction

In 1945, following the establishment of the United Nations (UN), the United Nations Educational, Scientific and Cultural Organization – UNESCO was founded in London on the initiative of Julian Huxley. The one of main objective of the organization is the protection of the world cultural and natural heritage. For this purpose, a special Confention was established in 1972. On the 1st session of the UNESCO World Heritage Committee held in Paris in 1977, rigid criteria for inclusion of unique cultural or natural properties in the List were adopted. Until 2005, there were separate sets of criteria, one for cultural and one for natural properties, but they were combined into one set. Currently, there are ten criteria. The fulfilment of at least one of them is enough to recognise a property representing a "unique universal value" and inscribe it on the List. Owing to this decision, the UNESCO World Heritage List has grown considerably longer. Presently, the List contains over a thousand properties in 161 countries.
Poland is one of the first countries – signatories to the World Heritage Convention and one of the major representatives on the UNESCO World Heritage List. With 14 properties inscribed on the List, it

holds the 9th place in Europe and the 15th in the world. The duty of Poland as well as other state parties is to realise the objectives of the Convention of 1972, ratified by Poland in 1976, the basis of which is to ensure the identification, protection, preservation, presentation and transmission to future generations cultural and natural heritage [...] situated on its territory".[2, Article 4]
In the paper, I would like to refer to the theme of 14th Forum, using the examples of two Polish cities, Krakow and Warsaw, in a comparative analysis of their historic centres inscribed on the UNESCO List. I will also present up-to-date practices related to the management plans developed to shape the future of the properties.
Krakow and Warsaw, the previous and the present capitals of Poland respectively, are two types of historic sites of exceptional value and importance, recognized by UNESCO. The Old Town of Krakow – the heart of the city – with its medieval market (the largest in Europe), together with the Wawel Castle and Cathedral as well as the Jewish district – Kazimierz, were inscribed on the List in 1978. The historic centre of Krakow was recognized as a site of science and art, and a treasure trove of memorabilia of the bygone epochs. The value of authenticity of the unique architectural objects such as the Romanesque St. Adalbert's church, the Gothic St. Mary's church, the Renaissance Cloth Hall as well as various tenement houses, constituting a panorama of styles over the centuries, was appreciated. Two years later, the historic centre of Warsaw was inscribed on the UNESCO List as an example of "a faithful reconstruction maintaining the original fragments of the urban structures". The exceptional value and significance of this historic site was recognised. Moreover, the determination which brought about the comprehensive reconstruction of the heart of the city deliberately and totally destroyed during World War II was considered the nation's merits.
The issue of property protection does not end with its inclusion in the World Heritage List. A variety of problems, namely the maintenance and preservation of a property with its exceptional value as well as the prevention of a property degradation, are just beginning to emerge. The established law is not sufficient to maintain and preserve the properties. The type of ownership does not facilitate this, either. The inclusion of a property in the World Heritage List entails neither a substantial change in its legal status nor any additional sources of funding. Its primary role is to influence the public awareness, which brings both benefits and threats to the listed properties.[3] Increasingly more conscious, the society appreciates the historic value a property holds for the future generations and, more importantly, realises the opportunities to utilise its unique qualities for their own commercial purposes. Obviously, the life and aura of such sites are significant; therefore, the historic properties should never be left inert. However, every practice implemented there has to be reasonably managed with wisely devised small- and large-scale smart plans.

2. Threats to the World Heritage-listed properties in Poland.

Every monument, object, estate or site is threatened with degradation. In Poland, the existing system of historic sites protection resolves the majority of the problems. Primarily, the *Act on the Protection and Care of Monuments* of 23rd July, 2003 [4], accompanied by the implementing regulations for the law[5] [6], as well as the *Act on Spatial Planning and Development* of 27th March, 2003 and the *Act on Construction Law* of 7th July, 1994 provide the tools necessary for the prevention of the threats as well as the reaction to any practices inflicting damage on the historic property. These regulations concern all the properties, without ascribing value to certain objects and sites or excluding them from the most treasured historic buildings, such as the World Heritage-listed properties.[7] However, the excessive regulation does not address all the needs concerning the prevention of the threats to the World Heritage-listed properties in particular. The provisions do not resolve the contemporary issue of degradation connected with the immense global transformation and development of the world. The programmes of ICOMOS and the National Heritage Board of Poland are aimed at developing the highest standards of protection of historic sites and monuments. The various objectives of both institutions include, among others, '*monitoring and anal□sing the threats to the cultural heritage as well as developing practices preventing such threats, including the threats to the □ orld □eritage-listed properties'* [8]. Primarily, the commitments resulting from Poland's ratification of the UNESCO World Heritage Convention of 1972 are being implemented. In addition to the national legislation, the UNESCO Convention for the Protection of the World Cultural and Natural Heritage [2, Dz. U. 1976 no. 32, item. 190], implemented in accordance with the guidelines brought together in the *Operational Guidelines for the Implementation of the □ orld □eritage Convention*[9], serves as the basis for all the tasks related to the World Heritage-listed properties. Both of the documents require that every property nominated to the World Heritage List have a ready management plan or system available, indispensable for the preservation and protection of its unique universal value.[9, II.F, 108, p. 22] Under the Polish conditions, the management plans and the management system are continued to be implemented in accordance with the guidelines stated in the *Operational Guidelines*, referring, in various contexts, to the threat issue. The chapter dedicated to the protection and management[9, II.F, 96-119, pp. 20-24] contains the greatest amount of information and guidelines related to the threats and their prevention. It specifies the systems which should be considered in order to preserve the

outstanding universal value of a property effectively. The chapter also points at the regulatory measures indispensable in preserving the authenticity and integrity of a property. Finally, it emphasises the necessity to include the related social practices in the systems.
Beyond any doubt, the issue of degradation of the fabric and form of a historic property, which can occur both as a process and a phenomenon, has a long history. For centuries, destruction has been brought about by fires and other cataclysms, natural as well as man-made. The risk factors for the threats of degradation should be either restricted or eliminated. One of the most dramatic forms of destruction of the urban fabric and form took place in Europe in the first half of the 20th century. The two great world wars left their marks all over the Old Continent in form of massive destruction. In Poland, both the heritage preservation services and the society quickly got involved in the effort of painstaking rebuilding and reconstructing of what was left after World War I. After 1939, however, the Polish cities and towns were further destroyed due to the outbreak and progress of World War II. In Warsaw solely, between October 1944 and January 1945, the German destruction troops, (*Technische Nothilfe*) wiped out about 30 of the antebellum buildings in the left-bank part of the city, and at the end of the war, 85 of the whole city was obliterated. Destruction on a similar scale was observed in Gdansk, where 80 of the historic city centre was annihilated, and in Wroclaw, with 68 of the city left in ruins. The rebuilding and reconstruction of the cities practically erased from the ground started after 1945. In five years' time, Warsaw rose from ruins, like a Phoenix from the ashes. Destroyed in 85 , the Old Town was rebuilt and reconstructed owing to the determination and involvement of the nation. Fortunately, Krakow did not suffer the fate of Warsaw, Gdansk and Wroclaw. The city survived, and all its authentic medieval architecture as well as the buildings representing other styles remained intact due to the function the city performed during the war. Krakow was then made the capital of the General Government, an administrative district under the Nazi authority, where the occupying army was stationed.
In the course of the lengthy and ongoing rebuilding and reconstruction process, contemporary civilisation threats and challenges of the new era have emerged, which the authorities of the Polish cities have to face and deal with. Nowadays, degradation is, all in all, related to a positive process of general development. However, the process can cause significant harm to the historic fabric and forms or even result in other means of destruction of the urban structure, particularly when left uncontrolled. Moreover, the inclusion of the cultural heritage protection in the policies of the EU Member States, aimed at the global issue of sustainable development, constitutes another problem. The policies related to the idea of sustainable development bring new opportunities of promoting heritage in the dynamically developing European cities, also in Poland, in Krakow and Warsaw, among others.

3. The issue of contemporary degradation and the practices for the protection of the World Cultural Heritage in Poland

In the era of world globalisation and urban development, there are many threats and other negative phenomena which have a detrimental impact on the process of preservation of various historic sites, including the world's unique properties. The central urban location of the World Heritage-listed properties, constituting the vibrant heart of the city, plays a significant role in attracting both tourists and the inhabitants of the area. Aware of the valuable locations of their historic properties, the society has started recovering unique sites and interiors and utilising them for commercial purposes. For this reason, a growing number of residential functions have given way to purely commercial features. Shops, galleries, restaurants and bars and the like, geared towards tourists mainly and the inhabitants of the remaining districts, are being moved to the ground floors or even the whole buildings.
The whole process started in the 1990's of the 20th century in Krakow, the mecca of the Polish culture and tourism. The magic of the city does not only originate from its beautiful churches, but also from the phenomenon of the Krakow tenement houses, the buildings which have been given their second life. The beautiful authentic medieval vaulted cellars have become unusual targets of conversion and adaptation works. Discovered, uncovered and cleared of rubble and debris, they have been altered into new functions, which makes them the main tourist attractions.
The tenement house at 35 Grodzka Street was one of the first buildings of that kind. After the purchase in 1990, the new owner immediately started the restoration and maintenance, preservation as well as adaptation works. The vaulted cellars were altered to meet the new restaurant functions. The conversion and adaptation works conducted in the magnificent 14th-century Gothic interiors of the tenement house, recreating the atmosphere of the medieval Krakow, belong to the earliest, if not the first, preservation interventions of such kind. Previously the residents' storage spaces, the impressive 14th-century vaults have become a well-known restaurant in Krakow. The unique atmosphere of the *Under the Angels* restaurant has grown into the culinary and cultural tradition of the city and spread quickly all over Poland. Now, the restaurant attracts guests from every part of the world.[10, p. 80]
Such projects soon resulted in the creation of a series of similar functions. Since that time, conversion and adaptation works have become a common preservation practice. At the beginning, single

tenement houses in prestigious locations were selected to be restored and maintained as well as converted and adapted. However, with time, such practices have been expanded to embrace vast historic architectural urban ensembles and sites.

Successful as they are, such practices may bring about the risk of an irrevocable loss of the unique structure of the city due to the tendency to focus entirely on profit-making. The shift towards improper trends, resulting from the lack of proper knowledge and awareness of the significance of urban architectural concepts, reveals the double nature of the process of adapting historic buildings to new functions. In the light of both the positive and negative effects of the conversion practices, special measures have been taken to improve the situation.

Since the end of the 20th century, and the beginning of the 21st century in particular, Poland has been designing redevelopment programmes aimed at historic buildings and monuments, which can be synchronised with sustainable urban development. The programmes vary in scale, from regional, through local to urban ones, which are further divided into the projects concerning city centres or the Old Towns solely. The preservation of the historic and cultural heritage is the priority of all the programmes, and the methodically implemented policy seeks to promote cities by creating a new shape of their historic centres. With reference to the programmes, smaller smart projects are designed, and their scale facilitates a better control both over the preservation works conducted as a part of the redevelopment investments and the further elaboration on the World Heritage-listed properties. The smaller scale also enables a more meticulous, 'expertise" approach which brings benefits to the historic properties. Based on the analysis of the needs and the scale of the undertaken redevelopment operations, an idea of regulating all the redevelopment practices was born in Poland. The *Urban Redevelopment Act* came into force on 9th October, 2015.[11]

The World Heritage-listed historic properties are not threatened with degradation. However, this does not mean threats can be disregarded and should not be predicted. Therefore, special projects and programmes, aimed at enhanced protection of such historic properties as well as utilisation of their potential, are devised. The plans should anticipate the impact of various development operations conducted on a large scale in the fields of infrastructure, urban planning and construction engineering. One of the main and serious threats is the improperly stimulated, excessive or incompatible tourism. The World Heritage-listed historic properties are particularly threatened with devastation and degradation by tourism due to such practices.

Despite its positive influence on the local economy, cultural tourism should therefore be approached as a potential risk factor[12] mainly due to its commercial aspects. Also, the excessive concentration of tourists in certain areas can grossly affect the historic properties[13] [14, p.7]. The increasing commercial approach turns the cultural heritage into a "tourist product". This must never be allowed. The commercial risk factor should be eliminated, and the best way to achieve success in the contemporary protection of cultural heritage is spatial planning of the historic districts. The directions of all the operations performed within the areas of cultural heritage as well as their protection largely depend on the plans and projects which should enable the proper management of such areas. The authors of the plans and projects ought to recognise the stimulating function of a cultural heritage site and utilise it for the development of a given area and city by means of modern methods.

Undertaking the proper course of action, aimed at reducing the negative phenomena and implementing sustainable development, is the prior objective of all the programmes created currently. In Krakow, for instance, in 2003, *A Stud□ of Spatial Development Conditions and Directions for the Cit□ of □ra□ow*, serving as the basis for the development plans of districts and other urban areas, was signed off. In 2008, *A Municipal Revitalisation Programme for □ra□ow*[**15**], concerning the Old Town primarily, was created. In 2014, in Warsaw, *The Concept of Integrated Sustainable Development Programme for the Cit□ of □ arsaw till □0□□*[16], relating to the *Local Revitalisation Programme for the Cit□ of □ arsaw* from 2005-2013 and continuing its revitalisation operations, was issued. In addition to all those, the municipal authorities prepared *A Management Plan for the □istoric Centre of □ arsaw*[17].

Since the beginning of the 21st century, important documents embracing and updating the constantly changing preservation doctrine have been prepared. The doctrine emphasises the significance of the subjective, not objective, approach to historic buildings and monuments[14, p. 8] and the society's responsibility for the identification as well as the management of their heritage. The attempts to solve the new problems made in the new century are starting to take the proper form and direction. The Polish historic properties of Krakow and Warsaw inscribed on the World Heritage List are the best and the most obvious reflection of the efforts.

4. The presentation of the witnesses to history in Warsaw and Krakow

Among the Polish historic properties inscribed on the World Heritage List there are two important cities, Warsaw and Krakow. A significant difference between the cities lies in their history. Krakow is an important city with a medieval history and a variety of historic buildings and monuments. Warsaw, on the other hand, has a great history behind its reconstructed buildings and monuments. The

comparison of these two sites is interesting, because they reflect two different approaches to the issues of presentation of history as well as preservation and maintenance of historic properties.
My objective is to demonstrate the latest completed projects of in-situ museums. I would also like to focus on the new approach to presenting the history of both the authentic and the rebuilt urban fibre and form, with reference to Krakow and Warsaw, respectively. In the two cases, large-scale management plans serve as a basis for small-scale projects, which are created and then implemented by the appointed preservation offices. Since interests lie in the Old Towns' vaults cellars, they are transformed into a tourist attraction by means of a variety of state-of-the-art technologies, including multimedia. In this way, in Krakow, "the Rynek Underground" museum (the Main Market Square Underground Museum) was created. This underground tourist route around the stone and brick vaulted cellars of the old trading sites, with a permanent exhibition entitled *Tracing the European Identit of ra ow*, is a genuine treasure trove of information on the history of Krakow. In Warsaw, the Old Town's Heritage Interpretation Centre was opened. The museum literally marks the beginning of the cultural route of the Old Town's vaulted cellars, and holds a permanent exhibition depicting the Old Town as a historic ensemble inscribed on the UNESCO World Heritage List.

4.1. Krakow

In the 21st century, the range of the Krakow vaults open to tourists have grown larger as a result of incorporating the western part lying beneath the Main Market Square. On the 24th September, 2010, an underground route around the stone and brick vaulted cellars of the old trading sites was made accessible to tourists. The idea of the new museum had been born five years prior to the event. In 2005-2010, pavement replacement works were conducted in the Main Market Square. This opportune time was used for large-scale archaeological research, in the course of which interesting discoveries related to the history of the place were made[18].
The concept of exposing the artefacts of Krakow and making the results of the research work available to people was an inherent part of the APPEAR Project[19] (*Accessibilit Pro ects Sustainable Preservation and Enhancement of Urban Subsoil Archaeological Remains*[20, p. 7]). The Museum of the Forum of Caesaraugusta in Saragossa, so far, one of the greatest European projects aimed at bringing archaeological artefacts to the society, served as the model for the Krakow project. The Saragossa project was carried out with the support of the European Union and under the expertise of ICOMOS. The Museum of the Forum of Caesaraugusta is located underneath the square of La Seo (the cathedral) and displays archaeological remains from the old Roman Forum by means of multimedia. The museum encompasses a large area between the exposed ancient walls, the public baths, the forum, the theatre and the river harbour, joined together by the Route of Caesaraugusta. The main objective of the Krakow project was to create an easily accessible museum with an educational space. Generally understood education, offered to a variety of target groups, including schools, families, tourists and senior citizens, was at the heart of the concept.[21, p. 73] In addition to the APPEAR Project, the Krakow "the Rynek Underground" [22] museum (the Main Market Square Underground Museum) was based on the heritage preservation and management model designed in accordance with the principles of the 'restoration project'[23, p. 64]. Also, the approved project of the Historical Museum of the City of Krakow's exhibition, '*ra ow – a Cit Founded under the Magdeburg Law*', was the starting point of the project in question. It envisaged the restoration of the original architecture of the vaulted chambers on the western and eastern sides of the northern part of the Cloth Hall's vaults as well as their connection to the newly explored archaeological passage 'Under the Cross'.
Having descended four metres below the current level of the Main Market Square, the visitors can experience a journey in time and space to the medieval Krakow, owing to the multimedia presentations supplemented with educational information displayed on touch-screens. In "the Rynek Underground" project, an underground exhibition of the remains of historic buildings was created, showing various artefacts of the medieval market square. These include, among others, the remains of the foundations and the old ground floor areas of the demolished buildings of the Town Hall, the Kramy Bogate Stalls, as well as the Grand and Little Scales, the stretches of the original pavement together with the timber components of transport routes, the fragments of water supply devices and the objects of everyday use excavated there. A reconstructed medieval burial site and a model of the centre of Krakow, surrounded with curtain walls and a moat, are also exhibited. The museum offers guided tours for children, teenagers and elderly people. The youngest guests have the opportunity to visit the reconstructed blacksmith's forge and goldsmith's workshop, enjoy their participation in live craft demonstrations there and get immersed in the world of medieval jobs by using the touch-screens in one of the corridors along the route. Finally, with the children in mind, a special educational multimedia playroom was designed, featuring the Krakow Legend which tells the story of the creation of the city.
In order to create a modern exhibition centre, in the northern annex a state-of-the-art reception room was designed. It comprises an information office, an administration area, a cloakroom, toilets and

retail shops with books, multimedia, maps and plans, souvenirs and the Cracoviana in offer. During the realisation of the project, a modern material, distinct from the authentic one, was used. The material merges well with the dark interiors, in which only the exhibits are flooded with light.

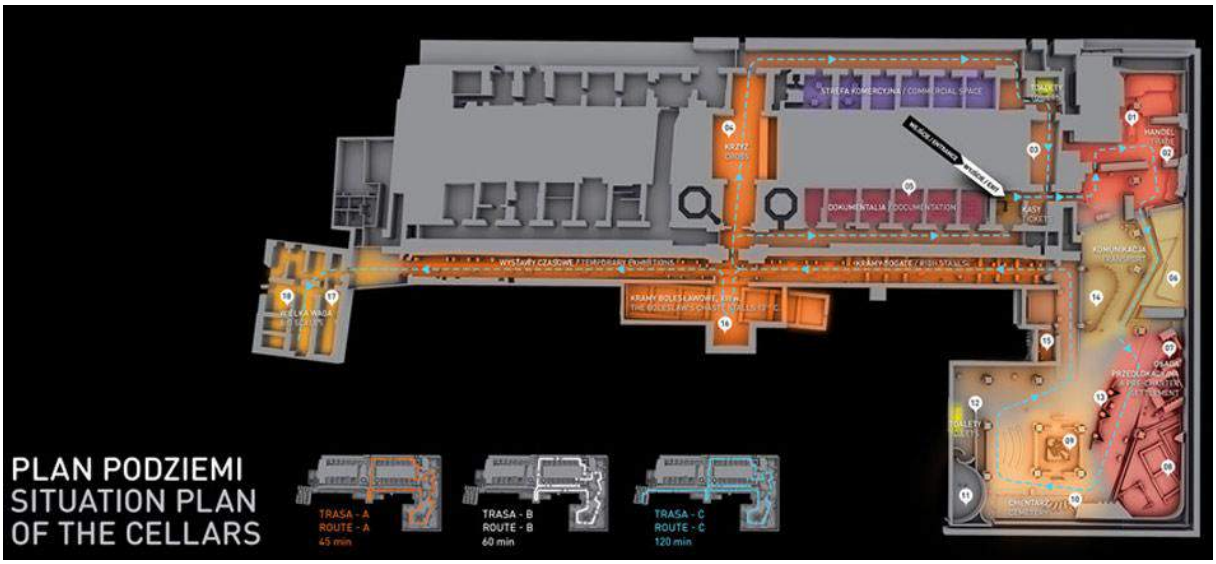

Fig. 1. "The Rynek Underground" – Situation Plan of The Cellars [22]

Fig. 2. "The Rynek Underground" – the model of the old city of Krakow [22]

Fig. 3. "The Rynek Underground" – the view through the skylight of the church of St. Mary, foto author

4.2 Warsaw

In the capital of Poland, where the majority of historic buildings were destroyed during World War II and subsequently rebuilt afterwards, the municipal authorities in cooperation with the preservation services have been committed to two objectives related to the World Heritage-listed properties. One of them is displaying the remains of the authentic urban fabric and form. The other one focuses on combining the exhibition with a presentation of the urban structure, resulting in the development of an up-to-date method of presentation of history, which can be utilised in modern, interactive exhibitions, designed to show history to the public, both the young citizens of Warsaw and numerous tourists, interested in the processes of rebuilding the Old Town.

Since the beginning of the new century, the number of new museums in Warsaw has grown considerably. Some of them have managed to exploit the available potential hidden in the authentic vaults of the Old Town.

Warsaw does not have a uniform body managing the World Heritage Site. Any changes concerning the registered historic properties can only be introduced with the consent of the Warsaw Historic Preservation Officer acting on behalf of the Mayor of Warsaw, to whom all the powers have been conferred by agreement. In addition to the Management Plan of the Historic Centre of Warsaw, the urban fibre, form and image of Warsaw is built up by means of the Integrated Urban Redevelopment Programme, under which seven projects have been carried out. One of them was the "Renovation and Adaptation of the Old Town Basements for Cultural Purposes at the Area Inscribed on the UNESCO World Heritage List". In order to carry out the project, a nine-member Team was appointed at the Warsaw Historic Preservation Office at the end of 2004. [24] [25]

The protection of the European heritage is the focal issue of the project. What follows is the process of its preservation and renovation. The creation of sites for cultural tourism in the historic cities of Poland plays a significant role in this process. The project involved the renovation of five cellars located at Boleść 2, Brzozowa 11/13, Jezuicka 4, Rynek 2, Rynek 28-42 and Nowomiejska 4-8. All of them were converted and adapted for cultural purposes, such as the Exhibition of History and Rebuilding of the Old Town or the Route of the Old Town Cultural Basements. Moreover, the Old Town's Heritage Interpretation Centre and the Tourist Information Office were created.
Although the conversion of the vaulted cellars has a common objective, the differences between the cellars concern their locations, investors and the functions they perform. The cellars at Rynek 2 have been adapted to the statutory activities of the Old Town Culture Club. The former café was converted into a literary club, where sessions with writers and book promotions are held. In addition, the place is equipped with audio systems and a stage that can be lowered so as to accommodate concerts there. All of those were designed in a space cleared of rubble and debris, where an authentic stone and brick wall with the blocked original window and door openings were exposed. In order to exhibit the remains of the foundation walls and tiles, a glass floor was designed and built above.
The Warsaw Cultural Education Centre is the investor of two other objects. The cellars at Jezuicka 4 have been adapted to meet the needs of young amateur artists who can now exhibit their works there. The cellar spaces accommodate well equipped specialist sculpture and photography ateliers, and the works created there are shown in an exhibition room. The large size of the vaulted cellars facilitated the design of two state-of-the-art concert halls for about 50 people each.
The very same investor has had a larger architectural object, the Old Gunpowder House at Boleść 2, adapted to suit the purpose. In the building surrounded by a "moat", a theatre hall, 'the Kazamaty Stage', a literary café and a reading room were designed. The function of the object was extended over the area around it, where a naturally shaped scarp was converted into a summer stage amphitheatre.
The Historical Museum of Warsaw is the investor at Rynek Starego Miasta 28/42, where the Museum of Warsaw is based. The renovation works conducted in the building resulted in the enlargement of its floor area and enabled the creation of a new, attractive exhibition space. The architecturally diverse cellars were turned into exhibition rooms. In the "new" rooms, the exhibition of the earliest history of Warsaw, displaying a variety of moveable archaeological finds, is located. As it has been done in Krakow, an exhibition entitled 'the Warsaw Legends', aimed at the youngest visitors, is to be opened. The conversion and adaptation of the cellars was followed by the renovation of the elevations of the tenement houses at the Market Square frontage. The choice of the colours for the tenement houses was the result of long stratigraphic analyses of the plaster samples bearing the traces of original paints and the history of alterations. All the meticulous efforts helped to restore the original appearance of the facades.

At Brzozowa 11/13, the former boiler plant and garages have been converted into the Old Town's Heritage Interpretation Centre, an interesting project with a permanent exhibition. The project was carried out in cooperation with the Historical Museum. It revolves around the idea of a presentation of the history of Warsaw before and after World War II in a broader sense, with the focus on the scale of the wartime damage and destruction as well as the city form after the rebuilding, reconstruction and restoration. The presentation of history also includes the reasons for and the process of the inscription of the reconstructed Old Town on the UNESCO World Heritage List. The exhibition displays authentic documents of the destroyed buildings, the reconstruction and restoration documents, various historic projects, plans and numerous photographs. Since the Old Town's Heritage Interpretation Centre aims at documenting and visualising the complex reconstruction and restoration programme implemented in Warsaw after World War II, it is of immense educational value, particularly to the young generation, who are led to understand and appreciate its scale and significance. The Centre provides the visitors with a new educational formula. In one of the rooms, a 1:180 model of the Old Town is placed under a glass floor. The young visitors can learn the history of Warsaw owing to modern teaching aids, such as jigsaw puzzles or miniature facades of the tenement houses. The Centre also accommodates the needs of the disabled and the visually impaired visitors. Special platforms are installed as well as captions in Braille are provided for the exhibits. Last but not least, the Centre has a Tourist Information Office, the objective of which is to promote the Route of the Old Town Cultural Basements. The exhibition in the Old Town's Heritage Interpretation Centre is combined with the presentation exhibited in the Royal Castle, which is also dedicated to the wartime damage and destruction and the lengthy process of rebuilding, reconstruction and restoration of the historic building.[26]

5. **Conclusion**

The new projects and exhibitions in Krakow and Warsaw are significant examples of well-designed presentation tools, using the latest exhibition systems, employed in the historic properties inscribed on the UNESCO World Heritage List. The APPEAR Project, embracing a set of practices related to

preservation, interpretation, exposition and utilisation of archaeological relicts, incorporating their release to the public, is pivotal to the idea of the projects at hand. Moreover, the museums conform to the contemporary standards of the historic heritage protection. Since they constitute social goods with a global significance, they are not the sole property of the state, and the society holds the right to equal access to them. Therefore, the entity protecting them has the duty to popularise the social goods among the general public as well as shape and display them in increasingly more attractive ways in the urban and social space, in consultation with the recipients – the society.

Fig. 4. Warsaw – The UNESCO World Heritage place with cellars in Old Town

Fig. 5. Warsaw – presentation of history in museum

Fig. 6. Warsaw - At Brzozowa 11/13, the Old Town's Heritage Interpretation Centre

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3D modeling of Pompeii amphitheater. Preliminary critical considerations

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Abstract
This abstract continues the discussion of the research presented at the last year's Forum about some important activities carried out within the archaeological site of Pompeii. In particular, the study introduces survey, analysis and modeling activities performed for the amphitheatre, combining the themes of knowledge of a cultural site of great value with the aspects of the conservation and safeguarding of degraded heritage.
The *Spectacula* of Pompeii, erected shortly after 80 B.C., is one of the most homogeneous buildings and better dating of Pompeii through the inscription that commemorates the construction (C.I.L., x, 852). The amphitheater of Pompeii, suitable for performances held there but not monumental, is the evolution of the architectural type of the amphitheater from false wooden construction to stable stone structure. Not changed nor extended by the consolidation restorations made after the earthquake of 62 A.D., the Pompeian amphitheater for its age is the oldest amphitheater architecture building.
The complex spatial configuration of both elevation elements and underground spaces has allowed some significant geometrical and critical considerations that frame the construction techniques, as well as the following consolidation and restoration works. Specifically, the geometric analysis involved the identification of the planimetric shape, the slope of the stands and tiers, as well as assessments on the three-dimensional configuration of the auditorium space.

Keywords: amphitheater, Pompeii, survey, analysis, 3D modeling

1. Introduction (Carmine Gambardella)
This monographic study continues the research presented at the previous Forum focused on a critical comparison between the various technical and scientific integrated digital survey steps applied to three case studies within the boundary of the archaeological site of Pompeii - the Amphitheatre, the Villa dei Misteri and the Torre di Mercurio - which are emblematic for construction and excavation dating, for historical and artistic importance, for material composition, for architectural morphology.

Fig. 1: Pompeii amphitheatre: panoramic view.

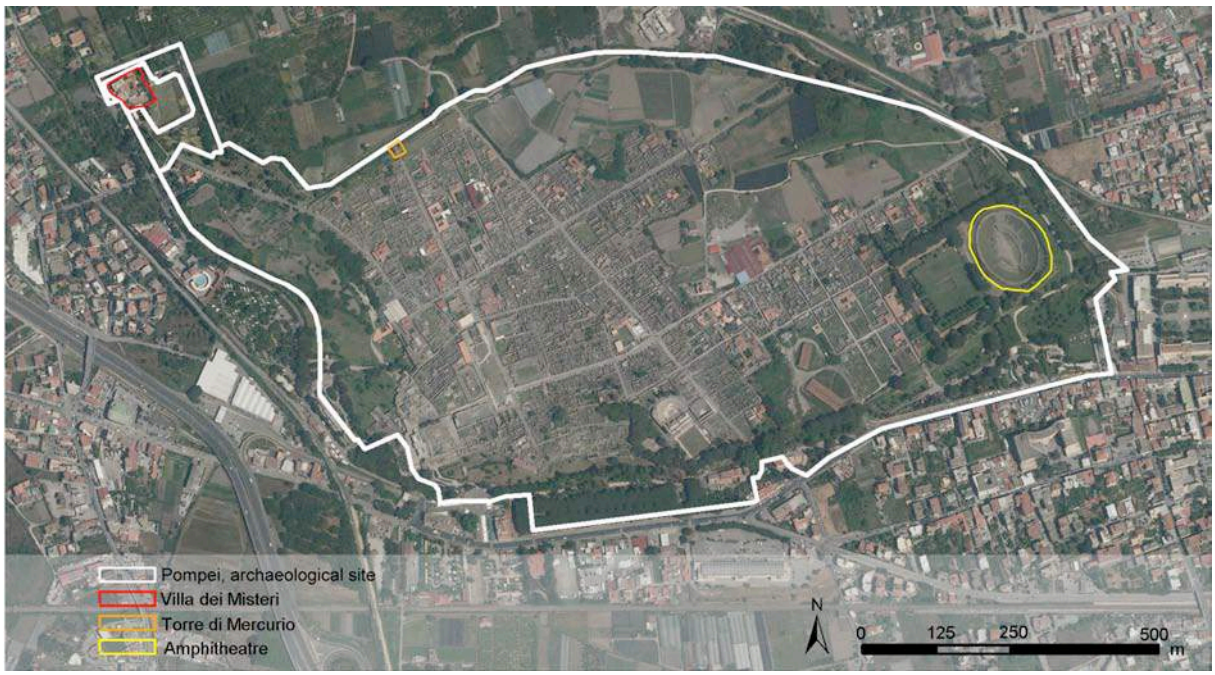

Fig. 2: Three case studies within the boundary of the archaeological site of Pompeii.

Fig. 3: Pompeii amphitheatre: underground ambulatory, main entrance, auditorium during 3D laser scanning activities and topographical survey by total station.

In particular, attention is directed exclusively to the amphitheater for which critical remarks were made in order to its configurative geometry on surveyed points with a considerable accuracy. This building was the subject of the integrated digital survey by applying 3D laser scanning sensors, GNSS topographic and close-range photogrammetric terrestrial and by drone aimed at the geometric and morphological characterization of each architecture. In particular, whereas the Amphitheatre is a large concave building, walkable along concentric paths on three significant levels at least, the survey was structured: to divide the building into homogeneous architectural sectors, corresponding to the same macro-scanning projects; to use two laser scanners Faro CAM2 and one total station. From the 3d model, following the phase of post processing of the data acquired as described above, useful information to intercept significant points of the amphitheater were extracted in order to understand, to learn and to investigate the complex geometry of the auditorium, the direction of the stairs crossing and reaching the different parts of the theatre space, such as the shape of the corridor below the auditorium itself; and also it is important to study the auditorium's slope in relation to the visibility inside the different parts of the theatre, or to study the trend of the tiers according to the problems of cutting of stones and other materials used for the construction. As it regards the planimetric shape of the amphitheater built from the outer wall from which then starts the construction of the internal parts of the auditorium, layout tracking of the external shape was dependent on the tracing of the geometry of successive internal parts. In fact, the tracking of the ellipse is much more laborious although operationally, especially for large curves, presents problems similar to those of the oval. The oval has however the advantage to be simply described by concentric curves (substantial problem for the bleachers) as well as a simplification in the preparation of stone that constitute the structure.
The above mentioned steps of analysis and knowledge of the amphitheater, from the 3d model surveyed through the extraction and analysis of significant horizontal and vertical sections, differ from experiences in other contexts and described by the scientific literature. This method does not limit the

study to interior and exterior stereometry of the building, to the simple form derived from projections on a plane, but deepening the study of the formal complexity of an architectural product declined in a multidimensional system for knowledge, protection, structural behavior and forecasting scenarios for recovery and modification of cultural heritage.

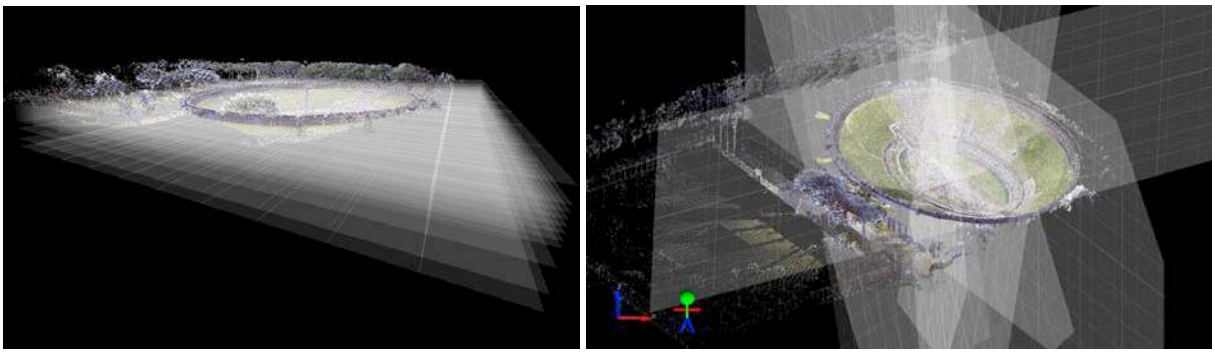

Fig. 4: 3D laser scanner model sectioned with horizontal plans (left) and vertical ones (right).

2. The *Spectacula* from wooden rectangle of stone ellipse (Nicola Pisacane)

The amphitheatre of Pompeii was built in the period immediately following the dictatorship of Sulla (82-79 b.C.), which put an end to the social upheaval due to civil wars, and in particular in conjunction with the foundation of numerous colonies of veterans. The architectural style of the amphitheatre, unknown to the Hellenic world, was introduced in the Roman Empire in order to give to colonies a permanent space for gladiator fights that, as events celebrated in the occasion of funerals, had become usual performances. The exponential development of gladiatorial games was recorded in Campania earlier than in other regions. From Campania, in fact, come the first evidence of stable masonry amphitheatres in Cuma, Capua, Pozzuoli and Pompeii dating from the middle of the second century b.C. and built directly on the ground and lying on the side of a slope, according to the logic of the Greek theaters. In Campania, where, as mentioned, the *ludi gladiatorii* (gladiatorial games) were perfected, there was the evolution of the architectural type of the amphitheatre from a mobile wooden construction to a stable structure in stone, of which the *Pompeii Spectacula* is for its age the oldest amphitheatre built in masonry. If in Campania are built amphitheaters stable in stone, in other regions, depending on availability of materials which offered the territory, the availability of money and the importance and solemnity of the gladiatorial games, they continued to make wooden and/or masonry amphitheatres. There are socio-economic causes that favoured the experimental building of the amphitheatre type in the Campania more than elsewhere, particularly in some of the military colonies and Romanized city, as Capua, Cuma, Pozzuoli and Pompeii which enjoy a strong cultural identity and of historical importance that has its roots in the Greek period and until the end of the fifth century. The commercial momentum and economic recovery of these cities by the end of the second century b.C. depended in part by the activity of "*negotiatores*", merchants belonging to the Roman ruling class that in the wake of Roman rule in these territories, based flourishing commercial activity in the eastern Mediterranean succeeding in some cases to monopolize trade with Italy; in part by the strategic geographical location of these centers crossed by all the main networks, such as the *Via Appia* linking Rome to Brindisi (the most important port of the whole of Greek and eastern area) passing through Capua, the *Via Latina* that was grafted to Casilinum, the *Via Popilia* that was inserted just through East direction from Capua, and the *Via consularis Puteolis-Capuam*, which linked Capua to Puteoli, the *Via Puteolis-Neapolim*. Among these, Pompei, Cuma and Sinuessa stand out among the other Campanian centers also important ports for harbor and commercial activities. The flourishing economic and commercial recovery of these centers favored the resumption of cultural activity. It is through cultural activities that Rome, which is faced with the difficulty of managing the strong historical identity of these military colonies and cities Romanized, manages to maintain control using for political purposes gladiator games and allowing the creation of an appropriate space , the amphitheater, for their implementation.

The term ‘amphitheater’, appears for the first time in imperial times, long after the appearance of the building that was built for the games gladiatorial defined *Spectacula*, as stated in the famous inscription that commemorates the construction. With amphitheater define those buildings to the Roman creation oval/elliptical plant that develop from the end of the second century b.C., reaching a monumental appearance during the imperial age and hosting gladiator fights (*munera*) and animals (*venationes*). Define the genesis of the amphitheater shape is not easy, mainly because of the lack of documentation on the transition from temporary What to do in the *Forum Romanum* wood, the oval/elliptical canonical stable of masonry buildings. Therefore, the *Forum Romanum* is the geometric prototype which should emanate the amphitheater form that seems to originate from a progressive

adaptation of rectangular areas, in the context of civic holes, for strictly functional nature motifs. The corners in the rectangular spaces away the action that takes place inside the amphitheater by the spectators; cutting or smoothing out the corners comes naturally to softer shape of the ellipse/oval, which might be defined as an elongated circle, or a circle with a tendency to linearity that best suits the diverse nature of events performed in the amphitheater, the shows for which it prefers a centric arena, and processions that require, however, a linear development of space. In general, in the amphitheater of Pompeii, you can seize the start of the operation mode of the arenas: the lack of an external porch; the stairs to the *summa cavea* resting outside and not set in the thick of the auditorium; the upper gallery limited to a series of boxes and of small doors arched; the lack of underground arena reserved more gladiatorial duels that hunts fairs and, finally, the ellipse of the auditorium built as a duplication of the auditorium of a theater. The verification of the elliptical amphitheater floor plan, already partly exposed in last year's paper, continued and extended to multiple horizontal plane sections of the amphitheater and exposed in this essay. The changes and the transformations that the building had over the centuries, suggested the research on the determination of the amphitheater's shape in several points. Specifically, the planimetric shape was analyzed from sections at different heights, so that from these sections the investigation could continue on vertical structures. The geometric investigations on vertical walls was possible because most of them, is original within specific architectural details that were lost due the eruption, or were looted in the years after AD 79 because the summit parts of 'Amphitheatre were the only ones to remain exposed after the catastrophe. These assessments are also confirmed in many historical iconographies. Among the first images of the Amphitheatre after the archaeological excavation, there are some gouaches representing the building, from "*Via Castricio*" (at the corner of The *Palaestra*). The graphical technique used and image purposes (they were marketed as souvenirs for visitors to the excavations) allow to have a true representation of the scene at the time, less than marginal details that were used to give a picturesque feel to the ruins. In gouaches reference, in fact, we see the double staircase, and the system of perimeter arches, partly ruined. The upper part of the *cavea* is largely non-existent precisely because those structures were the most slender, and were not fully covered by the eruption. This summit area and perimeter arches were restored in the second half of the twentieth century. The most suitable method for the elliptical shape's verification was Blaise Pascal's theorem, applied to five horizontal cross-sections of the auditorium at 14.0m, 18.9m, 23.0m and 28.0m and of hypogeum level at 17.0m over the WGS 84 model, and obtained crossing the mesh model of the amphitheatre, made from point clouds data. The theorem was published in 1640 by Blasie Pascal into the "*Essay pour les coniques*" dedicated to the principles and graphical results of any parabola, ellipse or hyperbole "*d'une manière plus universelle qu'à l'ordinaire*". In particular, this theorem defines the mystical properties of any hexagon inscribed in a conic.

Both the stands' planimetric system, and the four branches' shape of the underground corridor were analysed by choosing six random points not too close together, along the cross-section profile. Compared to these points a hexagon was built for each horizontal section. These hexagons should not necessarily be convex, as Leibniz pointed out in 1676 in his note to the theorem *(De Exagrammo mystico et conico)*, but the sides joining its vertices will also intersect each other.

For all the above five sections occurred the alignment of the three intersection points of the hexagon sides, which join two by two. The sections therefore are elliptical. Subsequent investigation steps allowed the determination of the points, and significant elements of the ellipses. In particular, the use of geometrical homology, and the application of the principles of planar polarity allowed the determination of the center of the ellipses. The same projective rules also allowed the identification of major and minor axes of the ellipse, and from these the foci (focal points) were determined for each of the elliptical sections.

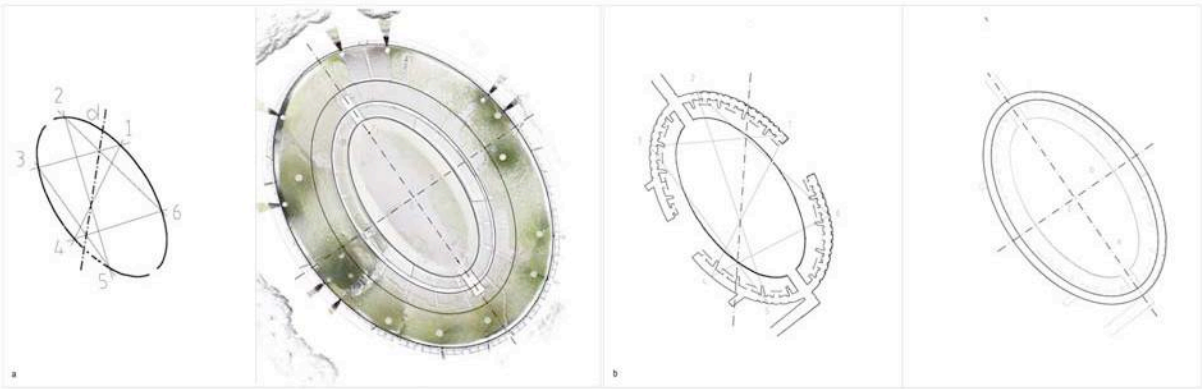

Fig. 5: Application of the Pascal's theorem and main elements of auditorium (left) and underground spaces (right).is important for our growth.

3. An integrated analysis of the amphitheater from the underground spaces to the auditorium (Alessandra Avella)

The amphitheater of Pompeii was built laying off center at the south-eastern boundary of the archaeological site near the fortified walls, specifically in an area of the ancient city outlying and still not occupied by buildings in the years when was erected. The building, therefore, uses the eastern corner of the city walls, reinforced inside by the *agger* (embankment), and is obtained by half in the embankment. The principles of the ancient method of consolidation by the *agger*, are in a way adapted to the needs of the construction of the amphitheater and to the rational use of what the environment provides. The construction on the embankment of the amphitheatres is not typologically earlier than masonry construction. In relation to the topographical situation and it means that you could have for the realization of amphitheater architecture was chosen one form or the other. It is for this reason that there are amphitheaters on the embankment belonging to the second century AD and masonry amphitheatres belonging to the same age. In general, the amphitheaters that belong to military contexts were built in most cases on the embankment, while those that belong to urban contexts were built mainly of stone.

The location off center of the amphitheater of Pompeii in the corner of the fortified walls, on one side facilitated the inflow and outflow of spectators on performance days, through the nearby 'Nocera' gate, on the other enabled a considerable saving in building costs, exploiting for the substructure of the auditorium a large tract consists of the embankment. At the same time, the construction on the embankment means that, of the two access archways to the arena, located at the end of the major axis, only the one to North side can follow in a straight line the same axis, while the other one to South side must, because of the fortified walls, bending at a right angle to the West. These access archways, 5 m wide, are made in *opus incertum* and in the typical reticulated dating back to Silla, paved and with a considerable slope in order to bridge the height difference between the ground level and the arena, realized through the removal of a large amount of terrain. The arena and the exterior of the building are connected by a narrow passage, which is accessed from the Libitinense gate on the western side at the minor axis of the ellipse. This gate was used to transport the dead out of the arena. When the arena is excavated to a much lower level than the surrounding level, the exterior of the monument is of course more modest. This does not occur in Pompeii where the embankment is supported for half by the city wall, and for the other half by a circular wall reinforced by masonry supports, connected to one another by 62 stone blind arcades, with walls made of *opus incertum* and in the typical reticulated dating back to Silla that give the monument a monumentality and a dynamic movement that is not always located within the static and triumphant magnificence of the amphitheatres of the imperial age.

On the free half of the ellipse two double flight stairs and two simple stairs, leaning against the circular wall at the south-west and north-east side of the amphitheater, leading to a terrace placed at the same height of the city walls, from which by 40 gates you can reach the inside of the amphitheater. The seats reserved for spectators were divided into many horizontal sections called *maeniana*. Between the first *maenianum* and the arena ran all the way around, like a huge ring, the *podium* or terrace intended to support the seats reserved to the authorities; the front wall of the *podium* went up and in an arena perpendicularly to a height of about two meters and was decorated with frescoes, today lost, depicting fights between gladiators. The different *maeniana* are separated from each other in a horizontal direction through open passages, called *praecinctiones*, in the vertical direction through walls, called *baltei*, that have a similar appearance to that of the front wall of the *podium*.

Between the first and second *maenianum* you could be accessed through the external stairs that divide the amphitheater into wedges. The *ima cavea* is divided into 18 wedges and includes 5 steps files; these steps are interrupted, in the middle of the longer sides of the ellipse, by two large terraces with 4 shallow and wide steps for the authorities chairs; on the east side (the corresponding place on the other side is destroyed), the second of the four steps is interrupted in the middle by a space of 3 meters reserved for magistrates who presided over the games and those that offered the show; the *media cavea* is divided into 20 wedges and twelve files of steps; the *summa cavea* was divided into 40 wedges with 18 steps to the top of which are recognizable remains of a wall in *opus incertum*, perhaps a remnant of accommodation in this part of the *cavea*. The bleachers currently visible, made by original stone material, had a decreasing slope from *ima cavea*, reserved for important people of the city, to the *media cavea* reserved to the people and the *summa cavea* reserved for women. Finally, above the upper outer ring remains are recognizable in *opera vittata* of an ambulatory which must be recognized *maenianum summum* reserved for slaves (servants), with only standing room.

In order to define the surface that best describes the shape of the auditorium, an analysis was conducted oriented towards the determination of the geometric rule that presides over the auditorium's partition in "wedges", through the system of the flights' stands.

This study was developed on the point cloud model of the northeastern sector, because it is the only original and fully preserved by the *ima-cavea summa-cavea*. This is documented fortunately in some prints and photographs of the nineteenth century, because most the draftsmen and photographers, choosing the frame with the cavea in the foreground and Mount Vesuvius in the background, had to be

placed on the southern stands. In this way, the sector of the northeast appeared framed in all the images. The comparison between the point cloud model and historical images (especially those by Sommer and Alinari) shows that this sector is intact from the early nineteenth century. The conservation of the Amphitheatre of Pompeii, enabled the investigation on the ellipsis's axes direction, which identify the wedges of the parterre limited to the northern quarter. This original auditorium's system allowed the verification of the flights' direction, projected on the horizontal plane.
These lines, traced for the average points of the ramps in best condition, off on them segments of similar length which radiate from the center of the archway on the elliptical wall at the top of the building until they reach the minor axis common to all the ellipses that define the stands, so for all forty equidistant passage. The rule that these lines follow, refers to the cycloid's construction, but it also refers to the positions that the writing arm follow while moving the elliptical compasses, described by Guidobaldo del Monte. This tool is described into text in two volumes "*Planisphaerium universalium Theorica*" (1579), which illustrates the problem of the projection of the celestial sphere on the plane. In the discussion, Guidubaldo also describes some drawing tools for tracking some curves: circumference of large radius, hyperbole, conchoidal and ellipse. For this last curve, the author refers to the most common construction, called "Gardener's Ellipse". It is possible with a fixed-length rope, bound in its extremes. The construction takes place through the use of a tool known as 'elliptical compass'.
The instrument consists of a set square, and a grooved slide ruler, in which two sliders slide bound to the same square. At the end of the ruler, it is placed a tracer stylus. Aligning squaring the ellipse's axes, it is possible to trace the conical for separate quarters, and in the same way is possible to trace concentric and equidistant ellipses.
The movement made by the ruler tracing refers as said to the graphic construction of the cycloid. This curve was studied by Pascal, who in his essay "*Histoire de la Roulette*" (1658) describes the cycloid's geometrical properties, that for the simplicity of its construction could also be applied in large construction sites. Recalling the title of the book, it is necessary to point out that "*roulette*" is the French term which indicates the cycloid, already known to the Romans who called it "*cycloidis*" or "*trochoidis*". The properties of the axes of the above geometric construction allows to orient the position of the vertical section planes, according to these directions. This in order to evaluate and calculate the slope of the three *cavee*, starting from the inclination of the flights that cross them. Against those plans, it was sectioned the mesh model, and it was verified the gradient of ramps crossing the *ima-cavea*, the *media-cavea* and *summa-cavea*. The plans - not through the vertical axis joining the centres of the ellipses - determine not symmetrical sections. Therefore, the analysis of the sections was performed only on the portion that affects the northern quadrant of the amphitheater. The slope is calculated between the horizontal direction and the direction determined by the intersection between the section of the rises and treads. It verified the constant inclinations for *ima, media* and *summa cavea*.
Further geometric analysis involved the determination of planimetric profile of the ambulatory that runs below *media cavea*. This masonry archway communicates with the outside world through the two main entrances of the arena, and through two corridors that pierced the western side. The construction of barrel vaulted ambulatory as well as the masonry stairways, superimposed planes and above the buttresses with blind arches is made possible thanks to the use of the *opus caementicium* and, in particular, for structures with vaulted roof, also by the use of the structure arched.
The realization of large public buildings, such as amphitheaters, was possible through improvement in technology of the vaults during the second century b.C. by the Romans, as well as the replacement of the unstable wooden structure with stable masonry construction. It should be noted that, since the third century b.C., the use of the masonry arch was one of the most important flywheels of Roman architecture development, which reaches its peak with the construction of one of the largest amphitheaters of the imperial age, the *Colosseum*, where you can still see three tiers of arches supporting the auditorium.

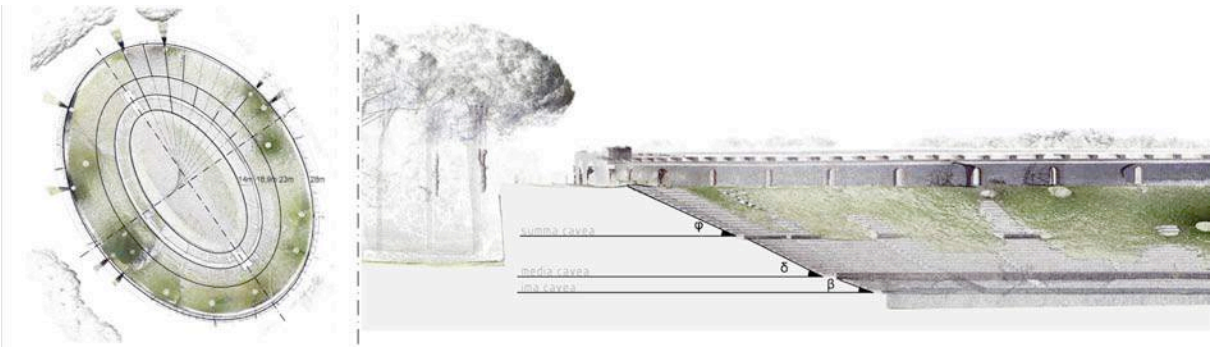

Fig. 6: Geometrical test and evaluation about slope on plan and vertical sections.

This is because the arch, present in many ancient cultures (Egyptian, Babylonian, the Mycenaean, Etruscan) was used by the Romans with consistency and awareness, compared to the ancient contexts in which he was born; roofing systems that utilized both the Egyptians that the Babylonians, are not based on the authentic arches, but on the "pseudo-arches" or "pseudo-vaults" for the nature of the thrusts which arise through the type of roof used. Only the Roman engineers were able to solve the problem of "pushing system", making it a recognizable and essential part of their architecture so much to get to build large vaulted structures like the vault of the Pantheon and the Temple of Diana in Baia.
If we consider that the use of brick arch joins the use of *opus caementicium*, that is a mortar made up of sand and lime, known since the time of the Egyptians and Babylonians but introduced to Europe by the Romans, it is possible understand how the Roman architects were able to take advantage of all types of stone and materials, experiencing endless ways to cut the ashlars and build them, in order to perfect the construction of the vaults. These vaults were built, especially in monumental buildings such as the amphitheater, through the centering, that is a sturdy wooden support tracing exactly the profile of the vertical section of the vaulted roof of the ambulatory.
The ambulatory curve that runs below the *media cavea* has been verified by a similar process described in the previous paragraph. In fact, the application of Pascal's theorem to six randomly chosen points on the profile of the outer wall of the underground corridor, have drawn a hexagon with the opposite sides which intersect with respect to three points aligned in a straight line.

4. The amphitheater shape from the iconography to identification of its geometric surface (Pasquale Argenziano)

The "*Spectacula"* is the largest public building in this city, and for its majesty exceeded in importance compared to the role of an average provincial town, which was Pompeii. The building, in fact, was designed for about 20,000 spectators, of course, considering the inflow of visitors from neighbouring towns, for example among these were the veterans of Sulla, residents in the surrounding area (Avellino or Nola). The current appearance of the amphitheater is the result of various natural and man-made actions, that occurred in the course of approximately 2000 years, from 70 BC (construction date) until the 70s of the Twentieth century, during which the most significant restoration works were completed. During this large period, the amphitheater was severely damaged in the earthquake of 62 A.D. - that strongly hit Pompeii and the Vesuvian region - and the eruption of AD 79.
Some of the damage caused by the earthquake had not yet been repaired at the eruption time. Among the three buildings used for public performances, only the amphitheater was usable again few years from the earthquake, thanks to a consolidation program. The majority of seismic damages of public and private buildings in Pompeii, were repaired using the clay brick, widely available for cheapness and speed of production, besides for the combining flexibility with the blocks of tuff or limestone. In the amphitheater, the clay brick was used mainly for the buttresses and the reinforcing arches of the entrance ambulatory to the arena. The size of the bricks in fact very well matched to model the reinforcement structures of the bowed architectural elements. The interventions conducted by C. Cuspius Pansa (father and son) - after the earthquake - modified the original appearance of the amphitheater, as it is possible see in comparison with the famous fresco representing the fight between Nocerians and Pompeians. This fresco - dated to 59 A.D. - was found in the garden of the house I.3.23. The obvious differences concern the arena parapet, and the series of arches of the summit the *cavea* sector, besides the brick buttresses already mentioned. In the fresco, the arena parapet, appears decorated with faux marble painting, while at the time of the excavation were found some paintings with gladiatorial scenes, which are now kept in copy at the Archaeological Museum of Naples. In the fresco of the "fight", again, the wall summit amphitheater is intended to support the "*maenianum summum in ligneis*". The reconstruction of this wooden elements is visible in the iconographic sequence of the most important buildings of Pompeii, arranged as a frame of the cartography, edited on 1832. This drawing - also enhanced by a panoramic view of the city - was draft by W.B. Clarke, and engraved by T.E. Nicholson for the "Society for the Diffusion of Useful Knowledge Atlas" (1844). This mapping is particularly interesting because it documents the planimetric shape Amphitheatre in detail, with the layout of the four vehicular and pedestrian entrances to the *cavea*, and to the Western underground areas. Following the consolidation work, the Amphitheatre reached its maximum capacity. After the eruption, the building remained visible in its upper part, which was the object of continuous looting, especially as regards the decorative elements and most of the stands.
The damaged architectural elements and their restoration work are documented in most of the iconographic archival repertoire, selected for this research. As already mentioned, the damaged architectural areas are documented in the gouaches, prints and photographs in the nineteenth century. The restoration of the perimeter arches, and the summit walls of the *cavea* are documented in a photographs' collection, dating back to the 60s of last century, preserved in private collections or in the archive of the Superintendent. These images are particularly interesting because they show the

various stages of restoration, from the ruined structures, to the building site (scaffolds were made of wood and non-metallic), till to the building as well as the visitors can still see today.
Considering the seismic and eruptive damages and the destructive action of man in the period after the eruption, the best preserved amphitheater area is the north-eastern quarter, as well as documented through various iconographic documents. The first considerations about the spatial geometry of the stands have been focused precisely in this area of the *summa-cavea.* It was verified that the ramps' axes lean on the elliptical sections at the top and at the base of each cavea, maintaining constant their inclination, respect to the horizontal plane. These arrays of straight lines do not converge (in this case it would be of a conical surface) but they lean on a straight line parallel, belonging to the plane containing the major axes, and parallel to them. The surface generated can be ascribed to the "ruled surfaces" family, being defined by the movement of a generating line leaning on three directrixes: two ellipses and the line, just described. In particular, the surface thus defined is classifiable between the ruled surfaces "non-developable", because two directrixes (in a close neighbourhood) are skewed, and therefore the surface can not be lying on a plane.
The ruled surfaces (ie the surfaces generated by the motion of a straight line) were so named by Jean Nicolas Pierre Hachette, who attributed to them the nickname of "*surfaces réglées*", replacing "gauche" (or "deformed") already used with a derogatory meaning. The variation of the title was used to emphasise the aesthetic value of these particular surfaces. Ruled surfaces were already known to Aristotle that in "De Anima" (I, 4) states, "the motion of a line produces a surface". But we have to wait more than twenty centuries to the publication of a scientific study of these surfaces. In the 60s of the eighteenth century, Gaspard Monge began to study the properties of ruled surface. The study of Monge was published in "Memoire sur les homesteads de plusieurs genres de surfaces courbes, particulièrement sur des cell surfaces développables avec une application a la theorie des ombres et des pénombres". In the text he distinguishes between "developable surface" and "hump ribbed surface", defines their apparent contour in perspective representation, and describes the genesis of the ruled surfaces as a "set of straight lines", that lean three fixed lines. The realisation of the Amphitheatre's 3D model, as a rational geometric extraction from point cloud, will allow the development of digital comparison among the scanned shape, the modelled shape, and the theoretical reconstruction according the classic treatises.

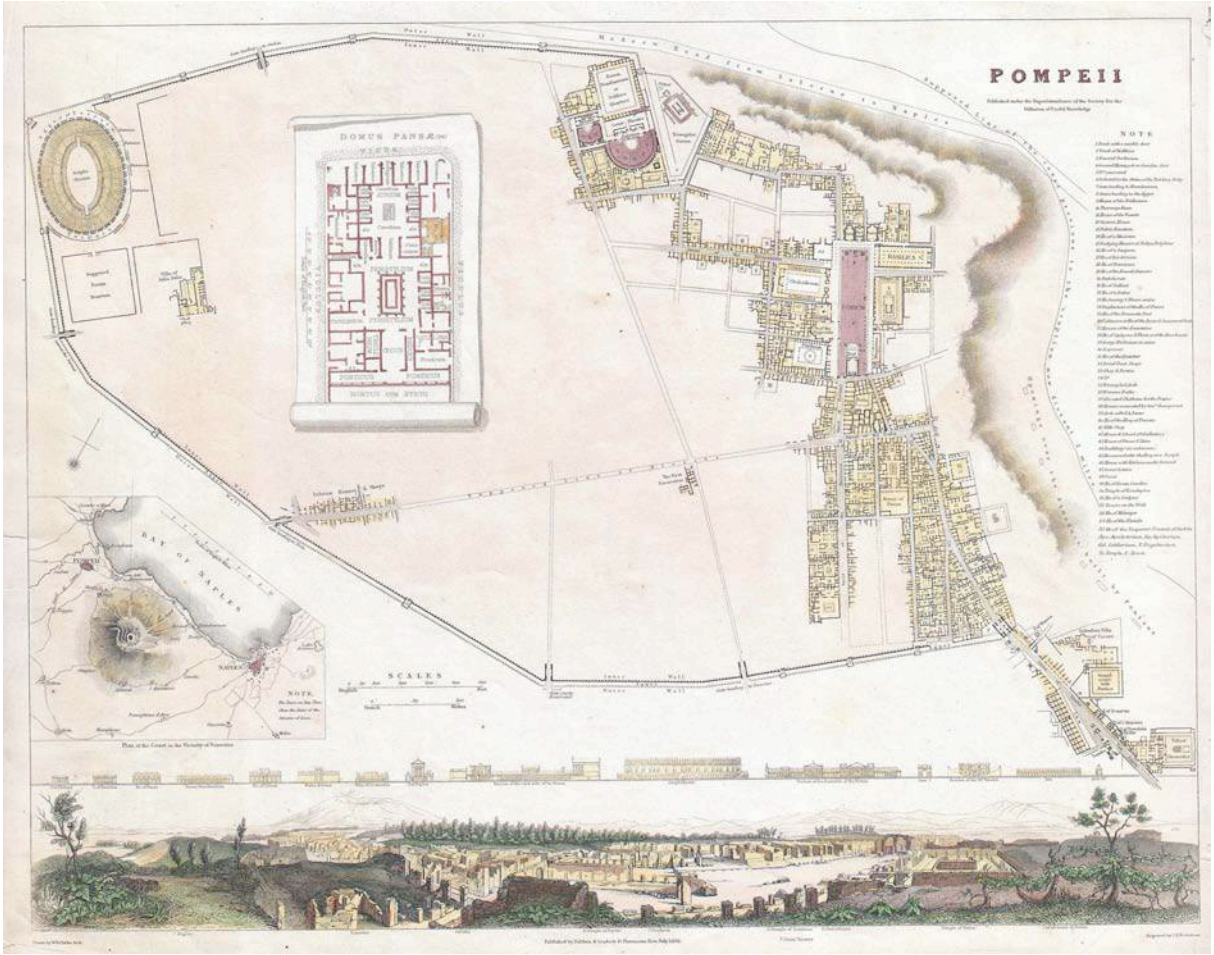

Fig. 7: Pompeii, map and panoramic view of the city - drawing by W.B. Clarke (1832); engraving by T.E. Nicholson for the "Society for the Diffusion of Useful Knowledge Atlas" (1844).

5. Conclusions (Carmine Gambardella, Nicola Pisacane, Alessandra Avella, Pasquale Argenziano)

The geometric investigations described in this paper allowed to reach the determination of the form, which best approximates the amphitheater's *cavea*. The assumptions of projective geometry and its application's outcomes in descriptive geometry, initially allowed to investigate significant plane sections (horizontal and vertical ones according directions suitably chosen) in order to verify: the planimetric shape of the stands and the Hypogea; the geometric rule that guides the direction of the flights towards the different cavea's areas; the calculation of the slope of *ima-cavea, media-cavea* and *summa-cavea* From analysis of the plane sections of the mesh model, it was possible to build 3D models, and define the rules that generate the ruled surfaces enveloping the three areas of the *cavea*.
The so performed geometrical analysis, through selective interrogations of point cloud model, are based on the methodological assumption, that the discrete model is the crystallization of the building to the instrumental capturing date. Given the particularities of the building, and its articulated the architectural and restorative events before and after the eruption of Vesuvius, the research group considered it important to support the geometric analysis with a large iconographic range (gouaches, prints, archival photographs) from whom deducing, in superposition on the reference bibliography, the authenticity or not of the architectural sectors, and therefore the reliability of the position and of the morphology of the various elements. If on one hand this methodological path was valid decision support to the 3D modeling, on the other one it opened up a new investigation item - to develop in future - inherent in the analysis of the various projective iconography in connection to the building.
For example, the pictures - dating from the mid-nineteenth century - will be re-screened in 3D digital scene of the Amphitheatre, in order to calculate the position of the trigger point, and the focal camera used at the time, and therefore it will be possible texturize the point cloud model (and the solid model derived) with the historical images.
This process will allow to display the scene observed by the photographer, and then to implement an accurate dating of the architectural parts, compared to the images' timeline and archaeological events, which affected the building in the last century.

Fig. 8: Integrated data from LIDAR sensors and terrestrial technology.

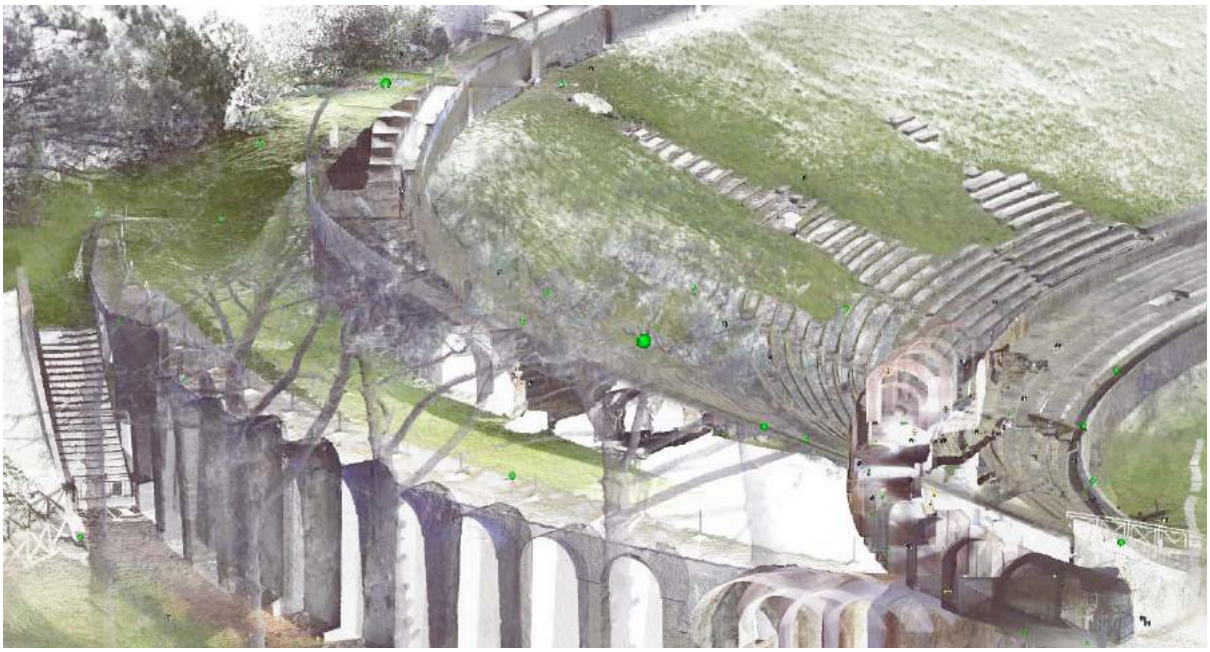

Fig. 9: Pompeii amphitheatre: external, internal and underground simultaneous view from 3D points cloud model.

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Strategic enhancement of the public wealth: the SMOM case in Pozzuoli

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Abstract
Rearranging and enhancing public real estate is one of the key factors in the requalification of Italian cities, especially if these procedures are set into urban policies that support Zero Net Land Degradation. Sustainable land use must be our choice, not only as a means of fighting government waste and fraud, but also as virtuous model of urban renewal, achievable through new moulds of public-private partnership. Moulds ranging from more experimented structures - as franchises, exchanges and project-financings - getting to the promoting of innovative real estate financial instruments. In this frame of reference, this case pertains to a recovery and reconversion project for the SMOM complex, located in the area of the Comune di Pozzuoli. The SMOM case is extremely important for the quality of the environment in which the resource is located and its place value; its susceptibility to improvement and development helps us prove the feasibility of the newest procedures of management acceleration and simplification forecast, also in relation to the alteration of the town planning instruments along with the parts involved. In this context we present this planning simulation, whose results confirm the workability of the operation, regarding environmental, urban and landscape compatibility as well as economic and financial sustainability.

Keywords: Rearranging, enhancing, public real estate, urban renewal, economic and financial sustainability

1. Introduction

For a long time, in our country, people have debated around the theme of a desirable rationalization and enhancement of public real estate. The awareness of the dimensions and most of the time also of the quality in terms of architectural value and of positional value of real state and areas of property both from the central administrations and from peripheral, accompanied to the certainty of the underutilization- if not in most of the cases, of the absolute lack of functions and use, of a lot of properties- has produced, for sure in the last ten years, a new sensibility, starting from the legislator till the government passing through the peripheral administrations, to find solutions and define strategies for the future. It has been furthermore, arrived to the belief, that contrary to what has been affirmed in a recent past, there is the need to start again to set correctly the problems and define the nature and characteristics, not anymore inside of a spending review view, or of reduction of the public debt, but that together with important objectives of cost containment and capitalization towards the alienation of the disowned properties, could be needed in a wider project of placing a rationalization system for the use of the properties, in the full appreciation of the available ones but also plan and design for those that could be possibly dismissed. In other words, that, besides the policies turn towards to optimize the real states owned by the public administrations, with undeniable immediate and future benefits and for the State budget, could start to be define and subsequently put into practice, more complex programs of recovering and requalification of complete urban areas this means that the occasion represented by the appreciation of a dismissed property or anyway lacking of functions from a long time coincides with a more general urban regeneration, with important reverberations related to civil, economic, social and environmental promotion of the territory. In this framework, is then obvious how the matter of the

valorization of the public real state gets the significate of one of the determining capitals on the challenge, timely than ever, placed talking about urban regeneration.
The urban regeneration can be, if correctly understood and practiced, a new and alternative model of intervention that places the urban spaces – signally the ones from the bigger cities but not in an exclusive manner- as a resource to draw from, not anymore in an expansive manner through the man interventions on the territory, of spaces not yet urbanized, other than through the reutilization and appreciation of the existing real state but frequently underused, if not even rendered obsolete or dismiss.

2. Rationalization and enhancement strategies of public real estate

In the future cities, and specially in Italian ones, is desirable that the model of functioning, and of development, would not be trusted to a traditional, as much as anti-historic, anti-economic and with a rigid separation from what belongs (in the strict sense, legal, in terms of property but also more generally as owner of the control and of the decisions) to the public field, central or suburban administrations does not make a difference, and everything that is excluded and so returns, with full rights, in the dimension of private subjects, also in this case is of less importance if they are natural persons or not.

The urban Italian systems, whether they are small, medium or large, are based on a model that comes from very far away, as period in time and as regulatory-legal reference no less than administrative and territorial architectures, it has therefore develop inside a conception, rigidly hierarchical, that has clarify everything that, by definition belonged to the total control of the public authorities (decisions, designs, property, economic resources, management, …) from what, by exclusion, go back in the definition of private subjects, to whom it was in force, and even now it is in force in a different regime.
During the course of time, as already partially mentioned, and signally in the last years, this theoretical-ideological strategy, and therefore normative-procedural, started to open the way to a more flexible articulation of relations of public-private partnership, with the identification of a variety of operative and economic financial instruments but, even before, of new juridical institutes. Therefore, in the framework of the realization of public works, more extended forms of project financing or also of leasing while finishing constructing and other similar, have been experienced, engaging capitals and private subjects in financing, realization and further management of works that, differently and traditionally would have been all in charge of the public administration.

If initially the type of works interested on this modality of intervention, especially in the light of the expected returns (works called “hot”) where between the infrastructures that belong to the State or to the central administration, as in the case of the highway or the touristic harbours, or regional, as hospitals, lately also the local administrations have been involved by the new implementing processes, as for the municipalities with the realization of the cemeteries, for the public street lighting systems, etc. But it is mostly in the realization of the secondary standard facilities (as already widely mentioned) that a new vision has come forward violently, with the idea of private persons, owners of areas and real states addressed from the urbanistic previsions plan, that keeping the property (and therefore avoiding to the public authorities the problem of getting the necessary resources, first of all, for expropriation), they activate to realize, at their own expenses, the facilities and chosen services (green areas, sport facilities, parking, etc.) on the basis of some specific regulations of use, contained in specific conventions that are an integral part of the plans or projects approved.
Starting from this, first and sometimes important steps, is today possible to imagine a new model of operation of our cities that can view further, from one part overtaking the conceptual and operational schematizations of the actual ways of govern the territorial transformations, from the other part planning a system in which the public resources needed for financing the realization, the efficient conservation and, most of all an efficient management of the spaces, places and public services, will be always decreasing
Activities and related funding that can be alternatively left to private subjects – of course selected inside the open public procedures and with all the guarantees requested, respecting the national and European regulations, in force – to whom, in relief of the investment done, could be grant the exercise and the management of profitable activities.

More properly, the whole operation started during the last ten years focus on the actions, expected a more realistic and articulated gradation of objectives, from the rationalization and efficient work of the offices of the different administrations, to a saving politics and fight against wastefulness in the utilization of the property and on its management, to an enhancing focused also through the dismissing of the parts of properties that are slightly or not use at all.

In addition to this politic of a rationalize use of the resources, we have the decentralization of duties. These respond to the measure already defined of the Public Property Federalism (federalism demaniale), through the identification of the “state properties that can be confer to municipalities, provinces, cities and regions, who have them available in the interest of the community represented promoting the maximum functional enhancement”. The properties transferred can also be also include by the region and by the local entities in processes of alienation and divestment.

3. Alternative real estate investment funds

In addition to some of the requirements that affect in terms of rationalization of the spaces used by the administrations and reduction of costs, also with reference to the leasing (definition of the reference parameter between 20 and 25 sq.m. for employee, reduction of the spaces and royalties for leasing and stop of the ISTAT adjustments, interventions regarding the ordinary and extraordinary maintenance of the real states,…) other and more innovative instruments have been identified, in view of a more complex intervention related to the disposal of properties. For this purpose it has been scheduled the creation of an integrated system of real state fund, through the institution for the savings management (SGR). Particularly, in this case the net earnings coming from the cessions of the fund shares or from the company shares are destined to the reduction of the public debt. Other ways of rationalization of the expenses contemplate the possibility of making operations of exchange of state properties (demanio) and of the government assets. Much more interesting appears the connection with the institute of the concession of enhancement, where, in order to extend the scope and the application, there have been introduced some changes such as the elimination of the maximum limit of fifty years for the duration of the leases and concessions or the pre-emption right for the leaser/concessionaire, for the purchase of the property at a market price, at the end of the period of time expected by the concession and leasing.

In this way it has been agreed to promote a widespread use to the concession practice (or leasing) to privates, upon payment, of real states of property of the State aimed for the requalification and reconversion through recovering interventions, restoring, renovations also through the modification of the intended use to promote the development of economic or services activities for the citizens, respecting the provisions include in the Code of the cultural properties and of the landscape.

In order to fulfil the objectives given by the government there have been, furthermore, expected some instruments of programming and planning that hopefully could have a better life than the numerous (and often pleonastic) urbanistic instruments in force regarding the subject of the governance of the territory among which: Unitary Programs of Territorial enhancement, Plan of alienation and real state enhancement, Three-year Plan of investment related to the purchase and selling of real states for each administration, Plan for the rationalization of the spaces, the Property Project P.A., etc.

4. The Case "ex S.M.O.M. in Pozzuoli"

In this direction the study moved, after having identified some properties in the metropolitan area of Naples, has focus its attention on a building complex named ex S.M.O.M., that has not been used for more than forty years, placed in the district of Pozzuoli, in a mainly touristic location. The case of this property in Pozzuoli, actually part of the perimeter of the property of the PA and in charge to the Agency of the State Property (Agenzia del Demanio), assumes a special importance because of the quality of the property and the place value, as well as for the susceptibility of the enhancement due to the intrinsic characteristics of the property and the context in which it is in, it is well suited to illustrate the applicability of the new procedures expected relating to the administrative acceleration and simplification, also for the purposes of the variation of the urbanistic instruments in accordance with the interested municipalities. In the case of the S.M.O.M., indeed it is already in course the procedure of institutional plan previous of the Program Agreement, between the Municipality of Pozzuoli and the Agency of the State Property, concerning the disposal of the building, by now not used anymore by the Ministry of Defense, and the following enhancement through the definition (to be known also from the municipality urbanistic instruments or from an extended area) of new and compatible intended uses.

The case is about a pre-feasibility study, aimed to analyze the dimensional and qualitative characteristics of the building complex, the framework in which it is insert, the urbanistic and constructing points of view, and possible restrictions, potential transformations. Through the simulation of the new intended use (touristic-hotel business) we have proceed with the verification of the economic-financial sustainability, using the most suitable instruments for the matter in question, also in the belief that the proposal made could become pilot projects for the urban regeneration.

4.1 Introduction

Hypothesis of reconversion and recovery of the ex S.M.O.M., state property complex, constructed on the 1917 and originally designated to tubercolosaio, into an Up-scale hotel of about 85 rooms, complete of the following outlets:

- "Main" Restaurant of about 100 seating capacity
- "Theme" Restaurant of about 100 seating capacity
- Wine bar
- Bar
- Bar swimming pool
- Swimming Pool, SPA and Area fitness/wellness
- Meeting Rooms and a business lounge

"The S.M.O.M building standing at the entrance of the city of Pozzuoli, in an extremely panoramic position, could become a real entrance towards the knowledge of the beauty, of the history, of the natural and volcanic eccentricity, both of the territory of Pozzuoli than also from all the Campi Flegrei"(*).

4.2 Concept

The main idea is the realization of an accommodation hotel identified with the brand of Up-scale hotels of high quality, character and history. With food and beverage outlets capable of offering menu that, reflects the local gastronomic heritage.

A brand afferent to a worldwide group, leader in European the hotel sector, capable of ensuring also a qualified offer of MICE - Meeting, Incentive, Conference and Event -, including Wedding. Combining in the best of the ways the conferences, cultural and scientific sectors to the most typical sector of just leisure.

Following, it is shown in Fig. n.1 the distribution of the surfaces in the different outlets, as supposed in the recent study.

Fig. 1 Property size

Surfaces	**sqm.**
Total Lot	**22.507**
Gross covered Buildings	**5.377**
From which "rooms"	1.771
From which "reception hall"	328
From which "food beverage area"	340
From which "piscina Spa"	870
From which "MICE"	1.000
From which "connective"	1.068
Uncovered	**17.130**
From which "green areas in the inside"	8.600
From which "green areas convenzionate"	7.380
From which "inside parking"	1.900

4.3 Location

The building complex named ex S.M.O.M is placed in the District of Pozzuoli **Fig. 2 - 3**, at only 3 kilometers from the city center, in a panoramic position, it overlooks on the Gulf of Pozzuoli. It is situated precisely near to the Church of San Gennaro and the Convent of the Cappuccini, and in nearby the Solfatara Vulcano, along the San Gennaro Street that connects easily the City of Naples with the center of Pozzuoli. About 1km of distance there are located the train station of Napoli's Subway and of the Cumana. The access to Napoli's expressway is at a distance of less than 5km and represents a fat conection with "Naples International Airport Capodichino" (about 20 minutes) and with "Naples Central Station" (about 30 minutes).

( ) Source: http://www.palazzotoledo.comune.pozzuoli.na.it/index.php/notizie/210-pozzuoli-e-cultura

Fig. 2 - Location map

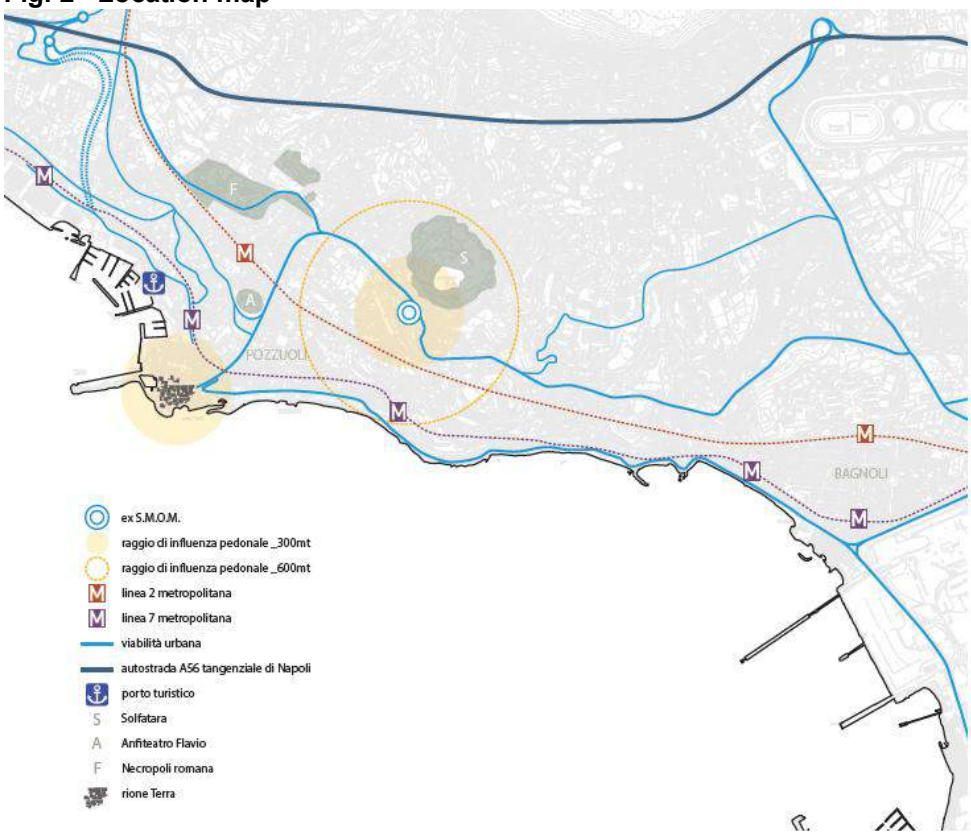
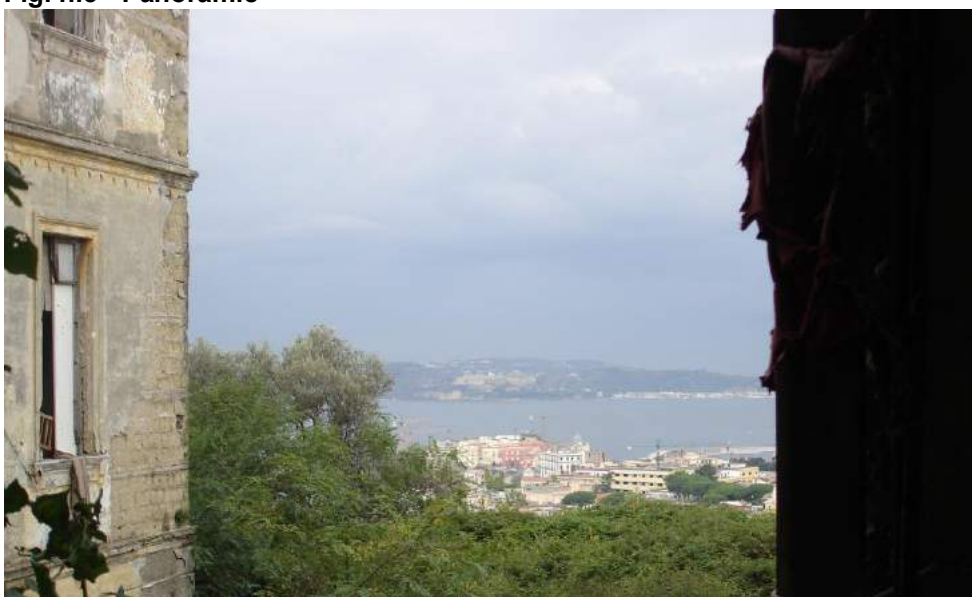


Fig. n.3 - Panoramic



4.5 Historical Background

The building of the state property named ex S.M.O.M. was made by 1917, as Tubercolosario by the militar authorities that have had, for a long time and in various modalities, the control of the area of the Solfatara (Fig. 4). The place where the building where made was part of a partial confiscation, occurred by the beginning of the century, from the land that was part of the vegetable garden of the Convento dei Frati Minori Cappucini, build between 1547 and 1580, annexed to the Church of San Gennaro. This church was build in the place of an ancient chapel where, according to the tradition, take place the martyrdom of the saint protector of Naples, it was enrich and enlarged in 1702, almost totally destroyed by the fire developed in february of 1860 but promptly reconstructed based on the project of the architect Iganzio Rispoli, and completed just after the cholera of 1866. In 1936, during the occupation from italians of the oriental part of Africa, the properties of the complex of the tubercolosario where assign for recovering the wounded persons, and following this event, after the

last conflict, it was entrust to the religious order of knightly with aid purposes of the “Sovrano Militare Ordine di Malta”, from whom keeps still today the name, and turn it into a Hospital, Around the early 70’s the order gave it back to the Ministry of Defense, that establish in the first time a military base and the provincial commision war rooms, after this it became Center for the medical visits for the compulsory military services, of napolitans and citizens of Pozzuoli. Maybe it could be attributable to this years the transformations of two of the main halls, that from independent and separate, turn to be one only body with the construction of a new volume, added improperly, conecting both of them. After that the X Direction of the Military Genious of Naples has proposed the disposal, the 13th of March of 1986 the building was acquired by the Aeronautica Militare that has install, around twenty years before, very near from there; the property should have been used for the realization of a residential complex designed for the officers, but the project of reconvertion of the buildings was never done and all the area and the buildings where totally abbandoned.

Fig. 4 - Historical picture

After a lot of years of total negligence that have determine the decline of all the complex, also with structural failures and collapse of som eof the volumes present in the area (Fig. 5), in 2013, the minister of the Property and Cultural Activities, Superintendence for the architectural heritage, landscape; historic and etnoanthropologic for Naples and provinces, has declared the compendium of historical and architectural interest submitting it to the protective provisions as in the Decreto n.42 from the 22 January 2004.

Fig. 5 - Actual state

4.6 The real state

Actually the building complex is property of the Agency of the state property (Agenzia del demanio) that- consistent on what previously shared on the framework of the institutional agreement – considered appropriate to activate a process of enhancement of the building, maintaining the same existing volume and with a change of intended use of the P.R.G. in force that allows the realization of the present intervention of requalification.

Through the instruments identified by the art.26 of the D.L. n.133/2014, converted with changes from the law from 11 of November 2014 n.164, aimed to the acceleration and administrative simplification for the urbanistic enhancement of the properties, with special reference to the agreement of the program of the D.Lgs. 18 august 2000 n.267.

4.7 Market Overview

The offer in the surroundings of the ex S.M.O.M. is composed by numerous independent hotels, farmhouses and Bed and Breakfast. In the following **Fig. 6** a more direct competitive set is shown for: type, ADR and location. All of them are located at a maximum distance of 1 km from the ex S.M.O.M.

Fig. 6 - Competitive set

5. Business Plan – *assumption*

Since we are talking about an intervention related to the strategy of enhancement of the property of the Public Administration, the instruments that can be activated are several, from the transfer to the concession and other ways of Public private Partnership.

In the present Preliminary BP it has been made an assumption of transfer of the building from the Agency of the State Property, and of investment of private funds for the intervention of transformation and management of the property. The economic-financial sustainability of the intervention from the investor consider therefore, a purchase price, a renovation cost and incoming from the direct management for a period of 10 years; the profit takings of the terminal value at the end of the 10th year of management. This last one estimate with the income method and interpolate with the OMI data.

For the determination of the expected purchase price, it has been made an estimation of the real state value of the complex, in the actual state, as residual value. The method of estimation used in the simulation has been the one of the value of transformation, to this method it is commonly attributed an important planning role specifically in the cases of properties of the Public Administration, for which the function of institutional use is over, and therefore, can be susceptible of a possible reconversion. The method of the value of transformation aims to define the value of a property (Vt) as a difference between the most probable market value of the property at the outcome of the transformation (Vpf) net of the necessary cost for the transformation itself (K).

$$Vt = Vpf - K$$

The recourse to such method is also coherent with the evaluation of the choice opportunity made by the possible buyer, this buyer would be ready for the purchase only if the total cost of the operation (purchase price + transformation cost) turn out to be less or at least the same – to the possible market value of the property as transformed.

$$Vt + K \leq Vpf$$

In the estimation practice, there has to be considered all the direct and indirect costs that intervene in the process of transformation – included the profit of the businessman – as well as the need to update the different distribution in time where such costs show. The formula becomes therefore the following:

$$Vt = Vpf - K + P \cdot q^n$$

For the estimation of the possible market value (Vpf) it has been used the analytic procedure of the management value based on the *Discount Cash Flow*, considering it the most coherent with the function of touristic hotel company where it has been supposed to transform the building complex. Such analysis that has required the development of an economic-industrial model of the hotel management is also important for the verification of the economic-financial sustainability of the investment touristic- accommodation from the possible buyer-investor. The present study fits therefore, on the doctrinal orientation, typically Anglo-Saxon, that links the possible value of a property destined to a typically business activity to its capacity of generating favorable cash flows.

In the **Fig. 7** and **Fig. 8** that follows they are report, respectively, the main selling indicators and the business plan of the whole management of the hotel structure, on a time horizon of five years – in addition of two years of transformation -, with the highlights of each area of incomes, of the operational costs, resulting operational margins, extra operational and net. Analytic values of economic and instrumental profitability for the determination of the resulting financial values.

Fig. 7 - Key Financial

Revenue		**Year 1**		**Year 5**
Occupancy Rate		**50□**		**70□**
Average Daily Rate - ADR -	**€**	**105**	**€**	**105**
RevPAR □VAT included□	**€**	**52**	**€**	**73**
Total Revenue: Rooms□F□B□etc.	**€**	**4.452.136**	**€**	**6.308.153**

Fig. 8 - Budget

anni	0	1	2		3		4		5		6	
	euro	euro	euro	□	euro	□	euro	□	euro	□	euro	□
Rooms	-	-	1.476.790	33,2□	1.624.469	32,0□	1.919.827	32,2□	1.860.755	32,0□	2.067.506	32,8□
Food □ Beverage	-	-	1.880.998	42,2□	2.095.467	41,3□	2.467.937	41,4□	2.348.945	40,4□	2.599.487	41,2□
Wedding □ MICE			447.061	7,7□	638.620	11,0□	906.856	15,6□	876.545	15,1□	906.856	14,4□
SPA e Wellness			580.130	10,0□	640.964	11,0□	580.130	10,0□	640.964	11,0□	640.964	10,2□
Other revenue (pay tv, internet, etc.)	-	-	67.156	1,5□	74.399	1,5□	87.755	1,5□	84.194	1,4□	93.340	1,5□
Total Revenue	**-**	**-**	**4.452.136**	**100,0□**	**5.073.918**	**100,0□**	**5.962.506**	**100,0□**	**5.811.403**	**100,0□**	**6.308.153**	**100,0□**
Material	-	-	879.868	19,8□	977.084	19,3□	1.151.752	19,3□	1.101.244	18,9□	1.219.946	19,3□
Utilities			222.607	5,0□	253.696	5,0□	298.125	5,0□	290.570	5,0□	315.408	5,0□
Management fee			178.085	4,0□	202.957	4,0□	214.650	3,6□	203.399	3,5□	220.785	3,5□
Payroll			1.035.000	23,2□	1.044.308	20,6□	1.062.923	17,8□	1.059.200	18,2□	1.072.230	17,0□
Administrative and general			267.128	6,0□	304.435	6,0□	357.750	6,0□	348.684	6,0□	378.489	6,0□
Other operationg expenses			178.085	4,0□	202.957	4,0□	238.500	4,0□	232.456	4,0□	252.326	4,0□
Propening cost			300.000	6,7□	-	0,0□	-	0,0□	-	0,0□	-	0,0□
Total Operating Expenses	**-**	**-**	**3.060.774**	**68,7□**	**2.985.436**	**58,8□**	**3.323.701**	**55,7□**	**3.235.553**	**55,7□**	**3.459.184**	**54,8□**
G.O.P. □EBITDA□	**-**	**-**	**1.391.362**	**31,3□**	**2.088.482**	**41,2□**	**2.638.805**	**44,3□**	**2.575.850**	**44,3□**	**2.848.968**	**45,2□**
FF□E	-	-	14.768	1,0□	32.489	2,0□	57.595	3,0□	74.430	4,0□	82.700	4,0□
Depreciation and Amortisation charges	-	-	1.003.127	22,5□	1.003.127	19,8□	1.003.127	16,8□	1.003.127	17,3□	1.003.127	15,9□
EBIT	**-**	**-**	**373.467**	**8,4□**	**1.052.866**	**20,8□**	**1.578.084**	**26,5□**	**1.498.293**	**25,8□**	**1.763.141**	**28,0□**
TAX (Ires 27,5□ □irap 4,97□)	-	-	172.704	3,9□	393.768	7,8□	565.231	9,5□	539.138	9,3□	625.782	9,9□
NET PROFIT	-	-	**200.763**	4,5□	**659.099**	13,0□	**1.012.853**	17,0□	**959.155**	16,5□	**1.137.360**	18,0□

Using the method of determination of the cash flow, commonly known as indirect, the economic values of the management have been changed in the corrispondent cash flow produced by the management itself (EBITDA plus TAX), for a period of ten years of management, assuming the same cash flow from the fifth – year at standards – till the tenth year. For the determination of the possible market value of the property transformed in hotel have been, therefore, update – at time 0 – the above mentioned cash flows and the terminal value at the tenth year, equal to 5,5 times the EDITDA. Multiple estimated based on local comparables.The hurdle rate used has been equal to 7,5□, defined us Weighted Average Cost of Capital – WACC –hypothizing a recourse to the bank leverage of the 50□ and a cost of debit equal to the 5□, the one for equity equal to 10□, that considering the free risk taxes equal to zero – o negative -, represents practicly all premium for the risk.

Fig. 9 - Trasformation costs □excluding VAT□

	Euro	in □
a) Cost of building renovation of the property	10.330.750	
b) Cost of the systems, machinary and set up common aera	1.500.000	
c) Design □ PM	1.183.075	10,0□ di b) □c)
d) Construction and urbanization costs	1.183.075	10,0□ di b) □c)
e) Set up and Interior Design (€ 10.000/room)	850.000	
TOTAL INVESTMENT	**15.046.900**	

From the following fig.10 the possible market estimated value of the property referred to above, estimated with the combination of methods of the cost transformation and of the DCF, turns over to be around 6,6 millions in euro and represents also the maximum cost at which the buyer – equivalent to the opportunity cost of the capital WACC – would be willing to buy because he will get even nearly zero the net actual value of his investment, becoming the IRR equal to WACC. Therefore, such hypothesis is only theorical being the investor encouraged to choose to invest only when there is a positive distance between this two last paramenters – and so a positive NPV – that guarantees safer margins of more security for the sustainability of the investment.

Fig. n.10

anni	0	1	2	3	4	5	...	11	12
capex	-6.018.760	-9.028.140							
terminal value (EV/EBITDA □ 5,5)									19.025.515
cash flow	0	0	1.218.658	1.694.715	2.073.574	2.036.712	2.223.186	2.223.186	2.223.186
Cash flow	**-6.018.760**	**-9.028.140**	**1.218.658**	**1.694.715**	**2.073.574**	**2.036.712**	**2.223.186**	**2.223.186**	**21.248.701**
Present Value cash flow	**-5.598.847**	**-7.812.344**	**980.971**	**1.269.003**	**1.444.366**	**1.319.711**	**1.340.037**	**933.414**	**8.298.935**
Discounted Cash flow □ Vpf	**6.663.466**								

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Energy and economic performance of a single-family wood-frame house in Italy under varying climatic conditions

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Abstract
In this study, the influence of construction materials of a typical Italian single-family residential application, located in Italy, was analyzed from both energy and economic point of views. In particular, the differences between a brick and a wood house, characterized by the same thermal transmittances and internal volumes, were evaluated by varying the climatic conditions (three different Italian cities representative of different climatic regions of Italy were considered). The performances of the two construction materials were investigated by means of dynamic simulations.
The comparison between the two buildings was performed in terms of primary energy consumption as well as operating costs in order to evaluate the potential benefits associated to the wood house with respect to the brick house.

Keywords: energy saving; economic analysis; wood-frame house; TRNS□S; building simulations.

1. Introduction

The residential sector represents the 40□ of the total energy consumption worldwide [1,2]. In 2015, this sector consumed more energy than the transportation and industrial sectors combined [3]. The operational phase contributes to more than 80□ of the overall energy usage during the life cycle of a residential building [2]. In addition, the heat losses through building envelopes contribute to approximately 50–60□ of the total heat demand for a residential application [2]. Therefore, the efficiency of both the building envelope and the thermal/cooling plants for this sector is very important in order to save primary energy as well as reduce both the operating costs and pollutant emissions. The increase of energy efficiency in the building sector is also one of the key objectives of the European Union energy policy. With the adoption of recast Directive 2010/31/EU [4], the Member States are obliged to move towards new and retrofitted nearly-zero energy buildings by 2020.
As a natural raw material requiring minimal energy input into the process of becoming construction material, timber represents one of the best choices for energy-efficient construction, since it also functions as a material with good thermal transmittance properties when compared to other construction materials. The use of timber in construction is gaining ever more support, especially in regions with vast forest resources since it reduces the energy demand for transport if the building material is available from the local area. Italy is ranked sixth in Europe in terms of its area covered by forest, but the wood is not widely used in the building sector because it has not enacted the same forestry policies as other countries have [5].
Several scientific papers have shown that the choice of building material affects the primary energy consumptions of buildings. Some of these studies are reported below. Cole and Kernan [6] analyzed the total life cycle energy use of a Canadian office building constructed with concrete, steel, or wood structural material. The results of this research showed that the concrete and steel buildings used

more energy than the wood building. Cole [7] investigated the energy consumptions and equivalent carbon dioxide emissions associated to the on-site construction activities of wood, steel or concrete buildings in Canadian climates. He found that the energy used and greenhouse gas emissions were lower for constructing the steel building, slightly higher for the wood building, and significantly higher for the concrete building. Adalberth [8] investigated the energy use and environmental impact during the life cycle of residential buildings. Seven authentic buildings (three single-unit dwellings and four multi-family house) built with wood and concrete frames in the 1990s in Sweden have been investigated. This study reported that the energy used to manufacture all the construction materials, including the renovation phase, was around 15 of the total energy use, while about 85 of the total energy use was used during the occupation phase. Similar results were obtained in terms of environmental impact. In addition Adalberth [8] highlighted that the overall life cycle energy balance, including the production, building, operation and disposal phases was 1 lower for the wood-frame building than for the concrete-frame building.
The cited papers generally highlighted that when compared with steel or concrete buildings, the wood-frame building allows to reduce the primary energy consumptions and the environmental impact associated to the buildings in northern regions, but they neglected the economic aspects, with the performances of wooden buildings in the Mediterranean area not being evaluated. In recent years, Italy has experienced a real evolution in the market for wood; in the past, only roofs were constructed of wood, but nowadays this material is beginning to be used to make whole buildings [5].
In this work, the performances of an Italian single-family wood-frame house were analyzed and compared with those associated to a concrete-frame building. Between the two types of residential buildings, no difference was considered in terms of transmittance values and internal volumes.
In order to evaluate the influence of the climatic conditions, three different Italian cities (Bolzano, Naples and Palermo) representative of three different climatic regions of Italy were considered. The analyses were performed by using the dynamic simulation software TRNS S 17 [9]. This software is widely used in literature to evaluate the energy performance of buildings upon varying the operating scenarios [10-21].The comparison between the timber and brick buildings was performed in terms of primary energy consumption as well as operating costs during the occupation phase in order to evaluate the potential benefits associated to the wood house with respect to the brick house.

2. Timber house

The growing interest in sustainable construction has led to significant research and development in timber engineering, with new high-technology products being available today for this sector. In this section the state of art is analyzed with particular attention paid to the Italian wood constructions.

2.1 State of art

A typical modern wood-frame house consists of a reinforced concrete strip-footing foundation, upon which a platform is constructed of joists covered with plywood or oriented strand board (OSB) to form the ground-floor level of the house. This platform is connected directly to the foundation with anchor bolts. On this base, the exterior and interior walls of the first floor are erected. The wooden walls are anchored by steel brackets screwed into the concrete foundation. After the walls of the first floor are completed, the second floor is constructed, which, in turn, acts as a platform for the walls of the second floor. This process is continued for all the floors. The roof structure typically consists of prefabricated trusses, which are covered with sheathing and roof tiles.
The typical architectural technologies to build the structure of a wood-frame house are the following:

- Platform frame: is a load-bearing frame structure. This technology is the most popular construction system, it is the typical construction system used in American wooden houses. The buildings made with this technology are made floor by floor. The first floor frames are fixed to the basement (usually in concrete), after which the first floor is developed. The second floor frame is fixed to the first, and so on. The internal and external panels and insulation, are laid in place on site after the frame structure is built.
- Blockhaus: is typical of Central-Northern Europe and the Alps. This is a massive type construction system comprising overlaying trunks. Generally they are connected using screws, and thereby forming the support walls. The corner joint between the walls is generally obtained by means of a visible male-female carpentry knot or dovetail joint and potentially reinforced with metal bars or screws.
- X-Lam: is a construction system consisting of wood panels with crossed, glued layers (at least 3) with highly variable thicknesses and geometric characteristics that generally depend on the technology used by the manufacturers as well as on static sizing. Due to the presence of the cross-layers, these panels are in-plane stable and can be used for plane members such as walls and floors. It was first experimented and marketed on the Austrian and German markets

during the late 1990s. In Italy, the product has only become widely available in the last ten years.

Figures 1a, 1b and 1c report three examples of timber houses under construction, by using the three above-mentioned different technologies. In particular, Figure 1a reports a typical Canadian house built by means of Platform frame technology, Figure 1b shows a residential building realized by means of a Blockhaus system with a specific detail of this technology in the left corner and finally Figure 1c presents a construction built by using X-Lam panels highlighting a detail of the cross-layer.
Nowadays, the X-Lam system is the most widely used building technology in Italy.

Fig. 1: Examples of timber houses under construction using three different technologies: (a) Platform frame structure, (b) Blockhaus system and (c) X-Lam panels.

2.2 Italian wood constructions

There is a constant growth in terms of the numbers of wood constructions in Italy. In 2010, 82□ of timber buildings in Italy were single-family houses, 9□ two-family buildings and the remaining 9□ multi-family houses (located especially in the North-East) out of a total of around 5,000 wood-frame residential buildings. This figure reached about 7,500 units in 2015. The current share of residences made of wood in Italy is 8.5□, that is of every 12 buildings made in Italy, one is built by using wood. This is obviously still a niche market but it is growing considerably [5].
About 71□ of these wooden buildings are located in the North of Italy (influenced by countries such as Austria and Switzerland, where wooden houses have been used for several years); around 22□ are located in central Italy and the remaining 7□ of the wooden buildings are built in the South and in the islands. In Italy, there is the highest residential building in Europe made of wood. This building is realized in Milan and was completed in the autumn of 2013. The complex (Figure 2) is a solid wood construction with cross laminated timber (X-Lam) elements and comprises four nine-storey buildings, each 27 m high [22,23].

3. Case study

In these sections, a description of the building considered in this study can be found.
The building was simulated by using the TRNBUILD software included in TRNS□S package [9].

3.1 Wood-frame house

The building considered in this work was a typical modern prebuilt wood-frame house (Figure 3) realized and commercialized by the company Brennerhaus S.r.l [24]. The TRNS□S multi-zone building (Type 56a) was used to model the building envelope, indoor air set-point temperature and infiltration, in order to evaluate the heating thermal load as well as the cooling load during the whole year.
A single-family house (SFH) composed of two floors was modelled in this study. The total useable floor area was equal to 163.3 m^2, while the net height of each floor was 3.0 m. The building was modelled considering four thermal zones, two for each floor. Figure 4 reports the thermal zones and the geometrical layout of the SFH.
In order to evaluate the influence of climatic conditions, the simulations were performed by considering the SFH located into three different Italian cities representative of three different climatic regions [25] of Italy:

- Bolzano (latitude = 46°29 North; longitude = 11°20’ East; Heating Degree Days = 2791; climatic zone □E);
- Naples (latitude = 40°50’ North; longitude = 14°15’ East; Heating Degree Days = 1034; climatic zone □C);
- Palermo (latitude = 38°07’ North; longitude = 13°20’ East; Heating Degree Days □ 751; climatic zone □B).

Fig. 2: Building complex realized in Milan [22,23].

Fig. 3: Prebuilt wood-frame house considered in this study [24].

A specific EnergyPlus weather data file [26] was considered for each city and the Type15-6 was used for reading the external EnergyPlus weather data file [26] of the above-mentioned cities.
The transmittance values of the building walls considered in this study were the following: 0.12, 0.59 and 0.16 W/m^{2}K for the external wall, internal wall and roof, respectively. The transmittance values of the overall windows were considered equal to 0.68 W/m^{2}K. The transmittance values of both building walls and windows were assumed as constant upon varying the city where the building is located.
The indoor air set point temperature was established at 20°C during the heating season and at 26°C during the cooling season. The indoor air temperature was controlled only during specified time periods, in particular the following time operation of heating systems during winter was considered:

- Palermo: from December 1st to March 31st;
- Naples: from November 15th to March 31st;
- Bolzano: from October 15th to April 15th.

During the rest of the year the cooling systems were assumed switched on.
The internal gains profile suggested by the Italian Standard UNI/TS 11300-1 [27] was used in this work (2.75 W/m^2); the suggested constant profile was modified by considering the assumed

occupancy profiles. A stochastic occupancy profile, with a maximum number of 4 occupants, was assumed according to [28].
A daily electric demand profile resulting from the operation of both the lighting systems and other domestic appliances (such as vacuum cleaner, dishwasher, washing machine, PC, TVs, fridge), was assumed according to the reference values suggested in [28]. The overall electric energy consumptions considered in this study for the whole building was about 153.7 Wh/m^2 per day.
The domestic hot water demand was not considered.
A typical thermal plant composed of a natural gas-fired boiler and an electric reversing heat pump was considered in order to satisfy both the space heating thermal load during winter as well as the cooling load during summer, while the Italian central grid was used to cover the electric demand of the considered SFH during the whole year.

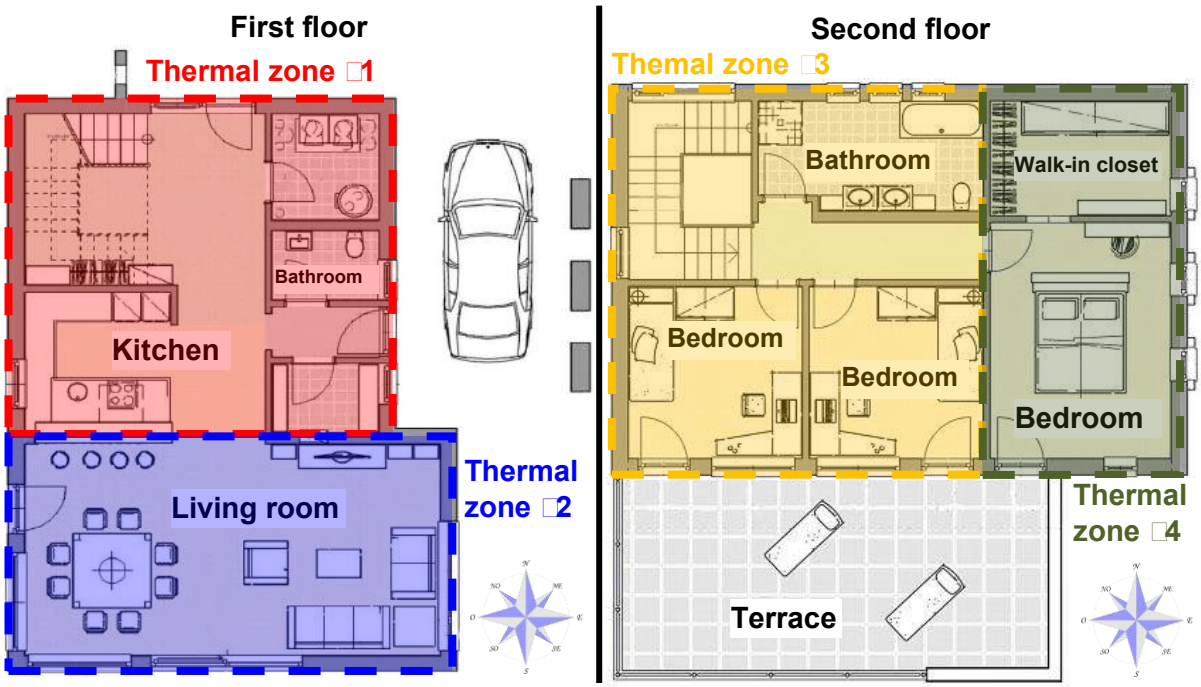

Fig. 4: Thermal zones and geometrical layout of the single-family wood-frame house considered in this study [24].

3.1 Concrete-frame house

The main focus of this study was to compare the performances of the proposed wooden house with those of a conventional brick house. The geometrical characteristics of the concrete-frame building were the same as the single-family wood-frame house in terms of internal volume.
Table 1 reports the characteristics of building walls (from inside to outside) for the concrete-frame house considered in this study.

Tab. 1: Characteristics of building walls for the concrete-frame house (from inside to outside).

Wall type	h_i [W/m^{2}K]	h_e [W/m^{2}K]	Layer materials	s [m]	ρ [kg/m^3]	c [kJ/kgK]	λ [W/mK]
External wall	7.7	25.0	Gypsum plaster	0.030	900	0.84	0.250
			Bricks	0.300	1550	0.84	0.440
			Air	0.070	1.30	1.00	0.026
			Bricks	0.300	1550	0.84	0.440
			Expanded Polyester	0.100	30	0.67	0.038
			Gypsum plaster	0.030	900	0.84	0.250
Roof	7.7	25.0	Gypsum plaster	0.030	900	0.84	0.250
			Concrete	0.250	2200	0.88	1.48
			Bitumen	0.010	1200	1.00	0.170
			Air	0.150	1.30	1.00	0.026
			Tiles	0.020	2300	0.84	0.720
Internal wall	3.0	3.0	Gypsum plaster	0.030	900	0.84	0.250
			Bricks	0.350	1550	0.84	0.440
			Gypsum plaster	0.030	900	0.84	0.250

No differences in terms of transmittance values, with respect to the proposed wooden building, of both the building walls as well as the windows were considered.
The same indoor air set point temperature of the timber house was assumed (20°C during the heating season and 26°C during the cooling season). No differences in terms of internal gains, occupancy and electric demand profiles in comparison to the proposed cross laminated timber construction, were considered.

4. Energy and economic performance: methodology

The simulation data were used to compare the performance of the proposed timber house with the conventional brick house assumed as a reference in terms of primary energy consumption and operating costs with the aim of assessing the suitability of the single-family wood-frame house in comparison to the concrete-frame building.
Firstly, the comparison between the two above-mentioned buildings was performed from an energy point of view. This energy comparison was performed by using the following indicator:

$$\Delta E_p = \left(E_{p,CH} - E_{p,WH}\right) / E_{p,CH} \tag{1}$$

where $E_{p,CH}$ is the primary energy consumption associated to the concrete-frame house and $E_{p,WH}$ is the primary energy associated to the wood-frame house. A positive value of ΔE_p indicates that the wooden building allows to reduce the primary energy consumption in comparison to the brick house.
The values of $E_{p,CH}$ and $E_{p,WH}$ reported in Eq. (1) were computed as reported below:

$$E_{p,CH} = E_{th,CH} / \eta_B + \left(E_{cool,CH} / COP_{EHP}\right) / \eta_{PP} + E_{el,CH} / \eta_{PP} \tag{2}$$

$$E_{p,WH} = E_{th,WH} / \eta_B + \left(E_{cool,WH} / COP_{EHP}\right) / \eta_{PP} + E_{el,WH} / \eta_{PP} \tag{3}$$

where:

- $E_{th,CH}$ and $E_{th,WH}$ are the thermal energy demands associated to the concrete-frame house the wooden building, respectively;
- $E_{cool,CH}$ and $E_{cool,WH}$ are the cooling energy demands associated to the brick house the wood-frame house, respectively;
- $E_{el,CH}$ and $E_{el,WH}$ are the electricity associated to the concrete-frame house the wooden building, respectively;
- COP is the coefficient of performance for the considered electric reversing heat pump (EHP) assumed equal to 3.0 (typically used for residential applications);
- η_B and η_{PP} are the boiler (B) efficiency and average efficiency of the power plant (PP) connected to the central electric grid; values of 0.92 and 0.461 were respectively assumed according to [10-19].

The values of $E_{th,CH}$, $E_{th,WH}$, $E_{cool,CH}$, $E_{cool,WH}$, $E_{el,CH}$ and $E_{el,WH}$ were calculated based on the simulation results.
The operating costs (OC) due to both electric energy and natural gas consumptions were considered in order to perform an economic analysis for the two above-mentioned buildings typologies.
The economic comparison between the concrete-frame house and the wood-frame house was performed by means of the following equation:

$$\Delta OC = \left(OC_{CH} - OC_{WH}\right) / OC_{CH} \tag{4}$$

where OC_{CH} and OC_{WH} are the overall operating costs associated to the concrete-frame house and the wooden building, respectively. A positive value of ΔOC means that the brick house was characterized by larger operating costs in comparison to the wood-frame house.
The values of OC_{CH} and OC_{WH} reported in Eq. (4) were computed as reported below:

$$OC_{CH} = \left[\left(E_{th,CH} / \eta_B\right) / \left(L \cdot V_{ng} \cdot \rho_{ng}\right)\right] \cdot UC_{ng} + \left[\left(E_{cool,CH} / COP_{EHP}\right) + E_{el,CH}\right] \cdot UC_{el} \tag{5}$$

$$OC_{WH} = \left[\left(E_{th,WH} / \eta_B\right) / \left(L \cdot V_{ng} \cdot \rho_{ng}\right)\right] \cdot UC_{ng} + \left[\left(E_{cool,WH} / COP_{EHP}\right) + E_{el,WH}\right] \cdot UC_{el} \tag{6}$$

where UC_{ng} is total unit cost of natural gas consumptions, UC_{el} is the unit cost of the electricity bought from the national electric grid, LHW_{ng} is the lower heating value of natural gas (assumed equal to 49599 kJ/kg [29]) and ρ_{ng} is the density of natural gas (assumed equal to 0.72 kg/m^3).
According to the Italian scenario [30] the unit cost of the purchased electric energy (UC_{el}) varies depending on: (i) the day; (ii) the hour of the day and (iii) the level of cumulated electric energy consumption. In Italy, the total unit cost of natural gas (UC_{ng}) for residential applications [30] depends on both the region of Italy where the natural gas is consumed as well as the level of cumulated natural gas consumption.
In this work, the unit costs for both natural gas as well as electricity were evaluated by using a simplified approach. The following unit costs according to the Italian scenario were assumed:

- an average unit cost of electricity equal to 0.208 €/kWh [30] for the electricity purchased from the grid;
- an average unit cost of the natural gas equal to 0.89 €/m^3 [30].

5. Energy and economic performance: results and discussion

In this section the simulation results were reported and analyzed.
Figure 5 reports the values of thermal, cooling and electrical energies during the whole year as a function of the building typology and the city where the building is located. This figure highlights that:

- whatever the city is, the thermal energy demands associated to the concrete-frame house is larger than those associated to the wooden building ranging from 67.4□ (Bolzano) to 96.1□ (Palermo);
- the cooling energy demand associated to the wood-frame house is higher than that associated to the brick building in the cases of Bolzano and Naples; when the building is located in Palermo, the proposed wood building allows to reduce the cooling energy need by about -1.1□ with respect to the concrete-frame house;
- using a wood building, the electrical energy consumptions is reduced by around -0.42□ in comparison to the conventional concrete building, in the case of Palermo; while in the other two cities, the proposed timber house increased the electricity needs by about 0.91□ and 4.18□ for Naples and Bolzano, respectively.

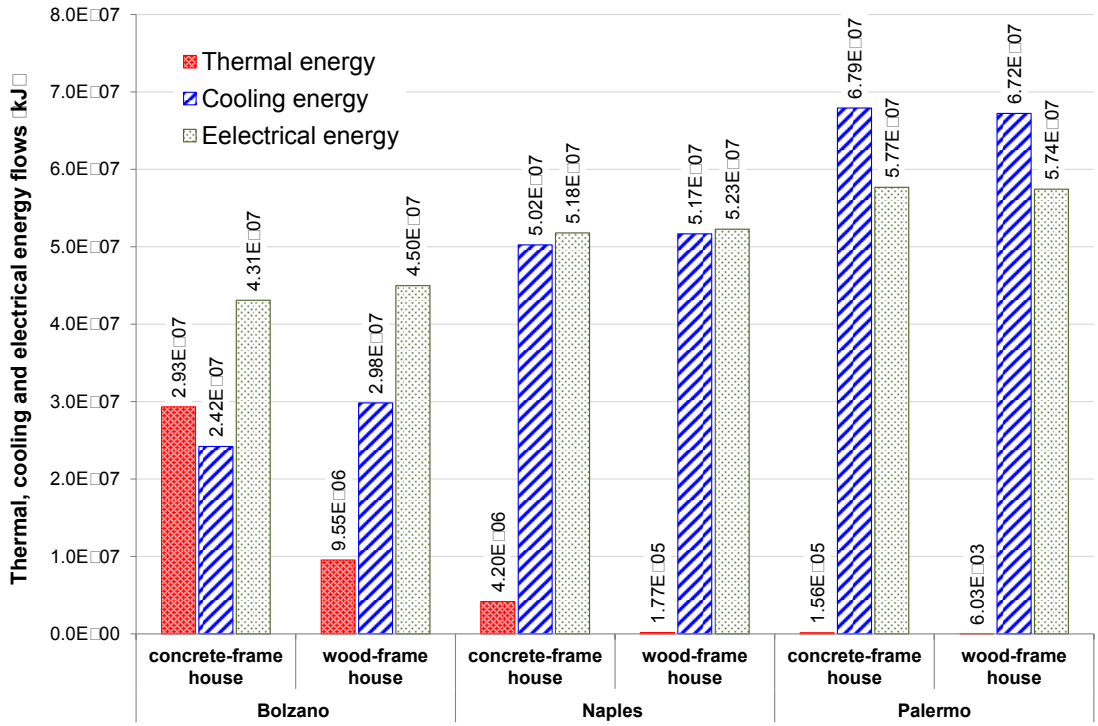

Fig. 5: Values of thermal, cooling and electrical energies upon varying the building typology and the city.

Figure 6 shows the primary energy consumptions during the whole year upon varying the building typology and the city.

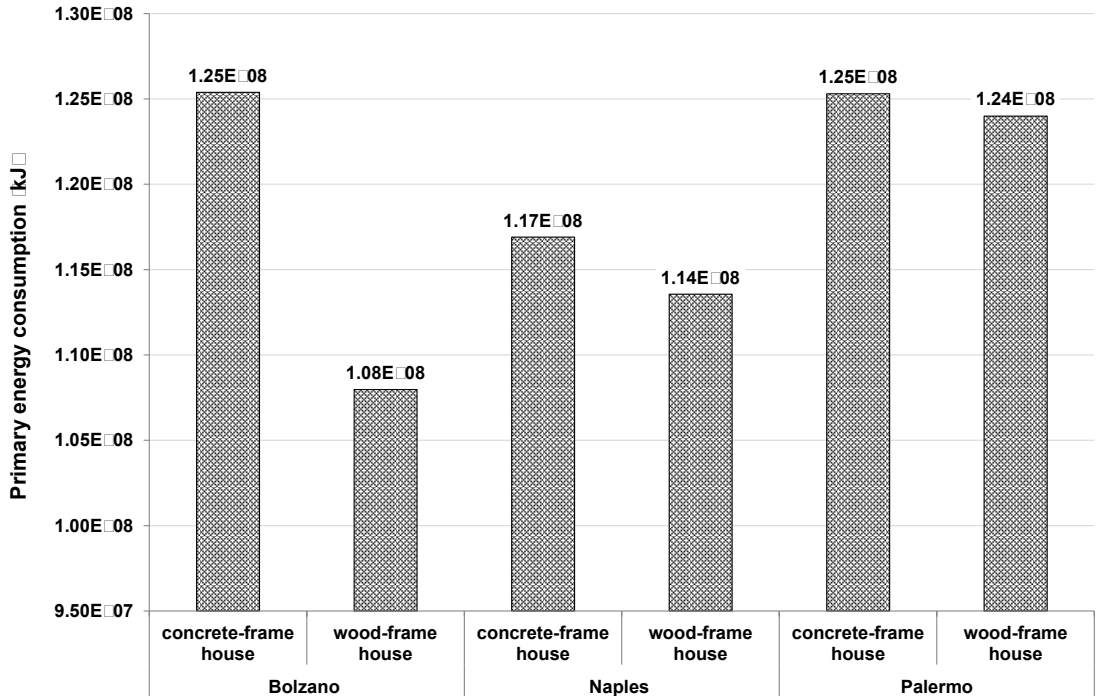

Fig. 6: Values of primary energy consumption upon varying the building typology and the city.

These values were calculated by using Eq. 2 and Eq. 3. This figure shows that:

- the higher values of primary energy consumptions associated to the concrete-frame house were obtained in the cases of Bolzano and Palermo (1.25E□08 kJ);
- the higher values of primary energy consumptions associated to the wood-frame house were obtained in the cases of Palermo (1.24E□08 kJ);
- when the timber house is located in Bolzano, the values of primary energy consumptions are lower than other cities and are equal to 1.08E□08 kJ; this is due to the fact that the cooling energy required in this case (wood-frame house located in Bolzano) during summer is around 58□ with respect the cooling energy required in Naples and around 44□ with respect the cooling energy required in Palermo.

Figure 7 compares the performance of the proposed timber house with those associated to the conventional brick house. The comparison was carried out from energy and economic point of views by means of the equations above-reported. In particular, this figure reports the values of ΔE_p (Eq. (1)) and ΔOC (Eq. (4)) as a function of the city where the building is located. This figure highlights how:

- whatever the city is, the wood building reduces the annual primary energy consumption with respect to the concrete-frame house with a value of PES ranging from 1.0□ to 13.9□;
- whatever the city is, the timber house allows to obtain a positive value of the annual value of ΔOC ranging from 0.5% to 13.0%;
- the worst results in terms of ΔE_p and ΔOC are achieved when the building is located in Palermo, while the best energy and economic performances are obtained in the case of the building is located in Bolzano;

6. Conclusions

In this paper, the influence of construction material on the energy demand of a typical Italian single-family residential application, located in Italy, was analyzed. The primary energy consumptions and the operating costs associated to two building typologies were evaluated by means a transient simulation software during yearly operation. In particular, a single-family wood-frame house and a brick building were analyzed.

In order to evaluate the influence of the climatic conditions of three different Italian cities, representative of the different climatic regions of Italy were considered. Finally, the performances of the timber house were compared with those of a concrete-frame house.

The main results of the comparison can be summarized as follows:

- when the wood-frame house is located in Bolzano, the values of primary energy consumptions are lower than the other cities;

- the timber house proposed in this work allows for a reduction of primary energy consumption with respect to the conventional brick building with a value of ΔE_p ranging from 1.0 (Palermo) to 13.9 (Bolzano);
- the wooden building is able to reduce the overall operating costs when compared to the concrete-frame house and the values of ΔOC range from 0.5% (Palermo) to 13.0% (Bolzano).

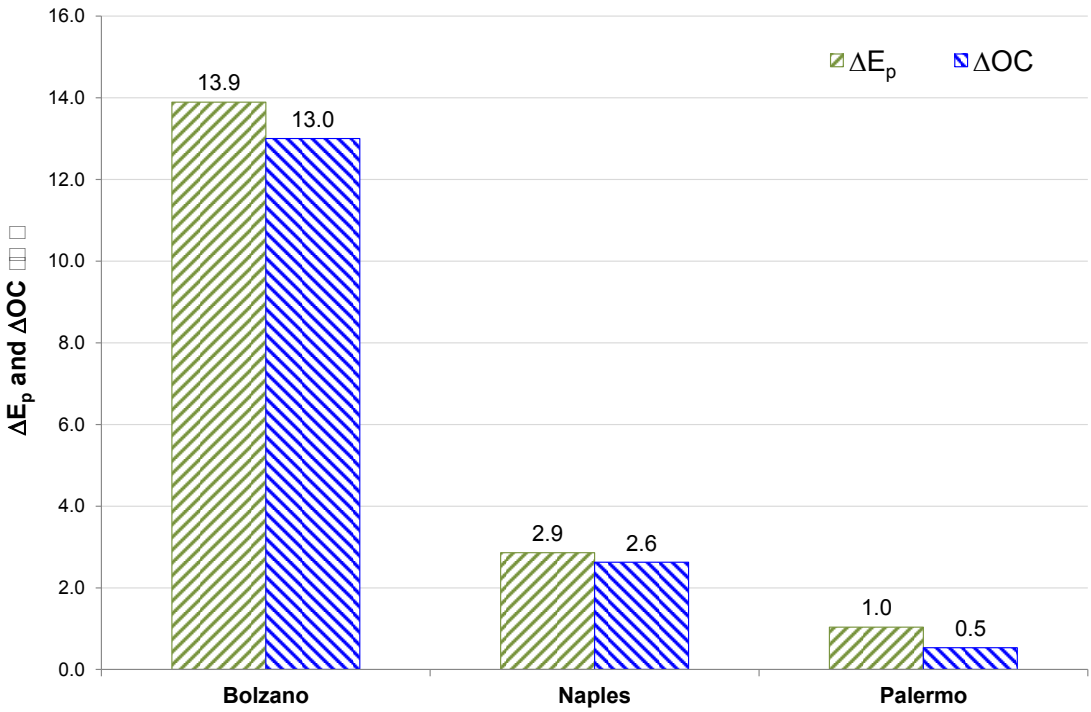

Fig. 7: Values of ΔE_p and ΔOC upon varying the city.

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The perception's drawing.
A project for the occupation of the Ruvo di Puglia's public land

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Abstract
Observation is the preparatory action that precedes the act of drawing. This basically means "identification", an ability allowed by a precise scene's visual scan that establishes which areas of the image must be focused on to recognize the objects.
The researches of the Russian psychophysicist Alfred L. arbus, that found that the gaze is only interested in a few elements of the scene and not in its wholeness, and the later discoveries made by the scientists C. Kock and S. Ulman (1985), have allowed the definition of a numerical model, named 'saliency map', that simulates the human perception's mechanism. Therefore, it defines digital images, in which each pixel is given a value linked to the visual impact that it embodies in the scene, in accordance with the parameters of coloration, lighting and orientation, thus reproducing the visual attention of a "common gaze", that can be shared by almost everybody.
In our project, the saliency maps have been experimentally applied to the drawing of the outline for the occupation of public land of the Ruvo di Puglia's old town centre. Moreover, three-dimensional models have shown the possible types of the occupation's constituent elements, later added in the urban context by the photo compositing technique, while the saliency maps' elaboration has allowed to foresee the visual impact and the choice – in agreement with the Soprintendenza Architettonica of Bari – of materials, shapes and colors of the occupation's elements.

Keywords: Perception, saliency maps, urban furniture, smart design.

1. The urban image's perception
This research's purpose is to describe an experimental procedure, tested by the Politecnico di Bari's research team belonging to the Architectural and Urban Modeling's laboratory of the Dicatech, suitable for foreseeing the visual impact of the equipment used for the food and drinks supply on external public places when urban environments with high historical and architectonical value (presumably the old towns) are involved [1].
In particular, we wanted to verify the possibility of adding dehors, even in a context of an high valuable environment such as the one of the Ruvo di Puglia's old town, with the necessary measures to protect and enhance the urban environment, also considering solutions that could allow the existence of the local marketplaces and the safeguard of the monuments' perceptual fruition. Moreover with the aim of improving the economic activities to recover a part of the city's identity and stem the social degradation.
For this reason, we have experimented a graphic analysis on the above equipment: at first it has been virtually inserted in the old town's context thanks to advanced computer graphics techniques, then it has been examined by computational elaborations that simulate the human visual perception, allowing the measurement of the selective attention, in order to define the priority of the visual stimulus in a virtual scene perceived. This process involved the use of the "saliency maps" that simulate the human

visual perception's mechanisms in the automatic identification of the visually significant elements in a photographed scene [2].
Such experiments, that clearly emerge from researches associated to the neurosciences, reveal the relationship between the perception and the reality's understanding, resulted from a never-ending synthesis of the sensory data, later compared to the memory and the decision-making skills.
As far as the city is concerned, the attention towards the sensory experience, easily simulated thanks to these tools, presumes the idea of a mental space reconstruction, made by the temporal overlap of numerous sequences obtained in different occasions and conditions.
This research's purpose is to underline how much this tool, that partially reproduces the ordinary sensory experience, could give more strength to the visual perception in the analysis of the urban environment's components by indentifying the easily seen and recognizable elements.

2. The saliency maps

The saliency, in the visual perception, is the quality that let an element emerge among the others in the surrounding environment. It is what appears immediately because of its chromatic qualities, lighting level and position, thus gaining a preeminent role. It is what emerges as a result of a process involving both the observed environment and the observer that applies the saliency on the perceived elements to simplify the continuous meaning-attribution's process and help the creative mental process of anticipation.
This numerical modeling reproduces the discrimination processes that happen, at an unconscious level, before all the mental elaborations important for the interpretation of the visual shapes, such as the analysis of the sensory data based on the past experience and the visual system's control of the creative and inferential hypothesis.
The aspects concerning the neuronal mechanisms in charge of controlling the attention [3] have been reproduced in a mathematic model by Laurent Itti e Christof Koch in 1999 [4], using a method that can combine a single normalized representation (the saliency map) with the measurements of the selective attention and establish the priority of the visual stimuli in each of the real scenes portrayed.
The saliency map is a digital image made by the same number of pixels that compose the original one. To each pixel is associated a fair saliency value (0-255) that sharpen the contrast visually perceived between the parts, in accordance with the selected parameters. In this representation, the distinctions between the elements recognizable on the scene can be modified on the basis of three parameters: the lighting, the color and the orientation [5].
These are three specific stimuli that can make the neuronal processes clear to the sensory experience, starting from the retina's highlighting processes [6].
Such elaborations come from the study of the complex biologic system that connects the excitatory or inhibitory data received by various sources, thus materializing the integration activity of the nervous system.
Briefly, we can say that the receptor sites attached to the retina's photoreceptors' cells, react to the part of the image in which the intensity of the light changes, gathering the perceived aspect of an object from the contrast between the object itself and the background.
Indeed, thanks to the studies made by Kuffler, who observed the activity of the ganglion cells that use a "center-on or center-off" receptor site [7], it has been discovered that identifying in a visual scene those parts in which the light intensity changes helps the perception of an object by gathering its own outline from its contrast with the background.
Therefore, the saliency maps not only stimulate the visual attention normally caught by the dark points on the bright outlines or vice versa, but also individuate the value of the color in the perception. This is essential for the visual discrimination because allows the individuation of objects that otherwise would go unnoticed and intensifies the contrast between the components of an image.
The applied system proceeds by the opposition of pairs of colors (double-opponent), simulating what the retina's photoreceptors do in the fovea.
At last, the orientation is the reaction to the guidelines of the primary visual cortex [8] that reacts selectively to every specific disposition – vertical, horizontal or oblique – by activating different neurons influenced by the discontinuity between bright and dark areas. This produces a perceptual illusion called "Mach bands"[9] that let the outlines between the brighter and the darker areas be perceived.
They appear because of the combinatory effect of the receptor sites' inhibitory actions that intensify the contrasts and lead the brain to perceive the outlines of the objects in a real scene.
In summary, the saliency maps, simulating the neural net that oversees the selection of a visual stimulus, are aimed at representing the relevance of every visual field's positions, expressed by a scalar quantity after selecting the image's focal points and highlighting with brighter spots the objects or the details in order of saliency.

So, in each map derived from the elaboration of a photographic image, it is possible to identify in a decreasing order of importance the "focus of attention" (FOA) that underlines the part of the image that would catch the observer's sight as if he was in a real scene.
In this sense, it could be important to start the understanding of what in every urban environment can be appreciated by every citizen, considering the city in relation to the direct involvement of the observer/citizen, just like for the art critics' of the 20th century the definition of a work had to include the involvement of the public.
As far as the urban scene is concerned, this means analyzing the visual rendering, trying to reconstruct (although partially) the mental process that defines it and indentify which components could compose the mental image of the city.
Kevin Lynch had already recognized a peculiar visual quality of the urban environment in its possibility of appearing clear and "readable" to its users, resulting as the product of the interaction between the observer and the observed environment [10].
Therefore, the saliency maps could become an important element in the process of acknowledging of the architectural and urban reality. Being the product of the perception's modeling, we firmly believe they could be the useful requirements to deal with the issue of the urban built-up area's image, thus supporting the copy "model" that has found its expression in the urban representation's field since the invention of the perspective.

3. The case study

Our experimentation has involved a urban area representative of the old town. The scene analyzed is one of the Ruvo di Puglia's old town, that is a built-up area north of the Murgia barese's upland and provided with a physical structure that has - with no doubt - a great historical and architectonical value. Furthermore, a particular attention was given to the space located outside the Church of the Purgatorio, a 17th century building that preserve the Roman Rubi's remains in its hypogeum.
We started with the visual saliency's analysis of some images representing its real appearance from many points of view, so as to evaluate the original visual impact, thus comparing it with the results obtained from the elaboration of the same image thanks to digital models' photo compositing processes, that reproduce faithfully the equipment that can be used for the occupation of the public land. There have been detected and reproduced, many kinds of chairs, tables, panels to cover the occupied area's perimeter, platforms and umbrellas, then added in the urban scene portrayed.
The experimentation has considered different models and colorations for the equipment, normally used for the purpose, enough to draw up a list, gathered by the experimentation, by the shapes and colors that can be judged less visually out of place, and describe themselves in the figures with the correspondent saliency map that describes the analysis.
The above analysis has proved that the dark furniture sharply contrasts with the visible stony face's light background and, on the contrary, the light colors reduce the chromatic exposition, important in the outline's perception, by concealing themselves in the surrounding environment.
The vertical sticks of the chairs' backs or the woven patterns of the perimetral elements activate the recognition, emphasized by the "Mach bands" illusory effect, of the discontinuities between the light and the dark areas, thus catching the observer's visual attention to the detriment of the other elements existing in the perceived urban scene.
The several "visual verifications" performed have allowed the individuation of the main features of the furniture, with a low perceptual impact, for the occupation of the public land.
Generally speaking, colors that contrast with the background should be avoided whereas a linear furniture should be preferred, such as: platforms with light wooden slats; perimetral elements made by transparent panels; chairs or couches with a linear design; umbrellas with slightly sloping woven brims and dark structures.
The achieved results, represented in the images, underline that the urban scene's architecture often becomes a "visual background" for superfluous elements and that the presence of pedestrians, cars, signs, trash cans can gain a perceptual predominance because of their shape, color and lighting.
In spite of the simplicity of the case examined, we believe that this experimentation can add useful information to the urban analysis, thus being considered another valid instrument for the comprehension of the differences that can be found in a built-up environment and for the preliminary analysis of actions that modify the urban scene.

Fig. 1: Largo S. Cleto. On the left the church of the Purgatory.

Fig. 2: Largo S. Cleto. Starting situation. The “focus of attention” (FOA), identified in the saliency map overlayed, shows the visual impact of vertical overlapping lines of the balcony railing and the horizontal slats of window and of some elements of urban furniture (insignia, waste bins).

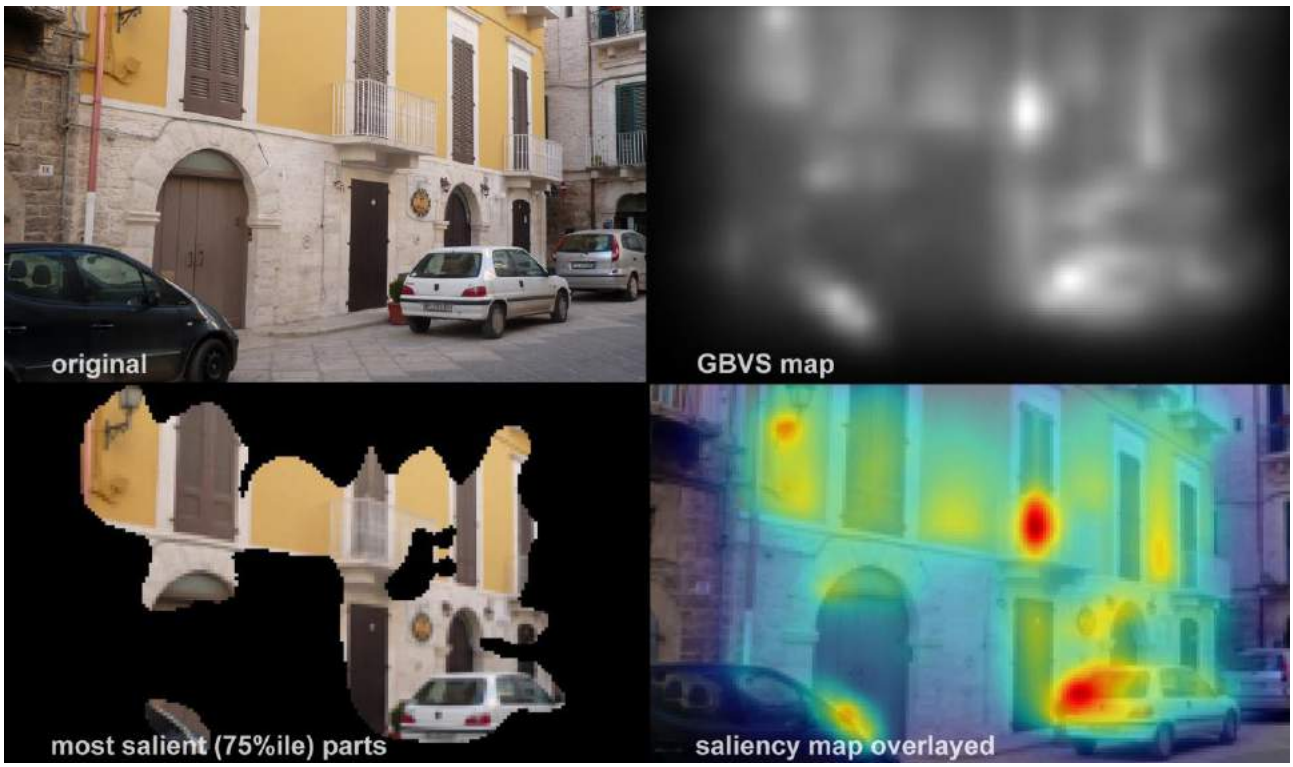

Fig. 3: Largo S. Cleto. Starting situation. Are evident, with decreasing intensity, the FOA determined by the color contrast between the background (the wall) and some elements of street furniture and parked cars.

Fig.4: Hypothesis n.1 made up by: light wooden slats as leveling elements; woven patterned panels as perimetral elements; a white umbrella as covering element; chairs with dark seats and full backs and a white table as furniture. The FOA highlights the relevance of the woven pattern in the perimetral panel and in the umbrella‘s supporting structure.

Fig.5: Hypothesis n.2 made up by: dark wooden slats as leveling elements; woven patterned panels as perimetral elements; a white umbrella as covering element; white chairs with full seats and backs and a white table as furniture. The FOA highlights the relevance of the umbrella‘s supporting structure.

Fig.6: Hypothesis n.3 made up by: dark wooden slats as leveling elements; opaque glass patterned panels as perimetral elements; a light color umbrella as covering element; white chairs with full seats and backs and a white table as furniture. The FOA highlights the relevance of the umbrella‘s supporting structure.

Fig.7: Hypothesis n.4 made up by: dark wooden slats as leveling elements; opaque glass patterned panels as perimetral elements; a dark color umbrella as covering element; black vertical slats back chairs and a white table as furniture. The FOA doesn't highlight relevance's point of the furniture.

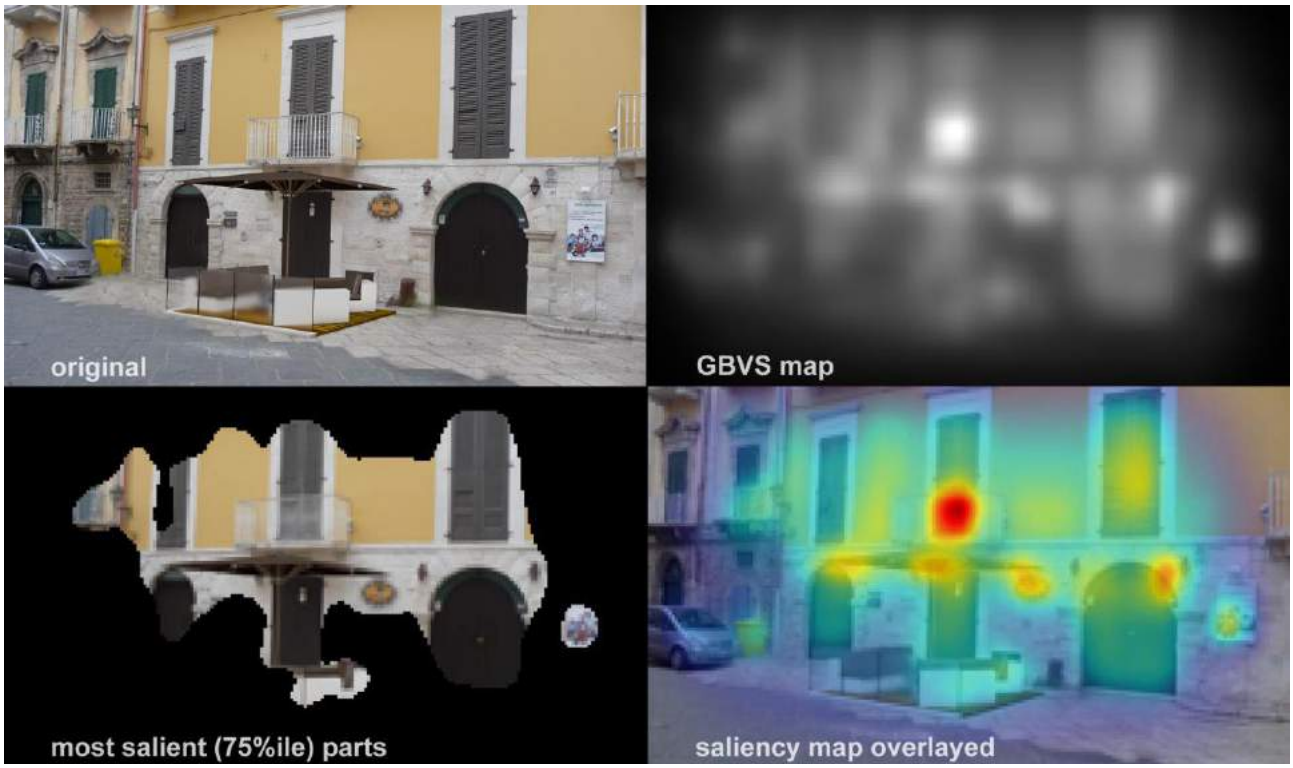

Fig.8: Hypothesis n.5 made up by: dark wooden slats as leveling elements; opaque glass patterned panels as perimetral elements; a dark color umbrella as covering element; white outdoor seating group with dark cushions as furniture. The FOA doesn't highlight relevance's point of the furniture.

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[2] Elaboration implemented by a MATLAB executive code through the standard algorithm Itti, Koch, Niebur PAMI 1998 saliency map. See. J. Harel, C. Koch, and P. Perona, "Graph-Based Visual Saliency", Proceedings of Neural Information Processing Systems (NIPS), 2006.

[3] Studied for the first time with reliable results by Kock and Ulman in 1985. See Christof Koch, Shiman, Ullman. *Shifts in Selective Visual Attention: Towards the Underl□ing Neural Circuitr□*. Human Neurobiology, vol. 4, pp. 219-227, 1985.

[4] See. Laurent Itti, Christof Koch, E. Niebur, and others. A model of saliency-based visual attention for rapid scene analysis. IEEE Transactions on Pattern Analysis and Machine Intelligence, 1998 pp. 1254-1259.

[5] In particular, the algorithm executed by the software Matlab processes three maps, starting from the decomposition in pixel of the image to by analyzed: the Graph-Based Visual Saliency map (GBVS map), is a cloud of points where the density shows the visual concentration areas; the most salient map highlights the area of the scene where's the greatest visual impact; the saliency map overlayed superimposes the GBVS map the real scene and uses the color (from red to yellow), gradually distributed, to highlight points of visual attention (FOA).

[6] See KANDEL Eric R. L'età dell'inconscio. Milano: Raffaello Cortina Editore, 2012, 622 p. ISBN 978-88-6030-491-9 p. 255.

[7] That is excitable by a bright point hitting the center of its receptive site, but inhibited by the light hitting its peripheral area. See. Eric R. Kandel, 2012. p. 252.

[8] Discovered by Hubel and Wiesel in 1962.

[9] From the name of the Swiss physic and philosopher that first studied them. See. Eric R. Kandel, 2012. p. 261-273.

[10] See. L□NCH Kevin. *L'Immagine della città*. Venezia: Marsilio, 1985, 249 p. ISBN 88-317-0024-3

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The survey of *Rotunda*: documentation, representation and data integration of San Lorenzo in Mantua and Santa Maria delle Grazie in Forlì for the interpretation of Renaissance architectures

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Abstract
The three-dimensional morphometric surveys of the *Rotunda of San Lorenzo* in Mantua (dated before 1083), commissioned by Matilde di Canossa, and the Sanctuary of *Santa Maria delle Grazie di Fornò* in Forlì (1450-1460), attributed to Agostino Di Duccio, are the opportunity to develop a methodology of data extraction and data query of 3D databases aimed at the documentation, understanding and knowledge of composition and design processes of one of the most relevant models for the Renaissance architecture. The central-plan layout becomes also for Leon Battista Alberti a subject of experimentation, which can be seen on the transition from the analysis of the Rotunda late-medieval layout up to the architectural solutions implemented in San Sebastiano and in the rotunda of the Santissima Annunziata.
The paper will present a morphometric comparison and interpretation of central-plan buildings, methodologically surveyed by the same instruments in order to develop a possible avenue of research aimed at the documentation of this heritage especially Italian (Renaissance).
An accurate and integrated comparison of the surveyed data can provide an opportunity to analyze the evolution of this architectural layout that, in this kind of church typology, has been pursued throughout the Renaissance and beyond.

Keywords: documentation, representation, 3D survey, Renaissance architecture, morphometric interpretation

1. Introduction
Within a knowledge-based process mainly directed towards the comparison of morphometric data, acquired by using the same technology for different centrally-planned buildings, the three-dimensional morphometric survey of the *Rotonda di San Lorenzo* in Mantua and the Sanctuary of *Santa Maria delle Grazie di Fornò* in Forlì, developed by DIAPReM Center of the Department of Architecture of the University of Ferrara in collaboration with Fondazione del Centro Studi Leon Battista Alberti in Mantua, become an opportunity to explore the issue of central plan buildings, one of the most significant Renaissance architectural models, and to develop a research methodology and a data extraction process from three-dimensional database, aimed at knowledge, documentation and understanding of these architectures.
The research process includes the architectures by Leon Battista Alberti, San Sebastiano in Mantua and the rotunda of the *Santissima Annunziata* in Florence, in their complex spatial and architectural articulations, still the subject of extensive studies and research by historians of art and architecture.
The integrated survey methodology applied to the architectural model of the rotunda is able to connect, in a close relationship of finalizing, the data acquisition process to the representation, with

the analytical implications that the 3D database allows. The use of these technologies also allows comparing the morphological and typological issues with the technical and constructive components of the *Rotunda*: architectural curvilinear elements, made of brick, require control of geometries and understanding of manufacturing techniques in order to analyze those challenging solutions, which have been debated for centuries.

2. Historical framework

The *scarlet thread* that connects the *Rotonda di San Lorenzo* in Mantua, the Sanctuary of *Santa Maria delle Grazie di Fornò* in Forlì, San Sebastiano in Mantua and the *Rotunda* of the *Santissima Annunziata* in Florence by Leon Battista Alberti; Agostino di Duccio, to whom the Sanctuary of *Santa Maria delle Grazie di Fornò* is attributed, and the *Tempio Malatestiano*, where Alberti's project involved the addition of a rotunda at the end of the church, allow to draw an historical and architectural path that, from the late Medieval typology of the rotunda leads to Alberti's Renaissance buildings.

By means of a documentation process that exploits the accuracy of three-dimensional survey technologies for an analysis that retraces the work of the great masters, from geometry to typological models up to the analysis of constructive technologies, it is possible to relate the survey to the representation, aimed at interpretations and historical investigations, with a strong interdisciplinary value.

Historically, the documentation path starts from the XI century, between the places of Matilde di Canossa and the work of Agostino di Duccio, and winds down to the Fifteenth century, when Alberti Architect runs proposing different solutions, or models, in different places and for different commissions [1].

The Rotunda of San Lorenzo in Mantua, built in the eleventh century, according to the Gothic inscription that is still readable today at the level of the high gallery, which brings the year 1083 and that seems to be the year of building, was built at the behest of Matilde di Canossa as evocation of the Resurrection in Jerusalem and ideally connected to the relic of the blood of Christ, now kept in the nearby crypt of the basilica of *Sant'Andrea*. Its circular plan cannot be correlated only to the imitation of the Holy Sepulchre, for the fact of being near St. Andrea. Matilde di Canossa would have revived in Mantua an imperial model or rather a specific Carolingian model, rotunda that perhaps she had seen directly or indirectly during her travels in Germany [2, 3].

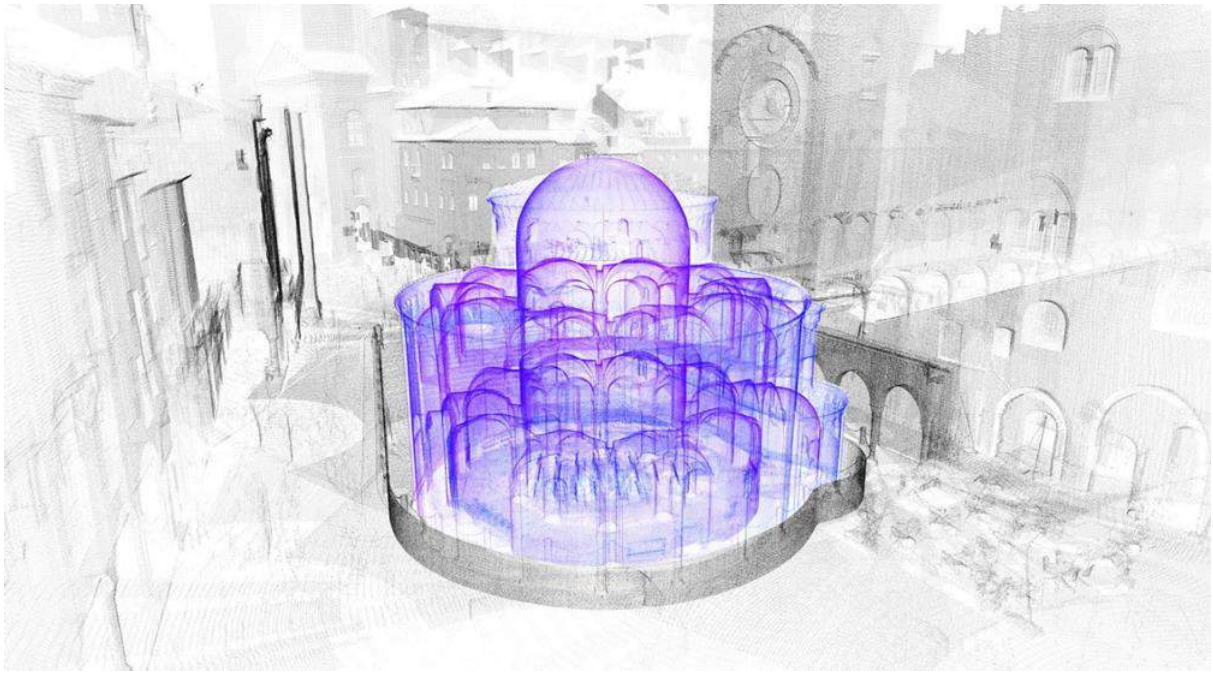

Fig. 1: Rotunda of San Lorenzo in Mantua, visualisation of data extraction in silhouette generated from the 3D database for a perspective view in which the reflectance data have been highlighted to make more recognizable the outer structure from the environment, in grey scale, by internal volumetric structure, in "false colors".

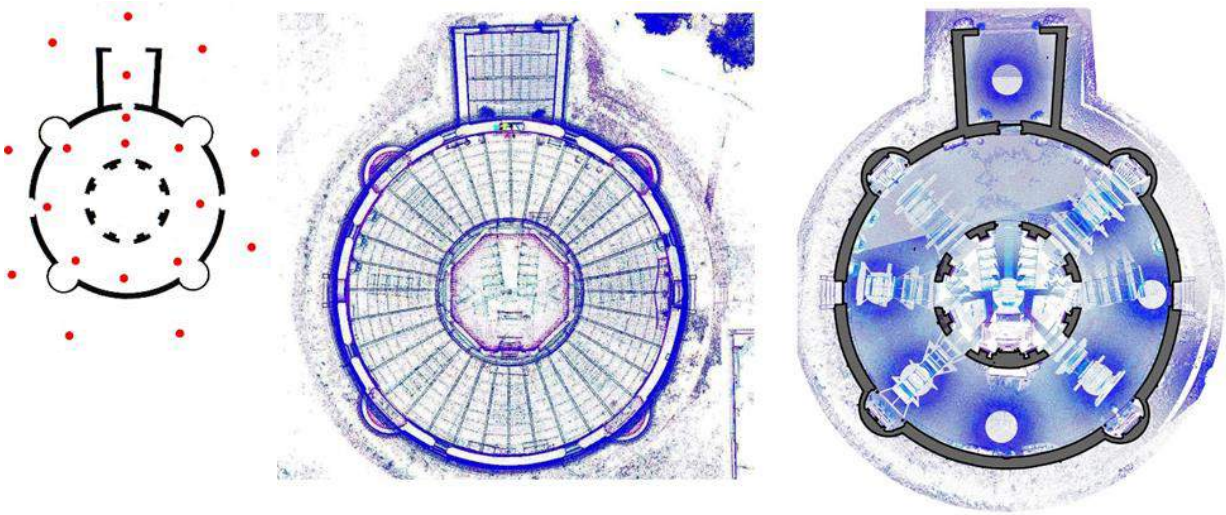

Fig. 2: Sanctuary of *Santa Maria della Misericordia* then *delle Grazie di Fornò*. On the left, the scheme of 3D scanning station, on the centre and right, plans obtained by the 3D database.

The sanctuary of *Santa Maria della Misericordia* then *delle Grazie di Fornò*, which is in the countryside between Forlì and Forlimpopoli, is the most unique monument of Forlì area, as it embraces, in a totally unusual way for a building dedicated to the Virgin, a central plan [4]. Attributed to Agostino di Duccio [5] and built in its present form and proportions between 1450 and the early years of the sixteenth century, is one of the most outstanding examples of Renaissance culture in Romagna, in the time of Melozzo da Forli. The architectural hall, consisting of a large structure with presbytery closed by a cylindrical wall, topped by a polygonal tambour of the dome and circumscribed by deambulatory, has a circular shape [6]. Piero (or Pietro) Bianco da Durazzo, the founder of this important architectural complex, erected in 1448 on the outskirts of Forlì a cell dedicated to the *Madonna della Misericordia*. In 1450 was built a temple on the site where would be built the sanctuary, until 1453 described by the chroniclers as a small church, whose foundation dates back to 1460, as the inscription on the portal attests. A series of structural damages and the earthquake of 1483 made necessary the redefinition of the entire architectural complex, completed in its present shape in the early sixteenth century.

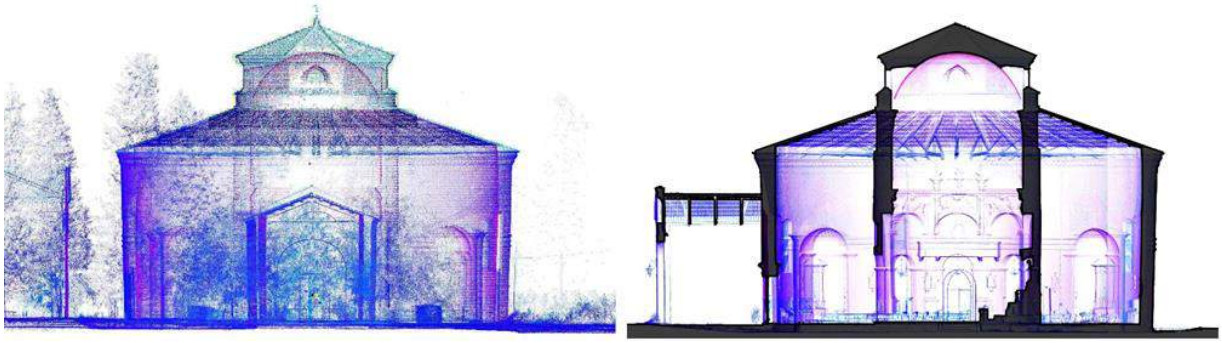

Fig. 3: Sanctuary of *Santa Maria della Misericordia* then *delle Grazie di Fornò*, view of the data extraction generated from the 3D database in elevation, to the left, and in section, on the right, with highlighting of the vertical section.

The architectures in which Leon Battista Alberti experiences the central plan model, allow to “close a circle” around the evolution of the model of the rotunda up to the Renaissance architecture. Particularly San Sebastiano in Mantua, began around 1460 with a system that is a model for the Renaissance buildings with a Greek cross layout [7], and the tribune of the *Santissima Annunziata* in Florence, in which Alberti works on the *tribuna* and on the large area covered by a dome, with the large arch of connection with the nave of the church. The experimental path of Leon Battista Alberti on the issue of central plan is accomplished in *Sant'Andrea* in Mantua and the *Tempio Malatestiano* in Rimini, ideally defined with an apse based on the central layout, comparable to the one of the *Santissima Annunziata* in Florence.

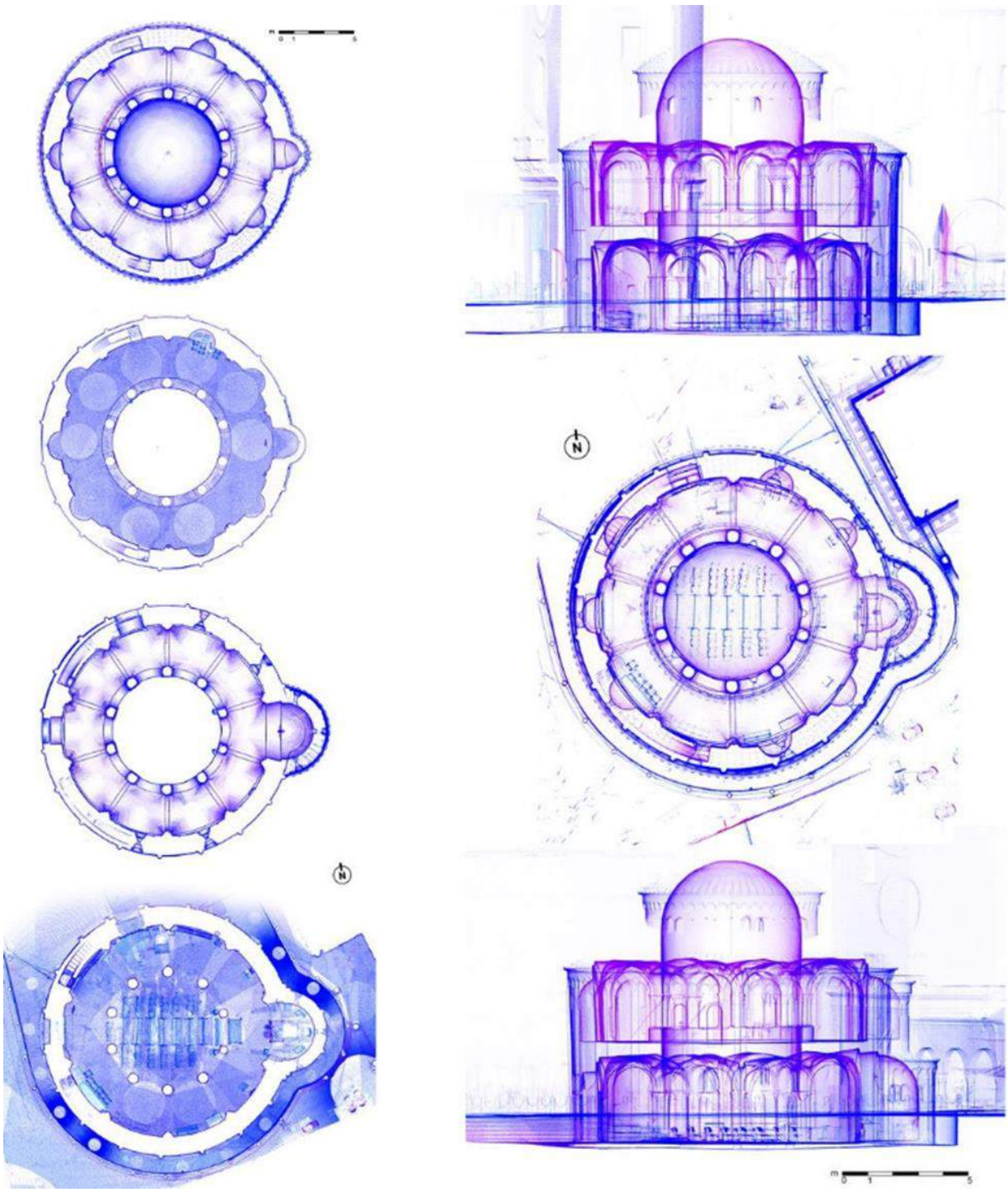

Fig. 4: Rotunda of San Lorenzo in Mantua, on the left, data extraction from the 3D database for planimetric projections: ground floor at 1.6 meters from the outside level, the women's gallery or second floor at 6.6 meters from the outside level. To the right, views of the data generated by the 3D database extraction for a vision in planimetric silhouettes and elevation, suitable for the analysis of the architectural structure.

3. The integrated 3D survey for documentation, knowledge and representation

The *Rotonda di San Lorenzo* in Mantua and the Sanctuary of *Santa Maria delle Grazie in Fornò* in Forlì, as well as the architectures by Leon Battista Alberti, in particular San Sebastiano in Mantua and the church of *Santissima Annunziata* in Florence, have been surveyed in different periods, by integrating the 3D laser scanning survey based on time-of-flight technology and the topographic survey. The articulated volumetric complexity, the particular architectural typology investigated and the technological-constructive analysis, require an instrumental integration that allows optimizing the scans registration, defining an overall reference network, and improving the data registration process. The photographic survey for documentation purposes, to state the factual and in-depth control in the

documentation of the decorations, and the direct survey to any inaccessible areas complete the integrated acquisition.
The survey steps have been carefully planned according to the representation needs, strongly "finalized" in relation to the qualitative interpretation of data (that in 3D acquisition are quantitative) to extract different descriptive visualisations. The aim was to obtain a correct and consistent representation able to respond to specific scale ratios and qualitative description, whenever necessary to comprise the answers to the specific needs required.
The survey of the Rotonda di San Lorenzo in Mantua [8] made it possible to obtain a database, achieved through 57 3D scanning stations, for 67 million metric points acquired. The acquisition was made through the drawing up of a sampling density mesh of about 20 mm. The topographical network was planned with the support of 80 targets to record all the different scans and to optimize the data registration process.

Topographic survey		
	Rotonda di San Lorenzo in Mantua	**Sanctuary of Santa Maria delle Grazie di Forn□**
Total station (n., model)	1, Leica TCR 1101	1, Leica TCR 1101
□ or□ timing (days)	1	1
Pol□gons (n.)	2	2
Pol□gon verte□es (n.)	14	19
Matched targets (n.)	33	39
3D laser scanner survey		
	Rotonda di San Lorenzo in Mantua	**Sanctuary of Santa Maria delle Grazie di Forn□**
□D laser scanner	1, Leica ScanStation 2	1, Leica HDS 3000
□ or□ timing (h.)	61	40
Number □D scan stations	57	22
Ac□uired targets	80	35
Point cloud coordinates	67.000.000	32.000.000

Fig. 5: Table of the main technical specifications of the integrated survey of the *Rotonda di San Lorenzo* in Mantua and the *Sanctuar□of Santa Maria delle Grazie di Fornò* in Forlì.

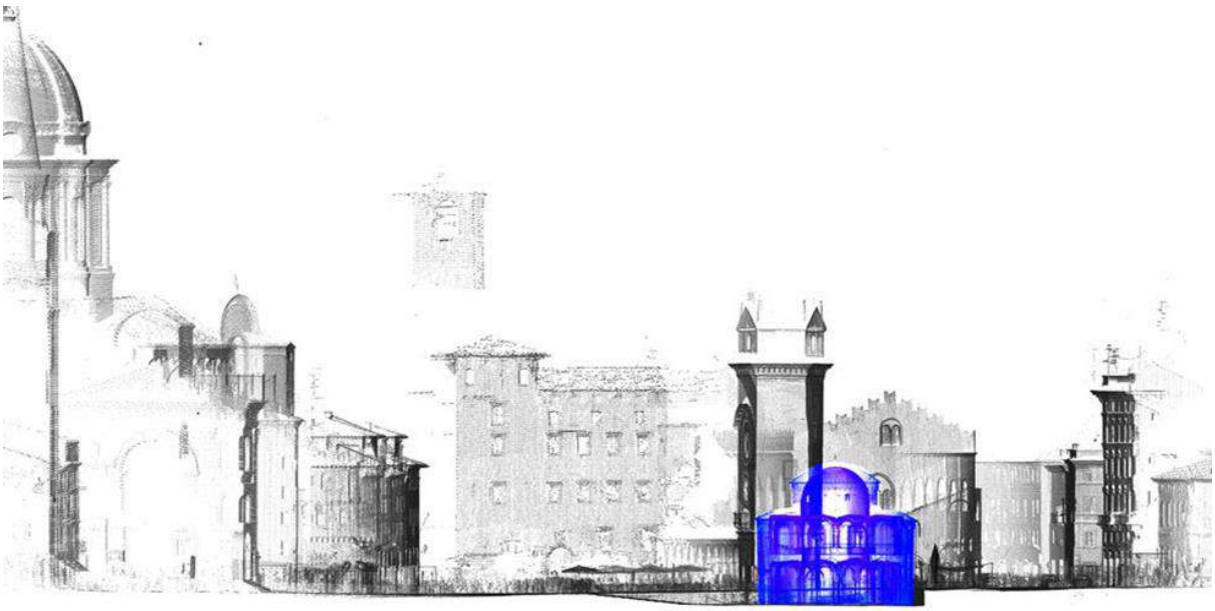

Fig. 6: *Rotonda di San Lorenzo* in Mantua, visualization of the data generated from the 3D database. It is understandable that the survey data are morphologically integrated in the environment, represented in gray scale, with respect to the internal architectural volume, in “false colors”.

The survey of the Sanctuary of *Santa Maria delle Grazie in Fornò* [9] was performed by integrating time-of-flight technology with topographic survey. The database has been realized through 22 3D scanning stations for a total of 32 million metric points acquired. The topographical network was implemented with the support of 35 targets to record all the different scans and to optimize the data registration process.

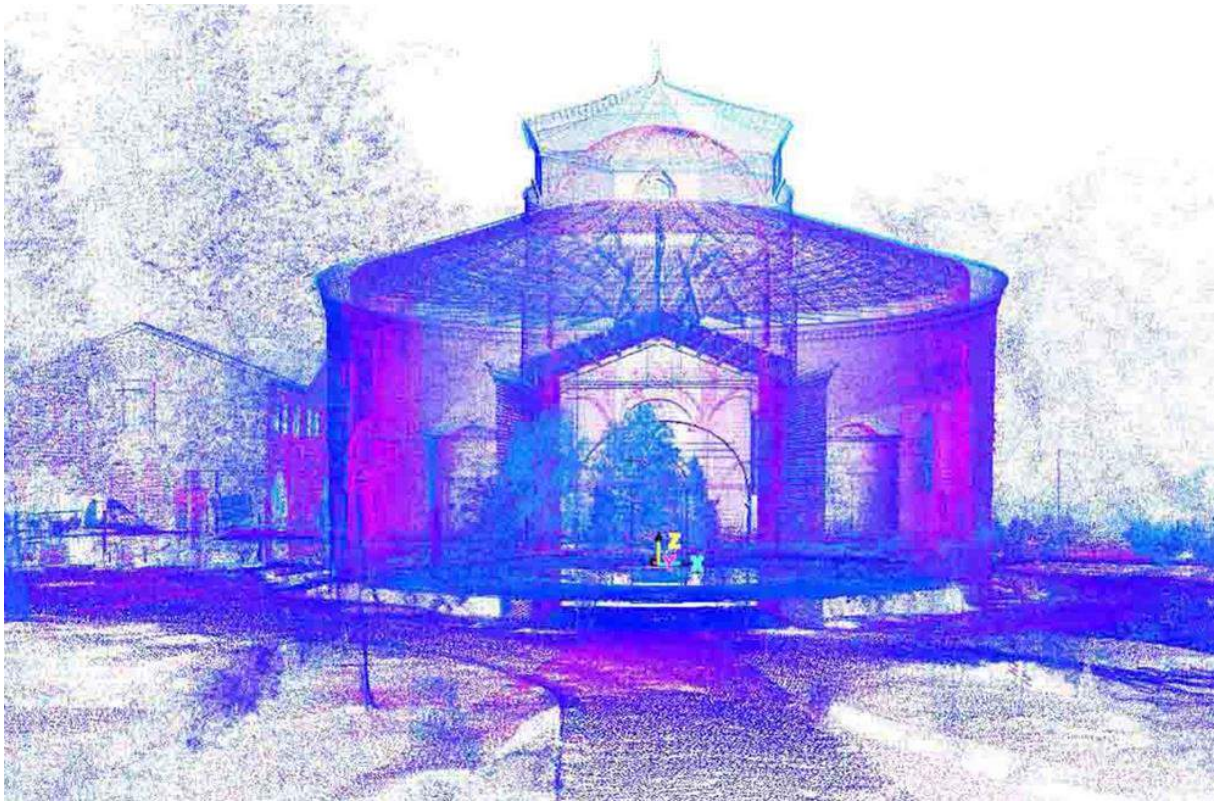

Fig. 7: Sanctuary of *Santa Maria delle Grazie in Fornò*, in Forlì. Visualization of the data generated from the 3D database.

The survey of all the architectures by Leon Battista Alberti, acquired by using the same methodology and instruments to create a morphometric database to be queried and browsed to support research, conservation and dissemination of cultural heritage, is a project began in 2005. The aim was to create three-dimensional databases able to setting up over time an archive of the “geometric memory” of Alberti architectural works, applicable for research by historians of art and architecture, but also for protection and conservation purposes and as a support in any restoration processes or reproduction needs [10].
The common methodology applied to the architectures described above implies not only the instrumental application of integrated technologies, as a result of years of research in the discipline of the survey and representation applied to cultural heritage [11]. The three-dimensional survey of such architectures and large monuments is also strongly connected to a methodology of documentation and representation for the knowledge applied to the implementation process and the extraction of the information.

4. From morphometric survey to interpretive studies of typological model

3D databases acquired through the methodology described above allow an assessment of different buildings and a metric-morphological comparative study, by implementing the so-called phase of "data processing" which allows a real exploration of the database and data use [12, 13].
The comparison between planimetric and elevations views, the comparison between upper and lower plans, morphological overlapping through point clouds, analysis of structural correspondences, investigations on interventions that have taken place over the centuries, are just some of the steps, and exploration opportunities, applied to the surveyed architectures.
In the case of the rotunda of San Lorenzo in Mantua, the data extraction generated by querying the 3D database allows views in silhouette particularly useful to extract and analyse profiles and shapes of

architectural structures, evaluate planimetric and altimetric connections and implement morphological overlapping useful to understand the modifications and offsets that cause some lack of structural masonry matches.
The survey of the Sanctuary of *Santa Maria delle Grazie in Fornò* allowed, on the other hand, to working in synergy with in-depth studies about Agostino di Duccio and the northern Italian artistic culture; the data extracted from the 3D database was compared to the seventeenth century drawings and surveys previously carried out by direct methods, allowing to formulate new studies and investigations on the restoration work carried out in the nineteenth century. Views in transparency allow to relate the cylindrical wall that closes the presbytery, the polygonal tambour of the dome and the deambulatory.

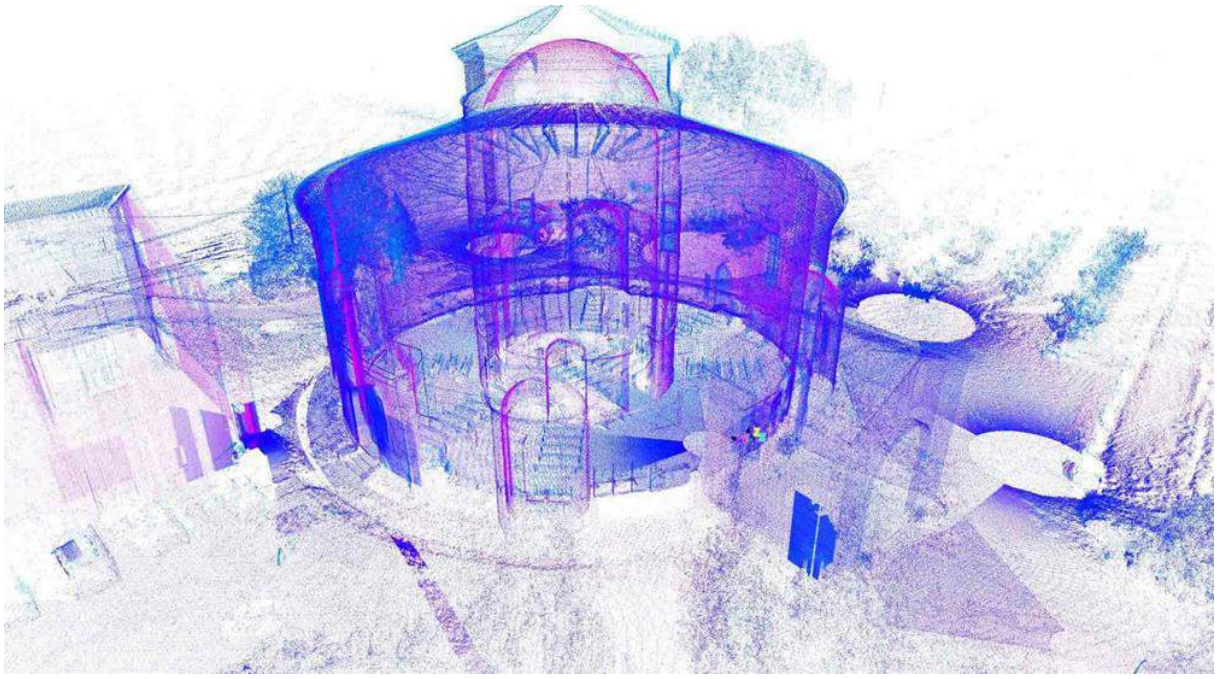

Fig. 8: Sanctuary of *Santa Maria delle Grazie in Fornò*, in Forlì. Visualization in silhouette of the data generated from the interrogation of 3D database, aimed at verifying the volumetric and morphological relations between outside and inside.

The interrogation of the three-dimensional database of the church of *Santissima Annunziata* in Florence has allowed to analyse the connection between the main body of the church and the *tribuna*. The survey data were extracted to show all volumetric matches of the arch of intersection of the tribuna on the central nave and the layout of the radial chapels. Viewing in transparency allows to have simultaneously the morphometric perception of the archway soffit, the correspondences between the two sides of the nave, including projections of cornices and structural boundaries.
The central structure of the Church of San Sebastiano in Mantua allowed, in particular, to correlate the upper church with the vaulted system of the lower church. The ability to compare volumetrically the two architectural spaces without constraints of predetermined section planes, opens up new investigative possibilities, which exploit the potential of morphometric querying of the 3D database both in the overall vision and in the progressive approach to detail.
Leon Battista Alberti developed (more or less completely) the model of the central plan through an experimental path that finds *Sant'Andrea* in Mantua and the *Tempio Malatestiano* in Rimini ideally defined by a central apse system, comparable to the Santissima Annunziata in Florence, based on the layout by Michelozzo. In this context, Santa Maria delle Grazie in Fornò emerges as an important connection (not only for the presence of Agostino di Duccio) but also for the continuity with the Rotonda di San Lorenzo in Mantua. The model (central round or on Greek cross layout as it will be for San Sebastiano in Mantua) outlines not only issues related to the proportion/typology, but also constructive, both on the technology and the type of coverage. A topic that for Leon Battista Alberti will become the focus of constructive experimentation in the dome of *Santissima Annunziata* in Florence that “compares” itself, along the axis of Via Servi, with the dome by Brunelleschi in Santa Maria del Fiore. Beyond the typological aspects, many considerations regard the construction of plans, not easy to be raised and defined in proportions for construction and procedures, with geometric checks at

every stage of the construction site. At methodological level, among the investigative paths that the 3D data provides, the investigation processes of inaccessible structures and volumes, and the morpho-typological study of architectural volumes in relation to the overall building articulation, the relationship between the whole and its parts [12] are part of a process of knowledge typical of the survey process that leads from the quantitative geometric acquisition to a qualitative interpretation.

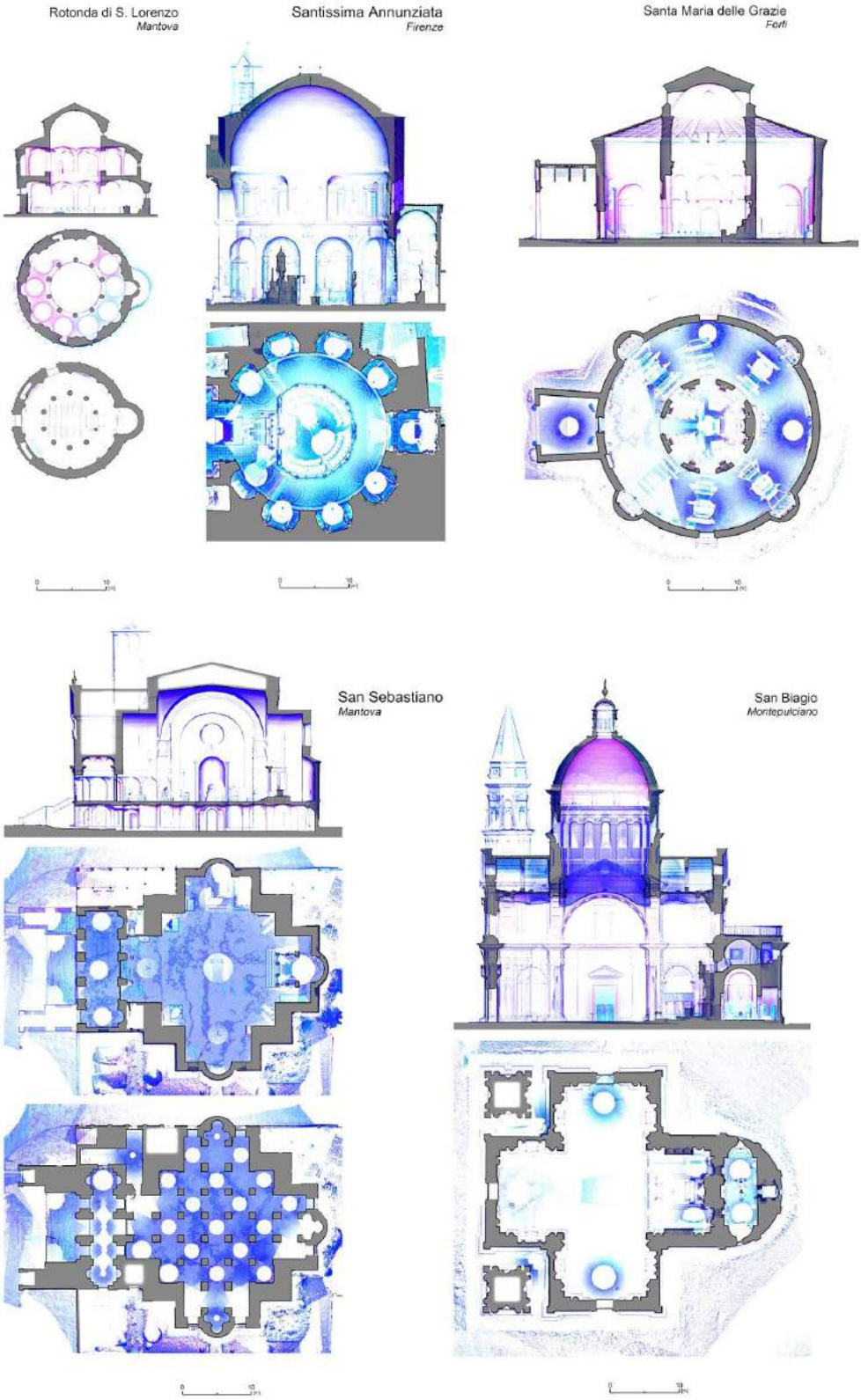

Fig. 9: Comparison of 3D database for querying and extracting horizontal and vertical section of central plan buildings analysed within the research process: the *Rotonda di San Lorenzo* in Mantua, *Santa Maria delle Grazie in Fornò* in Forlì, the rotunda of the *Santissima Annunziata* in Florence, San Sebastiano in Mantua, up to San Biagio in Montepulciano.

5. Conclusion

The three-dimensional survey implemented on central plan architectures, have allowed not only to respond to the primary need for documentation, but also for the availability of integrated databases that, thanks to the opportunity to query, display and extraction of metric-morphological data, allow insights in investigations and knowledge of one of the most significant models of Renaissance architecture, which opens new paths of study and discussion.

Processing a methodology for understanding the quantitative survey data to allow, on the one hand, the canonical representation of architecture, on the other to enable investigative processes on the volumetric structure of the built space, allow to display the survey finding connections of size and shape at different scales, and, in the particular case of typological model of the rotunda, to technologically investigate the constructive stages and implementation issues.

Sectioning parts of the architecture, filtering the data, place the observer in free conditions in relation to the acquisition plan, analyse in transparency volumetric correspondences, are some of the possibilities of interrogation of three-dimensional database that allow comparing and interpreting.

The querying "value" of representation, which makes the survey-design a real project step itself, allowed to investigate the issue of documentation of central plan buildings highlighting comparative issues of proportions and measures and connecting, over time, the evolution of the typological model up to the experimentations by Leon Battista Alberti.

Moreover, in the overall path of documentation, representation and interpretation of the rotunda model, the spatial query allows new and unexplored avenues. These opportunities, in addition to the extraction of coordinates, lines and surfaces to simulate canonical views and representations, allow new processes of architectural exploration, exploiting the potential of morphometric querying of the 3D database and identifying different points of view compared with the canonical representations.

In the present paper, the parts 1, □ and □ are b□ Federica Maietti□parts □ and □ are b□ Marcello Balzani.

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[9] The project for the *Surve□and digital database of metric morphologies captured through □D surve□ technolog□of the Sanctuar□of Santa Maria delle Grazie in Fornò* was developed by DIAPReM Center, Department of Architecture, University of Ferrara. *Scientific Coordinator*: Marcello Balzani, *Technical Manager*: Guido Galvani, *Integrated three-dimensional and topographic surve□*: Guido Galvani,

Drawings and representations: Guido Galvani. Fondazione Centro Studi Leon Battista Alberti in Mantua. *Scientific Coordinator*: Arturo Calzona. *Diocese of Forlì-Bertinoro*. *Diocesan Office for Cultural Heritage*: Monsignor Franco Zaghini. *Parish of San Paolo*: Monsignor Girolamo Flamigni.

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The sense of place.
Ildiri: the bond between the urban fabric and its history

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Abstract
This paper is a part of research on the rehabilitation of those villages in the Mediterranean area that have historical – archaeological value and on their updating in relation to the new social and economic needs [1]. The small Turkish village of Ildiri, on the Aegean coast, is one of them.
Ildiri is inserted in a shallow water cove surrounded by small satellite islands and hidden behind Chios Island. The coastal landscape shows very precious crops and extraordinary forest reserves. Thanks to its position and resources, it underwent, during the centuries, the influence of different people and cultures, transforming itself from the small port of the first Mediterranean sailors to the remarkable town of the Greeks and Romans (the old Erythrae), till the public structures of the Byzantines and Ottomans. Today, the strong interests of tourism along the Çeşme peninsula are violently cancelling this ancient history. Ildiri is sentenced to be dismantled giving way to a modern resort town scattered along the coast. The aim of the research was to enhance the strong identity of urban space and its architectural layers without sacrificing the tourist potential of this settlement. To do this, an architectonic and urban intervention model has been produced that also focuses on technical and technological methods of construction. The model of an archaeological park associated with an urban ecomuseum is applied where the urban structure binds together the different cultural experiences of the landscape.

Keywords: Retrieval of the Mediterranean landscape, protection of historical cultural heritage, cultural tourism, enhancement of local economies, city/landscape

1. The reference context
The European normative framework strongly underlines the relevance that an energic policy of protection of the architectonic and landscape heritage can hold over the territories for the recognition of the individual local identities and, therefore, for their own social and economic growth [2]. This condition would allow to drastically reduce the risk of negative effects of globalisation on the territories, such as:

- the maximisation of a low-cost tourist offer;
- the rapid consumption of local resources;
- the high anthropic pressure on the territories correlated to unpriviledged tourist flows (with evident consequences in terms of waste pollution, unbalanced consumption of water, environmental, agricultural and maritime resources, …);
- the progressive loss of minor - or deemed to be as such - cultural resources;
- the strong salary reduction and the increase of the social weakening factors of the territory.

Within this logic, it is absolutely relevant to the European Parliament [3] to have a holistic view of the heritage that could allow to highlight, by means of an integrated approach, the various degrees of relation existing between the cultural and landscape resources. This would allow a systematic enhancement towards the improvement of the well-being of the society and the durability of the resources.
Given these orientations, situations such as the Çeşme province, where the propulsive economic development of Turkey has determined a massive tourist transformation of the territory, seem to take

the opposite direction: privileging globalised forms of tourism and hence sacrificing important parts of the historical-cultural identity of this thousand year-old territory.

2. Method of investigation: from local resources to the concept of identity

The method of Research & Planning hereby proposed aims at demonstrating the possibility, after identifying the various typologies of resources (environmental, landscape, productive, architectonic) existing in a *homogeneous territorial context*, to enhance the functioning of that specific territory, connecting the above selected local resources to one another, through systemic planning actions conducted at differentiated scales (*multiscale actions*).

The strength, the number of bonds and the relational hierarchies existing between the various resources (*systemic relational complexity*) are directly proportional to the stability and the identitary strength of a territory. The stronger the identity, the stronger its perception by the local communities. Consequently, the social awareness and the necessity of safeguarding its value favour the progressive employment of this identity as an accelerator of the local social and economic growth. Eventually, this is translated into a driving factor in the lasting development of a territory.

In the present case, the proposed method is concentrated on a historic settlement characterised by a very particular anthropic structure, a testimony of the thousand year-old capacity of man to adapt and conform the environment to his own needs without compromising the balance, following a principle of a settlement high resilience.

Already evident from the XIX century, the loss of the distinctive power of these places risks, today, has been dramatically accelerated by blind economic speculations. Due to the incapability to recognise the extraordinary complexity of Ildiri and its cultural and historic-architectonic value, these would retrieve only some archaeological areas, and eliminate the rest of the territory in order to entrust it to a new settling speculation made of villas and resorts.

The research is therefore concentrated on the study of the settlement and the ecosystems connected to it, so to show the deep structural complexity and the impossibility to choose only a part of it to be transformed into a museum which would lack relations with the territory and its history.

Through the succession of analysis such as the historical-settlement, natural landscape structure and agricultural landscape structure phases, we aim, therefore, to come to a “definition of the degrees and orders of bond (*correlation systems*), effective or potential, existing between the resources” and, ultimately, at the definition of a “project intervention hypothesis”, that takes into account the potential reinforcement of the ecosystem services [4] of the territory in object.

3. Context analysis

Ildiri is a small coastal village in the Izmir province, in western Anatolia. It is inserted in the middle of the large bay bounded by the Çeşme peninsula in the south and from the Karaburun Peninsula to the north and it is surrounded in the sea by small satellite islands and protected on the west by Chios island.

Over the centuries this territory has been strongly projected towards the Aegean Sea populations, until it assumed the same historical-cultural identity. Two determining factors contributed to this:

- the extreme isolation of the coastal area from the inland because of the particularly rough orographical conditions;
- the presence, at short distance, of Izmir harbour (ancient Smyrna), important landing and crossing point of the Anatolian corridor, as well as a strategic territorial gate for the eastern territories on the Mediterranean.

The difficult accessibility from Anatolian populations and the need for an extended control of the Aegean Sea and its commercial routes made Ildiri a strategic point for those civilizations that alternated in the hegemonic control of the Sea. Its territory presented, in this regard, some precious peculiarities:

- characterised by a low coast, it was only accessible in a few spots and with specific maneuvers;
- hidden by Chios island and a crown of other islets, it did not have a direct contact with the Aegean Sea.

This has allowed Ildiri, especially in those politically unstable moments of the Aegean Sea, to filter and intercept the external attacks while proliferating as a trading post station.

3.1 The historical- settlement process

The geographic context and the particular structure of the places have noticeably influenced the evolutionary processes of Ildiri and its territory, favouring a settlement stage strongly related to the sea.

The first historiographic sources tell about a settlement called Erythrai and attribute its origin to Cretan colonists that, in the middle of the II millennium B.C. settled on the western coasts of the Anatolian peninsula, founding, apart from this one, the cities of Chios, Colophon, Magnesia on the Maender and Miletus [5]. The Mycenaean settlement leaves traces of its presence on what would become the Greek Acropolis. Dominating the territory, it probably worked as a check point and protection of the first settlement core now disappeared. The writer and geographer Pausanias [6], in particular, mentions a

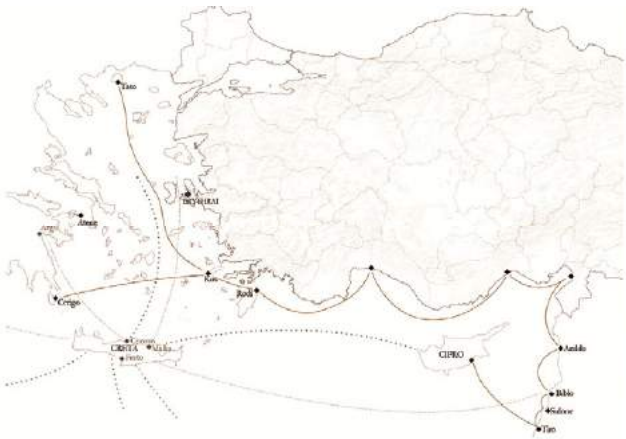
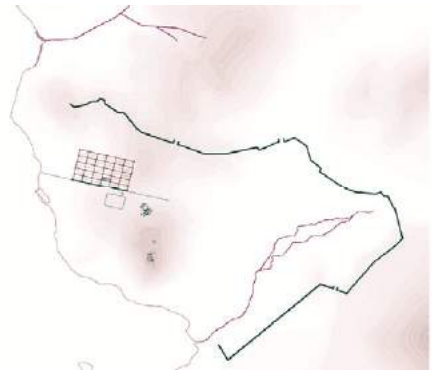
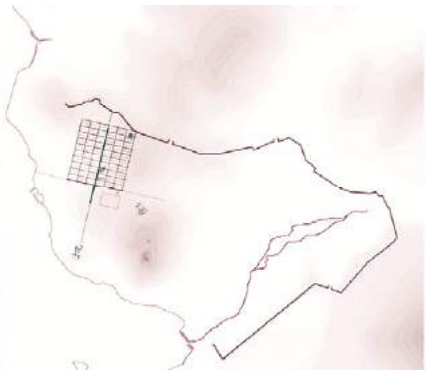


Fig. 1 Sea commercial routes in the Phoenician and Cretan period (authors: Miccoli A., Paradiso A., Picci M., Schiavano M., Tullio C., Tumolo P.)
Fig. 2. The cities of the Ionian dodecapolis: Erythrai (1), Chio (2), Clazomene (3), Teos (4), Lebedo (5), Colofone (6), Efeso (7), Samo (8), Priene (9), Miunte (10), Mileto (11) e Focea (12) (authors: Miccoli A., Paradiso A., Picci M., Schiavano M., Tullio C., Tumolo P.)

city founded by Erythrus, son of Rhadamanthys of Crete, and, later -probably until the VIII century B.C.- inhabited by minor Asian populations (Lycians, Panphylians and Carians). At this time, the settlement intersects a number of Mediterranean sea routes, as shown by the findings of votive structures and remarkable remainings of pottery at the mouth of the river Axos, where there is an important commercial port. (Fig 1). Starting from the VIII century B.C., the whole coastal area of the eastern Aegean Sea is affected by the phenomenon of “Ionian migration”. The establishment, on the Anatolian side of the Aegean sea, of populations of Greek origin, determines the birth of a solid coalition, the *Ionian dodecapolis*, that includes the cities of Erythrai, Chios, Clazomenae, Teos, Lebedus, Colophon, Ephesus, Samos, Priene, Myus, Miletus and Phocaea (Fig. 2). The *Ionian League*, although a religious, political and military alliance, favours, among these settlements, the creation of a dense network of commercial trades, and the proliferation of the wealth and stability of the local population [5].
After various vicissitudes, the settlement of Erythrai is destroyed by the Persians and the traces of its settlement are erased. The next transition under Athens’ control, with the adhesion to the Delian League, marks the first, important, territorial transformation of Erythrai: the farmland is structured, at this stage, following the typical settling pattern of the classic age. Along with the proto-settlement of Mycenaean origin, a spatial organization scheme set on an orthogonal grid appears now. From it, a series of terraces originate with a prevalent orientation parallel to the coastline (Fig. 3).
At the end of the IV century B.C. the majestic fortified walls of the city are erected. These, with a total length of 3.7 km and a variable section between 4 and 5 metres, enclose the settlement and a considerable part of its territory, including, on the south, the mouth of the river Aleon. In this way, the settlement is completely isolated with respect to the hinterland, and self-sufficient.





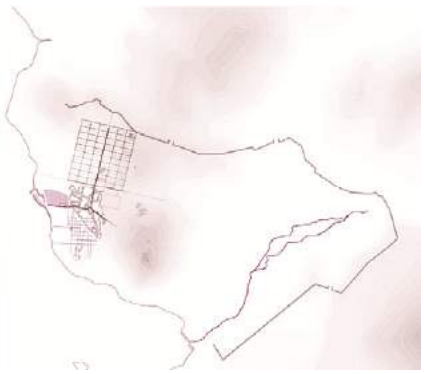


Fig. 3. Settlement hypothesis from the Mycenaean stage to the Archaic stage
Fig. 4. Settlement hypothesis from the Ellenistic stage to the Roman stage
Fig. 5. Settlement hypothesis from the Bizantinian stage to the Ottoman stage (authors: Miccoli A., Paradiso A., Picci M., Schiavano M., Tullio C., Tumolo P.)

At this stage, the displacement of the port from the previous location probably occurs, from near the mouth of the river Axos, to the mouth of the river Aleon. Far from the settlement, difficult to control and protect with a fortified perimeter and, overall, characterised by shallow and sandy seabeds, which are difficult to approach by the ships, the old harbour is therefore progressively disused.
Meanwhile, on the western side of the Agora, around the III century B.C., a great theatre carved in the trachytic rock appears, successively modified in Hellenistic and Roman age [7]. The great transformation of the Agora indicates a state of great economic wealth, to which corresponds a further cycle of anthropic structuring of the territory. In fact, the intervention on the morphology of the settlement appears, at this age, very forceful and, despite the scarcity of archaeological remains, the altitudinal variations given by the containing walls of the Agora, with a displacement of 2.5 metres, are clearly indicative of a strong constructive intentionality. This further affects the structuring of nearby agricultural terraces, set on mild slopes and dominated, in the higher ones, by buildings probably from the Roman age, placed in the vicinity of drainage canals, artificially obtained through soil modelling (Fig. 4).
After the reconstruction of the Asian Roman provinces, Erythrai manages to maintain its own autonomy. At this stage, as already happened in the other Asian Minor provinces, the city develops in the vicinity of the Greek settlement without imposing to it any significant change. Analogies can be found, in particular, with the nearby Hierapolis, especially in the functioning mechanism of the water system and the proportions of the terraced blocks. The Roman city of Erythrai becomes, meanwhile, one of the most important commercial centres of the Aegean Sea. The enhancement of the water regulation techniques allow the reclamation and dredging of Aleon river bed and the extension of the harbour of Hellenistic origin with a navigable canal, which increases its capacity and the possibility of commercial penetration towards the inland. The period of peace and the fertile commercial conditions favor, on the other hand, around the V century B.C., the settlement of a small trading middle class. This determines the birth of a sumptuous villa neighbourhood located on the coastal spur immediately close to the Greek settlement. Among these, at the southern edge of the spur, in a particularly strategic place for the control of the coast, known as *Cennettepe* (Heaven's hill), a luxurious villa distinguishes from the rest in direct connection with the commercial harbour, almost assuming its control. In the north of the same villa, at about 130 mt, on the margin of the Roman neighbourhood, the rests of a domed thermal space appear, directly connected to the neighbourhood and later transformed in a small hammam. The presence of a public bath, in correspondence with a so structured residential area, makes it evident how in late Roman age the settlement is equipped with a complex water storage and distribution network. Even without a system for direct water collection, it allows to satisfy important public needs. The Roman stage, therefore, does not modify the Greek age urban layout, but integrates it in terms of infrastructures, and expands it towards the sea, keeping the settlement structure roughly parallel to the coastline and the contour lines, as it had already happened in Classic age. (Fig. 4)
This stage is characterised as the last important moment of Ildri's history. A radical trend inversion is already determined since the Bizantinian age with a progressive loss of the settlement commercial power that culminates with the abandonment of the Roman harbour, its progressive silting, and the construction of a new small harbour near the *Cennettepe*. The urban system also contracts abruptly, moving backwards from the coast and concentrating by the Agora. Here it is still possible to read a compact urban fabric that has nevertheless maintained the typical residential characters of the Greek tradition (Fig. 5) In Ottoman age, the decline is so acclaimed that makes this place appear, in the European travellers' logbooks, as an almost uninhabited small village called Rithri, characterised by numerous ruins in complete state of abandonment. [8]

3.2 The natural and productive structure of the landscape

Associated to the high historical value of Ildiri, there is the high environmental and landscape value of the Karaburun peninsula, characterised by the presence of particularly relevant ecotypes among which:

- a particularly varied marine ecosystem, with the presence of shallow and sandy seabeds alternated to rocky ones
- a dense coastal band of Mediterranean maquis, characterised by vegetal species as the arbutus, wild olive tree, kermis oak, maple, lentiscus and cistus;
- a prevalently mountainous coastal inland, surrounded by a dense woodland, with high foliage species such as conifers and broadleaved trees.

The agricultural productivity is also particularly active. Although aimed to satisfy mainly an internal need, the agriculture generates a small production line that sees in the retail of vegetables and preserves (jam, pickled artichokes,..) a reduced subsistence economy. Such economy acquires more considerable dimensions during summer when a significant tourism flow (prevalently connected to the internal circuits and the weekend) affects these areas. All this translates into the dimension of a prevalently rural landscape whose constant management and maintenance, although not bearer of great economic and occupational wealth, still allows to guarantee the maintenance of an agricultural landscape that privileges, as in the past, the arable farming in the flatter lands and that brings over the vast terraced fields, the cultivation of vegetables, vineyards and olive groves. This structure of the

agricultural landscape finds its origin back in the Archaic stage, when these areas, although adjacent to the settlement, were organised autonomously from the point of view of water requirements thanks to their belonging to a different hydrographic basin (Fig. 6). The watershed between the two systems is represented, in that case, by the long *anticline route* that, connecting the theatre, on the East, and coming to the sea, on the West, defines the northern edge of the residential area.

4. The connections between the landscape resources: water and the shape of the land

The agricultural system and the settlement are therefore structured on the basis of a metric, existing since the early foundation stage, from which a prevalently terraced landscape originates.
The settlement space occupies a limited part of this system. It presents itself as strongly uneven, with an irregular edge and lacking a definite marking between the rural areas and the more properly urban areas. The tension of the urban space is recognisable only in the higher structure of some *implantation paths*. The first one, roughly parallel to the coastline at about 150 mt from it, constitutes the edge of the Bizantinian core, today recognisable as town. This path is composed of a long panoramic view which detaches the town from the coastal spur, where the first urban settlement structures in the Archaic and Roman age sprung (from the IV century B.C. to the VI century A.D.). The path does not keep at the same altitude but progressively descends from 25 m, at the entrance of the town, to 15 m, where it intersects the *main impluvium axis* coming down from the Agora. From here, the panoramic path becomes urban and dilates to form a street-square, 55 m long, located on flat land (at 15 m of altitude). The square finally terminates on a *secondary counter-axis* which, starting from here, descends to the harbour (Fig. 7). This street-square, heart of the town, does not only house the main public buildings (including the *tea garden* and the mosque), but is also the junction of the drainage lines of the whole settlement and, among these, the main water route, which coincides with the *main impluvium axis.*
These formal solutions of the urban space highlight the special attention paid, over the centuries to the shape of the soil and the adjustment of the natural slopes in order to allow a perfect control of the rain water. In a territorial context such as the Aegean Anatolia, with short and reduced waterways and without any availability of underground water resources, the control and distribution of rainwater become, therefore, the main theme of the production process of the anthropic space.
Thence a settlement testimony of extraordinary historical, anthropological, cultural and architectural interest: since its origins, Erythrae's settlement has been structured over the territory in small hubs, each one with its functional identity (docking and commercial area, workshops and ceramics area, agricultural area, specialised services area and residential hub).

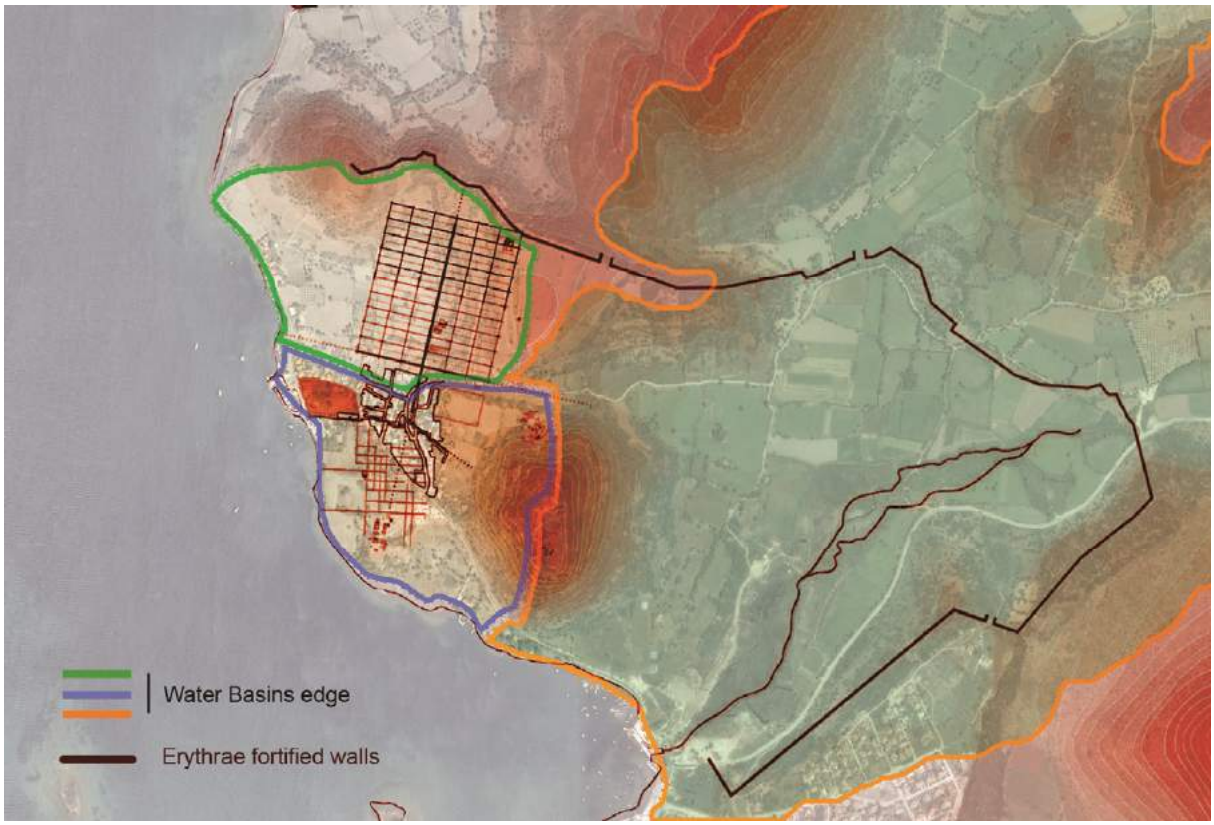


Fig. 6. Identification of the water basins in which Ildiri territory is subdivided (author: Montalbano C.)

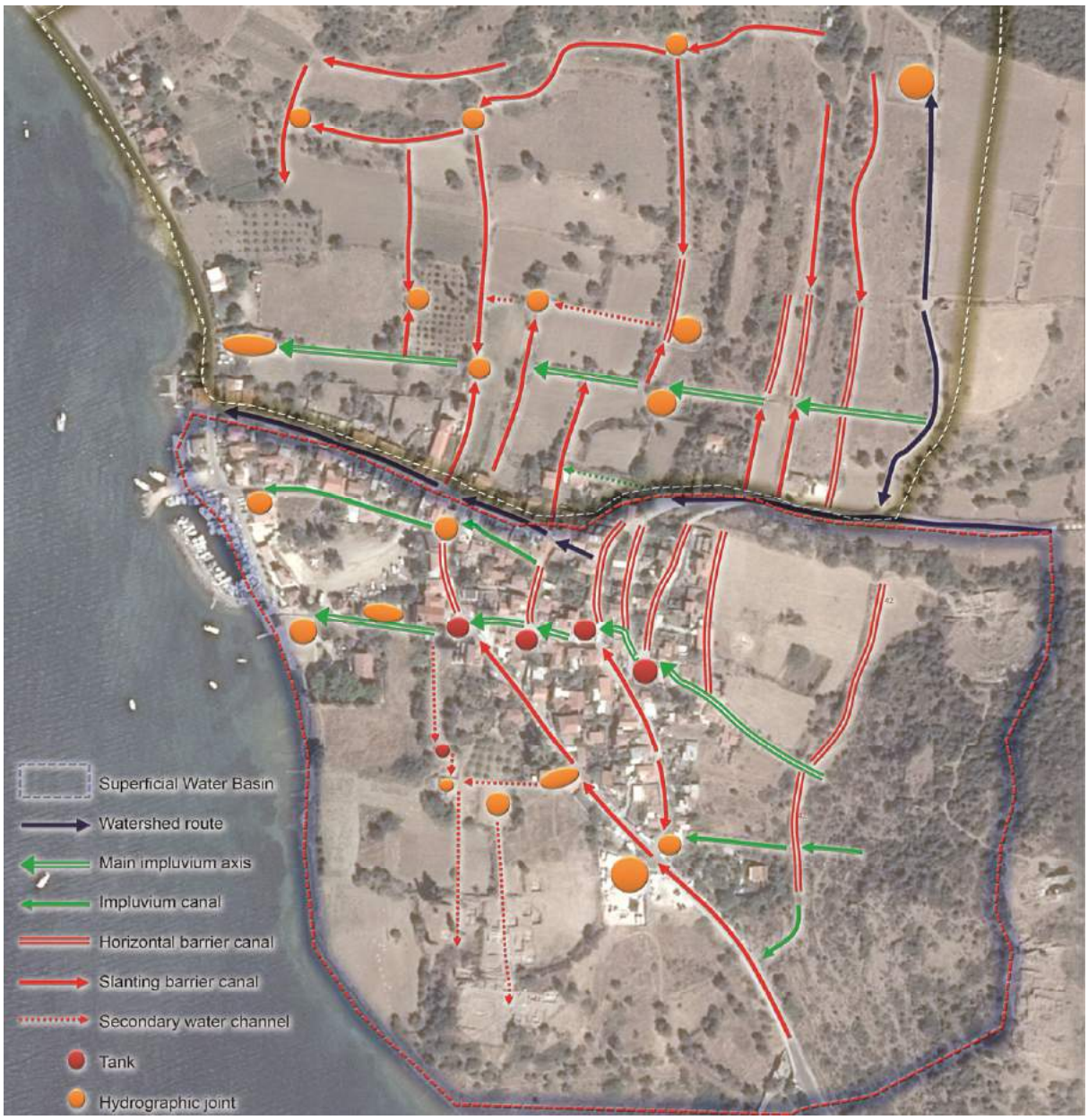


Fig. 7. Model of the surface water system of Ildri settlement and farmland (author: Montalbano C.)

Extremely close and interconnected to one another, they were however independent in terms of water supply. In this regard, it is interesting to observe how the whole settlement system has always kept within the same hydrographic basin in its various stages of expansion. Similarly, the great agricultural terrace in the north of the settlement is associated with another basin, exactly as it happened to the great irrigated plain fed by the river Aleon (Fig. 6).

The three hydrographic basins so defined are, in turns, completely inscribed within the IV century B.C. fortified walls. The walls had hence already been conceived, in archaic age, as a great territorial watershed (Fig. 6) and, of the three hydric basins enclosed within its perimeter, the central one, more elevated and panoramic, was designated to enclose the settlement.

The complexity of the archaic age territorial hydric structure became emblematic in the case of the erection of the theatre. Its *cavea*, perfectly oriented towards the north, is located at the northern edge of the hydrographic basin of the settlement and collects the rain water coming from the side of the *Acropolis* (at 72 m of altitude) and sends it towards the *orchestra pit* (located at 45 mt of altitude). From here the water was probably intercepted by a *barrier canal*, located on the hillside at 42 m of altitude, and sent in turns towards two separate routes (Fig. 6):

- the first route directly supplied the Agora, which appeared as a great inclined plane (100 x 90 mt), progressively moving from 42 mt, by the *barrier channel*, to 35 mt in correspondence of the first

urban step, where other public structures and water management systems (cisterns, pools, ...) were probably located;

- the second route, instead, supplied a drainage channel which, crossing the urban terraces, constituted the main street of the settlement (*main impluvium axis)* and, contextually, a supply for wells and urban cisterns. This route, perfected through the various historical times, will be definitely consecrated after the XI century, with the Ottoman domination. At this stage the hydric path is structured to become a perfect architectonic machine: it crossed, along its path, several specialised buildings including towers, nymphaea, cisterns, ovens and mills, coming to the main square of the settlement. Here the hydric path, incrementing its flow thanks to the confluence of the drainage canal which follows the panoramic route of the city, supplies the main fountain of the settlement and, subsequently, the small *hammam* and the splendid *tea garden* with its cisterns, pools, and orange groves open to the travelers coming from the harbour.

Certainly fundamental for the complete maturation of this settlement was the Roman stage. During this stage, thanks to the extremely rapid evolution of the techniques for the water control, a long and complex process of physical regulation of the territory started: the modelling of the soil became, in such circumstances, a fundamental tool. It not only allowed the creation of terracing levels where particularly precious vegetable species were cultivated (as olive trees and vineyards), but it was also the best way to contain and canalize water in specific directions. This way, from the III century, a reorganisation of the landscape began, through the upgrading or the introduction of new technical solutions such as:

- *Terraced slopes*. These allow to unify the residential blocks (up to the definition of urban blocks arranged on reduced difference in height) and to channel the surface water along drainage canals which supply cisterns and pools, useful for the management of houses and the pertinent spaces destined to closed orchards;
- *Barrier canals*. They coincide with the urban routes that surround the hill and, moving at constant altitude, block the water outflow towards lower altitudes, channeling it towards the drainage canals or directly onto terraces or intermediate cisterns;
- *Drainage canals (compluvium canals).* Correspond generally to the impluvium urban routes and, by collecting the surface hydric flows, distribute them directly to basins and cisterns.

This way the complex urban routes system, which innervates the current Ildiri town centre, although apparently lacking a well-defined geometric structure, actually achieves a timeless settlement space, extremely complex and able to come to an optimal exploitation of the territory.

5. Eliminating Ildiri to return Erythrae's memory

Ildiri settlement is undoubtedly characterised by the particular interactions of several landscape systems. Each one of them, ranging from the historical-archaeological to the settlement system, from the agricultural to the naturalistic (coastal and silvicultural) system, contains some extremely valuable specific resources. Over time, their lacking correlation with other typologies of resources has weakened the identity value of this place: an example are some relevant agricultural production totally disconnected from the tourism and eno-gastronomic chain or the considerable archaeological resources absolutely disconnected from the receptive capacity of the settlement or, also, the natural ones and, in particular, those coastal, totally autonomous with respect to some typologies of ecosystem services (in particular from the *habitat services* and *cultural services*) [4].

The heterogeneity of these resources makes on the other hand impossible to conceive such settlement as a direct manifestation of a particular historical age, although the Greek and Roman phase have left important marks of their passage. The same settlement area has managed to grow and adapt to the place operating over the centuries a continuous enhancement of technical solutions and architectonic forms: from this derives a settlement system in which the spatial structure of Greek origin perfectly integrates with the Roman, Byzantine and Ottoman and in which the various historical layers almost never overlap, but complete one another occupying time after time unrealised areas of the landscape.

In respect of these unrealised potentials it must be, on the other hand, underlined the now total youth abandonment of a village incapable of offering stable work opportunities, the progressive social decay and that of the historical and residential heritage, and even, the roughly total absence of urban services adequate to the local population as well as the tourists.

The response of the national authorities to this place appears, on the other hand, that of a simplification of the degrees of complexity of the local landscape through the forced removal of the town and its transformation into an archaeological museum of the Roman antiquity. The excavation of the archaeological plan of the Roman Erythrae would indeed erase the Byzantine-Ottoman village and its productive, cultural and social structure to create, in the vicinity of this uninhabited new cultural container a modern village, capable of adhering to the international tourism standards but incapable of having its own specific identity.

A similar attitude would not only damage the identity value of the landscape and the recognisability of the complex process of human adaptation to the territory but would also significantly reduce the potential value of the landscape. On the contrary, through an integrated approach aiming at the

enhancement of the production and local economy circuits in addition to the synchronization of the historical, environmental and landscape values, it would be possible to produce a lasting development of the territory: the enhancement of this strong local identity would also generate a high level of social awareness and a constant maintenance of the landscape and its environmental, cultural and historical resources.

6. Design implications

To a process of musealization of the territory, difficult to finance and manage over the time, it is therefore possible to contrapose a model of synchronization of the resources and enhancement of specific categories of ecosystem services, able to orientate the territory towards the rise of the quality of life and towards an offer of qualified cultural and tourist services.

The project proposal that derives from it tries to relocate Ildiri village at the centre of the natural, productive and historical landscape, taking it back to its nerve centre function from which depart and to which reconnect the various narration of the extended landscape. The synchronization of the various resources provides, firstly, the possibility to identify specific itineraries (urban, museographical, historical-archaeological, landscape, rural [9], culinary and tasting [10], bathing) on the territory. Some of these circuits, overlapping in particular points of the urban space, connote a higher propensity of them to assume an elevate hierarchical value for the control of the urban space.

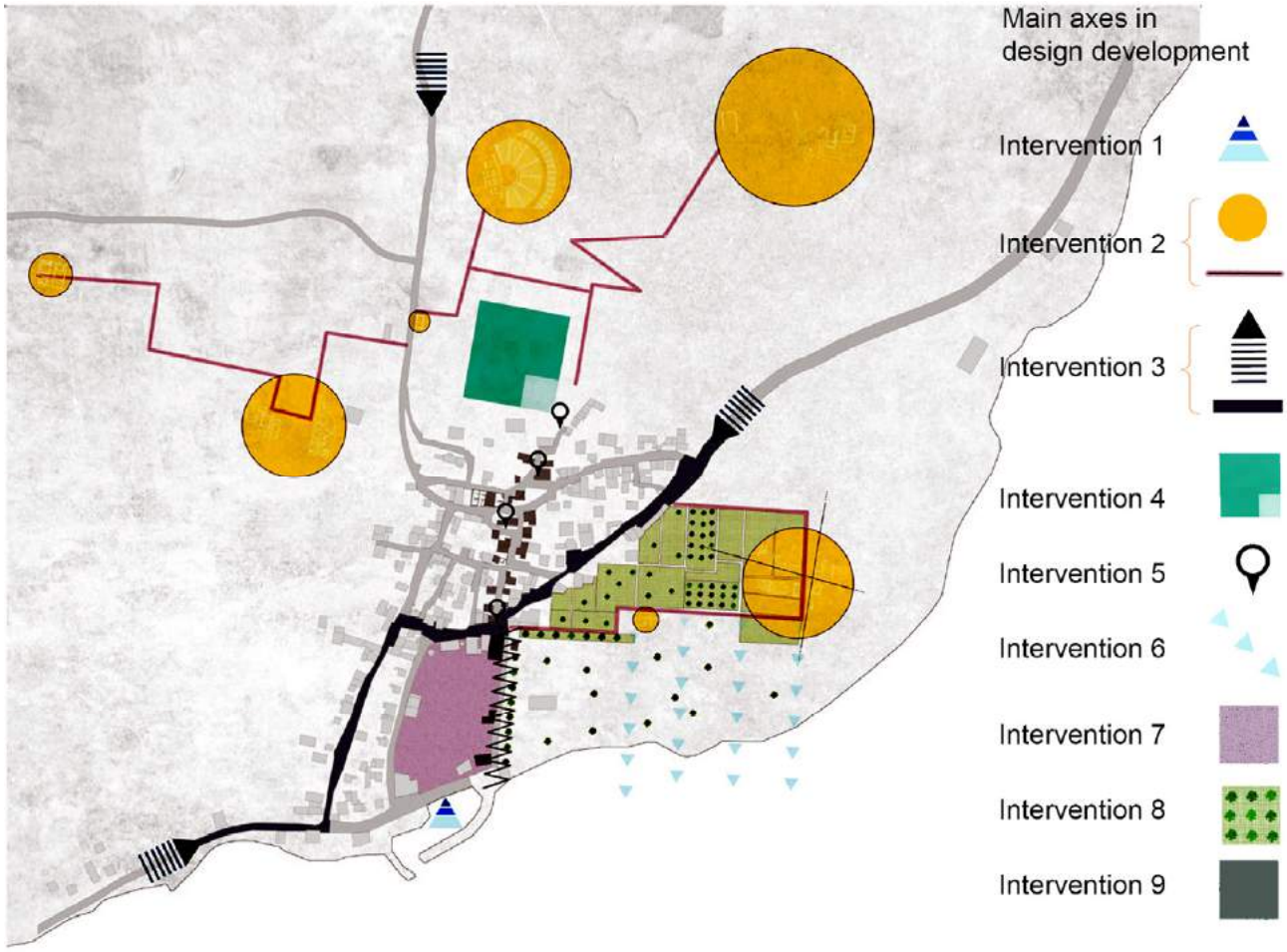


Fig. 8. Urban masterplan
Fig. 9. Direction plan and project guidelines (authors: Miccoli A., Paradiso A., Picci M., Schiavano M., Tullio C., Tumolo P.)

From here the identification of nine priority intervention guidelines aimed at the realisation of an readjustment and enhancement project of the various anthropic landscape systems previously identified, that include (Fig. 8-9):

1. the reconfiguration of the coastal and harbour area with the creation of a small port for the docking of small vessels;
2. the recognition of the historical-archaeological and landscape value of some areas and the design of their reconnection with the settlement in relation to the specific itineraries of belonging (such as, for example, the re-composition of the route that leads from the Acropolis to the theater, and from here to the Agora and to the higher access to settlement)
3. the structuration of access and exit hubs, in correspondence of the access road to the settlement, to allow the redistribution of vehicle flows and minimise the vehicular impact and allow the readjustment of the panoramic road with the realisation of resting and gathering areas and leisure areas for the citizens and the tourists
4. The requalification of the Agora area with the creation of a museum pole that would end the urban area and connect it to the ascending route to the Acropolis;
5. the architectonic enhancement of the panoramic areas and those evocative of the *water ways;*
6. the re-appropriation of the coastal area through the creation of direct connection between the settlement, the *cennettepe* archaeological area and the dune zone;
7. the enhancement of the dismissed ex-customs area through the realisation of a square that would manage the urban waterfront and provide space for productive, commercial and leisure functions;
8. the rearrangement of the terraced agricultural system located between the urban and the coastal areas with the creation of the *cennettepe* archaeological promenade through small urban orchards.
9. the retrieval of the main buildings and their external pertinence, which in their totality comprise a complex network of gardens and urban orchards, and the readjustment of some of them for the enhancement of the receptive and leisure services.

7. Final consideration

By means of a holistic approach, we wanted to show how the cultural dynamics of a territory is directly proportional to the degree of complexity of its anthropic organisation (in terms of spatial organisation, management of the resources, structure of its services) and to the potential complexity of the *ecosystem services* associated to it: with these two parameters it is possible to summarise the strength of the local identity of a territory, the potential of its cultural heritage [11] and its value in terms of economic impact on the local development [12].

The local identity is therefore manifested in a specific interdependence between natural and anthropic resources that determines, through the succession of local historical stages, a particular structure of the *ecosystem services*. The structuring and the degree of resilience of such services acts in a decisive way on the productive, social and economic propension of a territory. They highlight, at the same time, the relevant role played by the local material heritage, as well as its enhancement, not only as memory of a place, but also as a manual of best practices for land use, the modification of the productive system, the various forms of government and management of the territory, and the settlement, work and tourism policies.

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[2] Art. 12 - "Territorial Agenda of the European Union 2020": *"We believe that diversity of territories is a potential for development, and that the distinctive identities of local and regional communities are of key relevance in this regard. Territories …"*

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[4] The ecosystem services can be subdivided in the typologies of *provisioning services* (services/interventions aimed at the optimisation/enhancement of the food, water, wood, fuel, ... resources), the *habitat services* (services/conducts aimed at the enhancement and the preservation of the habitats and biodiversity) and the *cultural services* (services/actions aimed at the enhancement of the cultural, educational and leisure offer).

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Local building stones used in Calabrian architecture: calcarenite and sandstone of the Thyrrenian Coastal Range of Cosenza Province (Italy)

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Abstract
Calcarenite and sandstone, commercially kwown as “Pietra di San Lucido” and “Pietra di Fuscaldo” respectively, were employed in the past as building stones in the Northern part of the Thyrrenian Coastal Range of Calabria. Different kinds of architectonical artifacts were made by these materials. Their use was facilitated by the good workability of these rocks and by transport facilities due to the presence of many local quarry areas. Outcrops, some of them still in use, are situated in the San Lucido area for calcarenite and of Fuscaldo for sandstone and geologically belonging to the Tortonian-Messinian sedimentary succession.
Non-destructive and laboratory tests have been performed in order to assess chemical and physical-mechanical properties of building materials and the state of conservation of three Portals belonging to: Palazzo Manes (XVIII century) and the Church of “SS. Annunziata” (1406) in San Lucido made of calcarenite; “Oratorio dei Nobili” of San Bernardino Convent (XVI century) in Amantea, built with sandstone. Mechanical properties were obtained on site by means of ultrasonic pulse velocity and Schmidt Hammer Hardness Tests. Chemical and morphological characterization was determined in laboratory by means of SEM and Electron Microscopy analyses.
On account of tests results sandstone appears to be more sensitive to decay processes than calcarenite. Calcarenite is more homogeneous, less porous and more compact than sandstone, which shows worse mechanical properties.

Keywords: calcarenite, sandstone, characterization, decay, Cosenza

1. Introduction
The calcarenite of San Lucido, namely “Pietra di San Lucido” or also “Pietra di Mendicino”, is a whitish-red calcarenite while the sandstone of Fuscaldo, namely “Pietra di Fuscaldo” or also “Pietra dolce” due to its easy workability, is a yellowish-brown sandstone. Both of them have been widely used as building stones in the area of Cosenza Province and in the area of the Thyrrenian Coastal Range (Calabria, southern Italy). The most important quarries centers in the past have been the quarries of San Lucido, Mendicino and Altilia for the calcarenite and of Fuscaldo and Amantea for the sandstone. Calcarenitic quarries of Mendicino and Altilia were exploited until the last century but nowadays are not active. San Lucido quarries were situated in the area of the “Deuda stream” and the “Torbido stream”, where there was the most important ancient quarry. Since the 50s of the last century has started the quarry activity in the northern area of San Lucido with three new quarries that are still active (1). Sandstone quarries were prevantly concentrated in the town of Fuscaldo where there were many active quarries in the localities of: “Scarcelli” employed until the 1937; “Castello” until the 1945; “Cava del Pesco” until the 1940; “Codemma” in “Fuscaldo Marina”; “Mantina”; “Piccola” until 1937;

“Serricella” (2). Local sandstone quarries were also present in the area of Amantea and employed in the past for the construction of its most important religious buildings (3).
Due to the importance of these building materials in the architecture of Cosenza province, calcarenite and sandstone have been studied in the past by many authors. However, most of papers in the existing literature only concern specific issues, such as the study of provenance of the calcarenites employed in the monuments of Cosenza (4) or as the ancients quarries employed by the schools of Calabrian stonemasons (5) or as the petrographic characterization of the facies of the “Mendicino calcarenite” (6).
The aim of this study is is the chemical and physical-mechanical characterization of the San Lucido calcarenite and the sandstone employed in Amantea, in order to understand the causes of the forms of degradations on the investigated monuments. For this purpose non-destructive tests on site in order to obtain information about the decay process observed have been carried out. Moreover, some specimens, representative of three important portals, were selected and studied through destructive laboratory tests. Moreover, through a diagnostic analysis of these three portals, this work tries to individuate the principal degradation forms.

1.2 Historic and geological setting.
The Thyrrenian Coastal range of Calabria, belonging to Cosenza Province, is one of the most significant examples of the Calabrian architecture. The importance of this architecture is partly due to the frequent earthquakes that, entirely or in part, destroyed the little towns of this Province. One of the most destructive was the 1783 earthquake. After then, Calabrian towns were rebuilt and are full of decorative elements realized with local building stones.
The portals which have been investigated in this work include: a) the Palazzo Manes, built in the XVII century that is one of the most important Palace in the town of San Lucido (Fig.1); the church of “SS. Annunziata” of the 1406 in San Lucido (Fig.2), representing one of the most significate example of the architecture *“Durrazesca-catalana*” in Calabria; “Oratorio dei Nobili” of San Bernardino Convent (Fig.3) of the 1592 in Amantea, an example of the architecture belonging to the last Renaissance. The first portal is characterized by an arch structure and its building element is the calcarenite of San Lucido, the whitish facies (6). The portal is a round arch characterized by a particular handling of its capitals and its keystone, while its pilasters are characterized by smooth surfaces realized by a single-piece of calcarenite. The second portal is an elliptical arch characterized by fine decorative elements concentrated in its capitals, in its small rounded pilasters and in the extrados of the three-centered arch. The prevalent building material is the calcarenite, the reddish facies. The last portal is an architrave door, framed by pilasters with ovules and rosettes, that are local decorative elements. In the middle of its trabeation it can been observed the inscription regarding the year of the construction of the portal, the 1592. It has been restored in the past and presents some building elements different than the original ones (7).

Fig. 1

Fig. 2

Fig. 3

Figg. 1,2,3: the portal in calcarenite of the “Palazzo Manes” of the XVIII century, San Lucido (Fig.1); the portal in calcarenite of the Church of “SS. Annunziata” of the 1406, San Lucido (Fig.2); the portal in sandstone of the “Oratorio dei Nobili” of San Bernardino Convent, of the XVI century, Amantea (Fig.3).

Geologically, the calcarenite of San Lucido and the sandstone of Fuscaldo belong to the Sedimentary Successions of the Upper Oligocene-Middle Pliocene of the Coastal Thyrrenian Range that includes not only calcarenites and sandstones (arkose), but also conglomerates, clays, marls, gypsums and evaporitic limestones, from 200m to over 1500m in thickness (8). Macroscopically, both rocks show compactness, sandstone with a yellow-cream colour and calcarenite with a white colour and fossils from 1 mm to 6,50 mm. Amantea sandstone belongs to the sedimentary "Amantea basin" that it is one of the many Neogene basins along the Tyrrhenian margin of Calabria, belonging to the early Tortonian and subdivided into five main depositional units. In the first and in the second depositional unit, sandstones are characterized as "fossiliferous sandstones" and "pebble sandstones", outcropping, in particular, in the localities of Catocastro River, at 3 km east of Amantea and in the locality at 0,5 Km south of Cozzo Pellegrino, respectively (9).

2. Methodology and sampling

The description of the alteration forms which affect the monuments has been carried out according to the current standard recommendation (10). The observation of the alteration forms was performed through the naked eye and with the help of a 10X Canon EOS 750D.camera.

Examined materials consist of three samples of superficial layers of calcarenite and sandstone stones, taken from the principal façades of the three investigated portals. Stainless steel tools and surgical lancets were used, and the main criteria for sampling included a relevant state of decay of the samples, available quantities, and representativeness. The samples taken from the above mentioned portals are white, reddish and yellowish in color and some of them appear macroscopically intact and durable, and others, especially the sandstone specimen, very friable, probably due to salt crystallization.

The "in situ" mechanical tests have been performed in order to characterize physical and mechanical properties of the deteriorated parts of the three portals investigated. These tests included strength measurement of calcarenite and sandstone surfaces and weathered parts by the Schmidt hammer Geohammer (L-type), according to ASTM D5873 standards, to assess hardness characteristics of rocks (Figg. 4, 5a). The rebound test hammer housing was held firmly by hand in a position aligned horizontally downward (□0 degrees) so that the impact plunger striked at an angle perpendicular to the test surface of the portals. Twelve points were examined, eight for the portal of "Oratorio dei Nobili" and two for each portal of the other case studies. For each point twelve impact readings were recorded. After the plunger impact for each reading, the surface of the rock was examined. Readings were rejected if any individual impact test resulted in cracking or any other visible damage. The correlation between the uniaxial compressive strength and Schmidt hammer rebound values was determined by the relationship of Beniawski (11), that according to literature and empirical studies it is suggested to estimate the uniaxial compressive strength of rock on the basis of Schmidt hammer rebound:

$$\sigma_c = 21.479 \cdot e^{0.0148 \cdot (H_s - P) \cdot \gamma}$$

In the above mentioned equation, σ_c is the uniaxial compressive strength in MPa, H_s the Schmidt hammer rebound, P the porosity in □ and γ the unit weight in g/cm^3. Values of porosity and unit weight are referred to fresh unaltered quarry Calabrian specimens investigated in other studies. In particular the following values have been employed:

- San Lucido calcarenite: γ = 2,74 g/cm3 and P = 16,18%;
- Amantea (3) and Fuscaldo sandstone: γ = 2,25 g/cm3 and P = 20,14%.

P-wave veolocity measurements were obtained through the ultrasonic test portable equipment MATEST Ultrasonic Meter Ver (Figg. 5b, 6), with an accuracy of 0.1 microseconds and equipped with two 55 kHz frequency trasducers. During measurements, in order to improve coupling of the trasducers-transmitter and receiver, it was applied a couplant on the surfaces examined. Six measurements were obtained in each stone block of the portals, in order to describe the spatial variability of P-wave velocity values (12). Tests conditions were: dry surfaces and indirect mode with the application of the trasducers parallel to the surfaces analyzed (Fig. 5b).

Laboratory tests included chemical and morphological analysis. The chemical composition of the samples was determined by electron probe micro-analyzer (EPMA) - JEOL JXA 8230, while the morphological composition was obtained by scanning electron microscopy with energy-dispersive X-ray spectroscopy microanalysis (SEM–EDS) on a FEI Quanta 200 instrument, equipped with an EDAX Si (Li detector). A total of 3 samples were analyzed by the chemical-morphological analysis: the sample "MAN□B" was taken from the right part of the portal of Palazzo Manes affected by the major presence of lichens (Fig.9a); the sample "SS□A" from the left lower part of the church of "SS. Annunziata" (Fig.9b), affected by higher grade of deterioration than the other parts of the Portal; the sample "A4□dx" was taken from the right abutment of the Portal of "Oratorio dei Nobili" at 2.00 m height above ground (Fig.9c).

Fig. 4

Fig. 5a

Fig. 5b

Fig. 6

Figg. 4, 5a, 5b, 6: operative phase of the Schmidt hardness test, portal of Palazzo Manes, San Lucido (Fig.4); Schmidt hammer and Ultrasonic pulse velocity test, portal of the Church of SS. Annunziata in San Lucido (Figg. 5a, 5b) and performed with MATEST Ultrasonic Meter Ver (Fig.6).

3. Results and discussion

The results of the tests performed show a diversity of weathering forms the monuments. The weathering forms mapped in the monument are: slight and strong erosion (loss of material); delamination (detachment of individual grains or small grain aggregates); back weathering due to the break out (loss of compact stone pieces); cracks (presence of fissures); fractures due to the horizontal load (large fissures); discoloration (change in colour); efflorescence (mass of salt deposits); missing parts (morphological change of the stone surface due to the partial or selective loss of stone pieces); superficial deposits/crusts (due to the soil, salts and to strongly adhesive deposits); biological colonization (colonization of the stone by plants and micro-organisms such as bacteria, cyanobacteria, algae, fungi and lichen). The mapping result for the three portals investigated is shown in the Figures 9a, 9b and 9c. In general it can be seen that the Portal of “Oratorio dei Nobili” shows higher decay than the other two portals. The main forms of degradation observed and investigated in other studies for this monument (13) can be resumed as: erosion, concentrated along the pilasters; missing parts due to the break out, along the capitals; micro-fractures and fractures, along the blocks; alveolization, concentrated in its lower parts. The other two monuments present biological colonization and crusts as

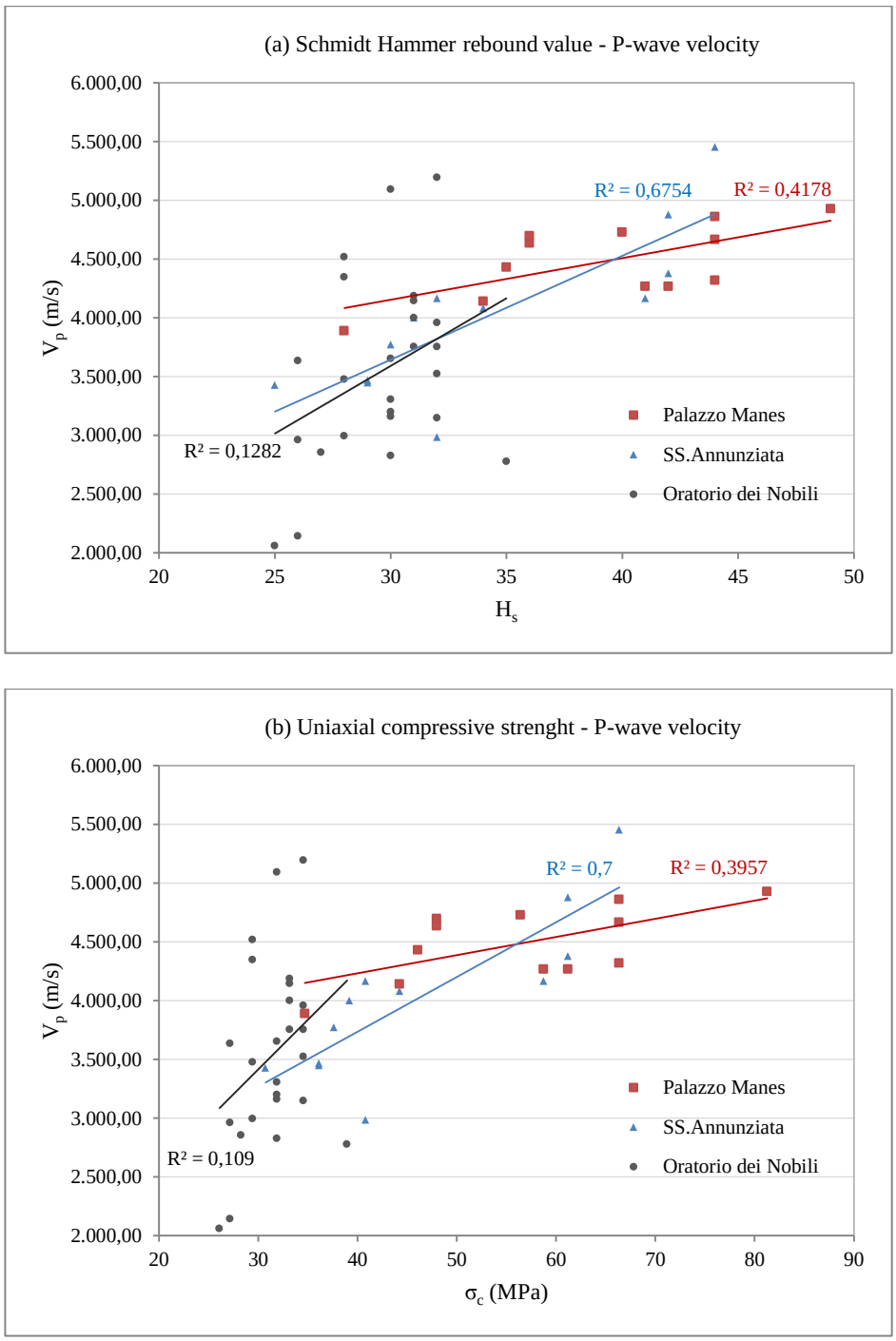
the main forms of deterioration. For the portal of Palazzo Manes the right part is the most deteriorated while for the portal of the Church of “SS. Annunzianta” the left one.
Schmidt hammer rebound values for each point examined, the uniaxial compressive strength values calculated and the ultrasonic velocities obtained are reported in the Table 1. Mean values of the physical and mechanical properties obtained for each case study, are summarized in the Table 2.
Calcarenite of both portals shows an average value of uniaxial compressive strength of 45,1-47 MPa and Schmidt hammer rebound value of 33-35 (Table 2). When this calcarenite is exposed, altered and rain-washed (points MAN□B, SS□A), the rebound values show a decrease. On the contrary, when superficial deposits develop on this lithology, Schimdt hammer values slightly increase (point SS□B). Major discrepancies between Schmidt hammer rebound values and related uniaxial compressive strength values were found for the portal of “Oratorio dei Nobili”, where the maximum value is 38,5□5,3 MPa for the point A4□sx and the minimum one is 21,3□21,3 MPa for the point A4□dx (affected by higher forms of degradation and also examined by the chemical-morphological analysis).
Points examined from “Palazzo Manes” show higher sonic velocity (average □ 4.486□315,78 m/s) with respect to those from the Church of SS. Annunziata (average □ 4.019,24□679,81 m/s) and from the “Oratorio dei Nobili” (average □ 3.548,02□786,48 m/s). The good correlation between the sonic velocity and the Schmidt hammer rebound values and the uniaxial compressive strength values can be observed in the Figures 7a and 7b. In both of them, the case study “SS. Annunziata” shows higher correlation coefficients between ultrasonic values and Schmidt rebounds and Compressive strength, R^2□0,6754 and R^2□0,7, respectively.

		block	H_s			σ_c (MPa)			V_p (m/s)			
Palazzo Manes	left	MAN_A	39	±	5,8	56,5	±	12,8	4.359,01	±	340,36	*calcarenite*
	right	MAN_B	27	±	3,2	33,7	±	4,5	4.477,07	±	305,16	
			33	±	*7,8*	*45,1*	±	*15,0*	*4.486,64*	±	*315,78*	
SS.Annun-ziata	left	SS_A	34	±	6,3	46,1	±	12,2	3.623,73	±	317,09	
	right	SS_B	35	±	6,3	48,0	±	12,7	4.098,20	±	832,39	
			35	±	*6,2*	*47,0*	±	*12,2*	*4.019,24*	±	*679,81*	
Oratorio dei Nobili	left	A1_sx	28	±	2,1	29,5	±	2,5	2.701,49	±	744,18	*sandstone*
		A2_sx	31	±	1,7	33,6	±	2,3	3.462,86	±	753,20	
		A3_sx	31	±	1,0	33,2	±	1,3	3239,91	±	584,15	
		A4_sx	35	±	3,4	38,5	±	5,3	4397,11	±	486,98	
			31	±	3,2	33,7	±	4,5	3480,40	±	891,03	
	right	A1_dx	25	±	2,3	25,8	±	2,3	3564,76	±	542,75	
		A2_dx	26	±	2,5	27,0	±	2,8	4303,69	±	778,47	
		A3_dx	23	±	2,1	24,0	±	2,0	3476,57	±	305,93	
		A4_dx	20	±	1,5	21,3	±	1,3	2969,92	±	271,73	
			23	±	3,0	24,5	±	3,0	3634,08	±	661,70	
			27	±	*5,0*	*29,1*	±	*6,0*	*3.548,02*	±	*786,48*	

Table 1: Schmidt hammer rebound H_s, uniaxial compressive strength σ_c (MPa) and ultrasonic velocities V_p (m/s).

	H_s			σ_c (MPa)			V_p (m/s)		
Palazzo Manes	33	±	7,8	45,1	±	15,0	4.486,64	±	315,78
SS.Annunziata	35	±	6,2	47,0	±	12,2	4.019,24	±	679,81
Oratorio dei Nobili	27,2	±	5,0	29,1	±	6,0	3.548,02	±	786,48

Table 2: Mean values of Schmidt hammer rebound (H_s), uniaxial compressive strength σ_c (MPa) and ultrasonic velocities V_p (m/s) for each case study investigated.



Figg. 7a, 7b: Binary diagrams showing the correlation between mean values of ultrasonic velocity V_p (m/s) and (Fig.7a) mean values of Schmidt hammer rebound values H_s, (Fig.7b) uniaxial compressive strength values σ_c (MPa).

Morphological analyses by SEM are reported in the figure 8. The sample "MAN_B" (figg. 8 a,b) shows an homogeneous texture with a medium porosity. It also shows the presence of fossils and lichens. Lichens form a biological crust on the sample, as also shown in the Fig.9a. The chemical analysis detects the content of crystals of salts of Na, Cl and K. Moreover it individuates the content of CaO (56.58□), SiO_2 (15.61□), MgO (10.56□), Al_2O_3 (4.36□), Na_2O (5.22□), K_2O (3.32□), FeO (2.37□), Cl_2O (1.98□).

The sample "SS□A" (figg. 8 b,c) shows the presence of crystals of salts of Cl, Na and K. It is prevantly composed by a micritic and microcrystalline calcite. Are also visible crystals of dolomite and gypsum. The rock shows a medium level of porosity and the substrate is altered. The sample is also deteriorated by biological colonization by fungi and lichens. Furthermore are visible fossils and the presence of salts is concentrated along deteriorated areas. The presence of gypsum has been

confirmed by the chemical analysis. The electron probe micro analysis detect the content of CaO (43.29□), SO_3 (15.76□), SiO_2 (15.77□), MgO (10.35□), Al_2O_3 (5.95□), K_2O (4.82□), Na_2O (2.00□), FeO (1.78□), Cl_2O (0.29□).

The sample "A4□dx" shows both intact parts and portions characterized by a lower compactness and a higher level of porosity. The sample can be defined as a fossiliferous sandstone with some recrystallizations due to the presence of gypsum, responsible of visible superficial crusts. In the figures reported below, can be seen traces of fossils and gypsum. The presence of gypsum has been also confirmed by the chemical analysis. Are also present crystals of salt of Na, Cl and K. The electron probe micro analysis detect the content of CaO (41.19□), SO_3 (30.44□), MgO (10,98□), SiO_2 (10.57□), Na_2O (2.97□), Al_2O_3 (2.07□), K_2O (1.16□), Cl_2O (0.63□).

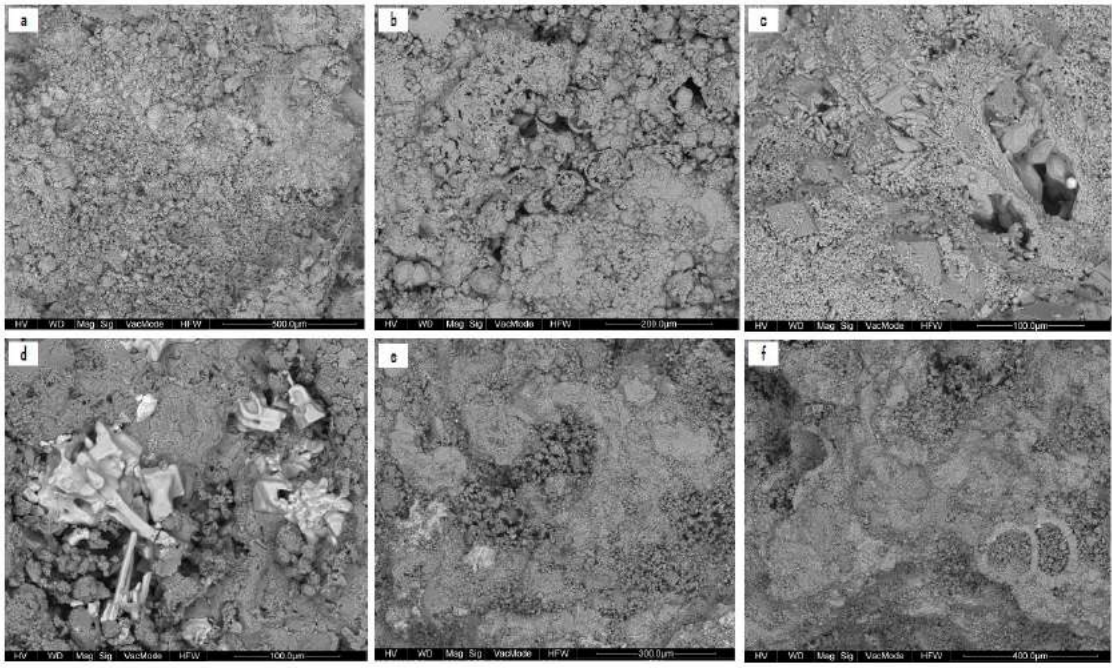


Fig. 8: SEM analyses: (a), (b) sample "MAN□B" belonging to right part of the portal of "Palazzo Manes", San Lucido; (c), (d) sample "SS□A", belonging to the left part of the portal of the Church of "SS. Annunziata", San Lucido; (e), (f) sample "A4□dx" belonging to the right part of the portal of "Oratorio dei Nobili", Amantea.

4. Conclusions

This study remarks the importance of diagnostic analyses applied to monumental architecture. Laboratory and in-situ tests carried out on the surface of the monuments investigated and on the samples belonging to "Palazzo Manes", to the Church of "SS. Annunziata" in San Lucido and to the portal of "Oratorio dei Nobili" in Fuscaldo, have allowed the identification of the degradation products (crystals of salts of Na, Cl, K and gypsum) as well as the presence of a biological colonization (lichens).

The mapping of weathering forms indicates that the investigated monuments exhibit different state of conservation. The most deteriorated appears to be the portal of "Oratorio dei Nobili" due to the different properties of its building material (sandstone), while the portal of "Palazzo Manes" (calcarenite) is the best conserved. In general calcarenite showed better physical and mechanical properties than sandstone. In relation to the ultrasound pulse velocity measurements, the values obtained are compatible with the forms of decay observed, which is corroborated by the measures taken with the Schmidt hammer. Moreover the study results demonstrate the major susceptibility of the physical and mechanical properties of sandstone than the calcarenite, to weathering.

In conclusion, this paper highlights the importance of a correct approach in restoration processes of monuments which must provide for a diagnostic study of the intrinsic properties of stones and take into account the textural and physical–mechanical compatibility between replacing and replaced materials. The critical issues detected exhort to organize and to design an intervention of conservation for those architectural elements affected by higher deterioration, in order to preserve cultural heritage and the important role of these building materials in the architecture of Cosenza Province. Deterioration effects detected on the surface of the monuments studied, demonstrate how decay processes cause not only damages on the ornamental elements but also affect the stability of architectural elements with the loss of mechanical stone properties and consequently load-bearing capabilities.

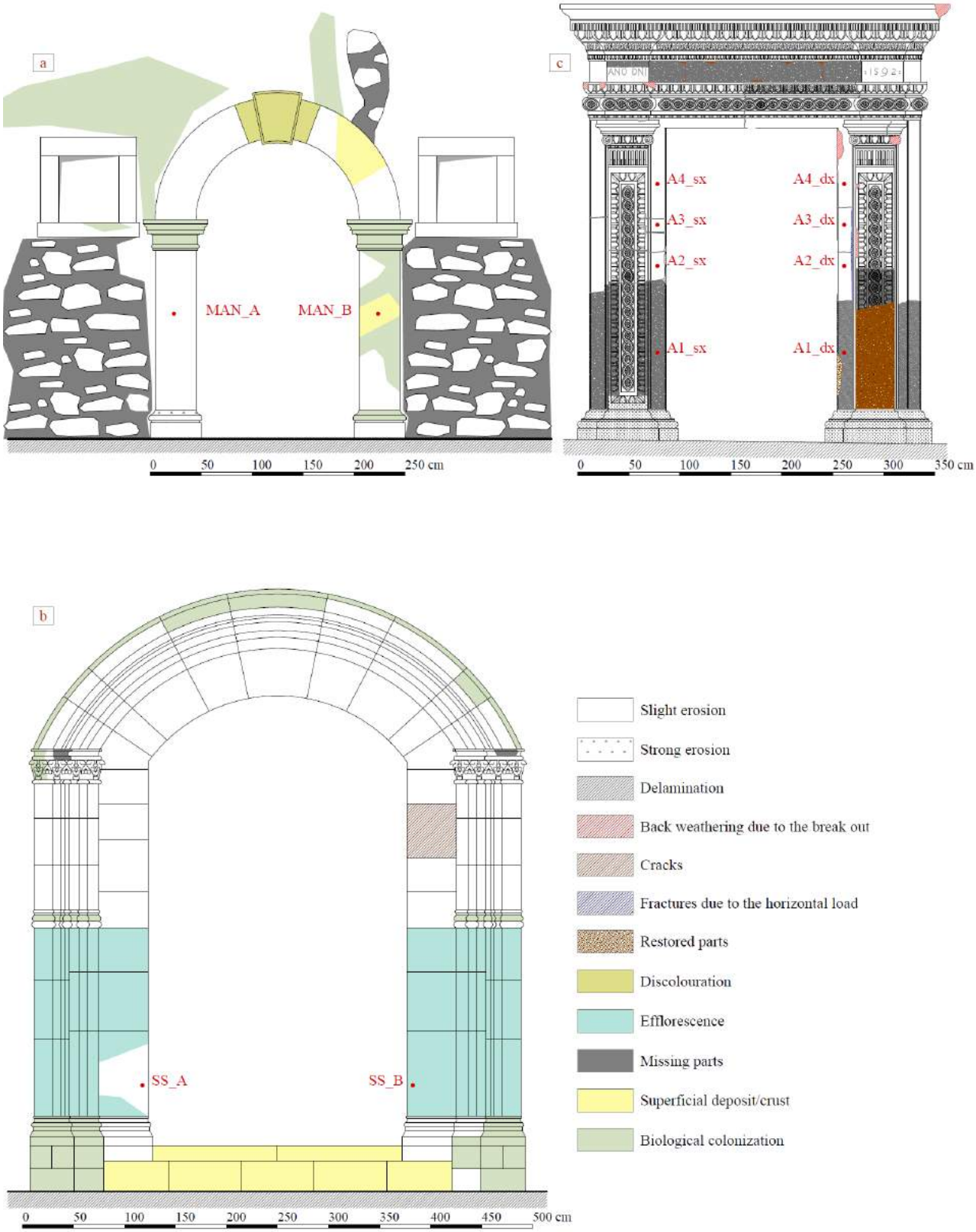


Fig. 9: The three portals with deteriorated parts: “Palazzo Manes”, San Lucido (a); Church of “SS. Annunziata”, San Lucido (b); “Oratorio dei Nobili”, Amantea (c)

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Architecture on Subaqueous Soils as a new chance for the environmental restoration of problematic seashores: the "*Sea*_ty garden"

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Abstract
The study of subaqueous soils is a modern frontier of Soil Science, involving both basic and applied researches. Conceptually, a "subaqueous soil" is an underwater environment, nearly permanently submerged by shallow water (□ 2.5m). The most common and relevant interest for coastal, tidal lands, arises from their substantial profitable potential as natural – even if conditioned – nurseries and fish-farms for aquatic organisms in freshwater as well as in brackish and seawater lagoons. An original, intriguing opportunity we forecast is to consider the subaqueous soils as the physical and conceptual bases for the sustainable restoration of problematic seashores. As a case-study, we considered the seaside of "Cilento, Vallo di Diano e degli Alburni" National Park (in short, Cilento), a land of great landscape/environmental value and promising economic development. The Cilento coast often suffers for hard, rasping rocks cropping out from the shallow seafloor, and frequently invisible at the sea surface, which hamper both walking and swimming. This paper deals with the restoration of an unusable portion of the seashore of Acciaroli town, one of the most favorite Cilento holiday destinations. Our multidisciplinary concept plans the composition of a marine garden with seagrasses and trees, and sessile and vagile fauna. The garden embraces aquatic promenades, benches and spaces, whose shape and hydraulic morphology continuously are drawn and modified by tide and longshore wave.

Keywords: unusable seashores, environmental restoration, subaqueous soils, pedotechnologies, aquatic garden.

1. Introduction
Coastal tourism is one of the most favorite, popular ways to live the sea. Indeed, it is much easier, cheaper and safer - for children and families - than sailing, deep-sea fishing or underwater fishing. However, sea shores often lack convenient accesses to sea, as in the case of the rocky coastlines. Examples include the karstic carbonatic coastlines of the Northern Mediterranean Sea arch, where mountain chains run close to the coastline, forming rugged terrains, from Provence to Greece [1]. In Italy, carbonatic rocks dominate over sea coastlines, as in Liguria, Sardinia, and most of Southern Italy

Regions. In some cases, as in Capri Island or in Sorrento-Amalfi coastline (Campania Region), the high sheer cliffs clearly hamper any direct access to sea. Truth be told, tourists appear to be repaid by the amazing landscape of the rocky walls hanging on the sea, at whose feet natural inlets, creeks and caves frequently occur. These last, however, can be reached and enjoyed just from the sea, *e.g.* sailing along the coast by yachts or by rowing, sailing or motor boats as well. Conversely, various stretches of Sardinia, Sicily and Southern Italy rocky coastlines gently shelve down to the sea, giving the appearance of an easy access to sea. In many cases, it is a mere illusion, since the rocky platform usually remains shallow, or even just below the surface of water, with projections and indented ridges, as well as cavities and fractures, which actually hamper both walking and swimming, making a number of seacoasts unusable.

Our view is to provide guidelines for the sustainable restoration of problematic seashores, by turning the factual obstacle of unusable rock into opportunities for the creation of welcoming, fun and "liveable" public spaces. To this aim, our restoration concept involves, *inter alia*, the use of *ad hoc* pedotechnologies to build and manage "subaqueous soils", suitable to perform genuine, functional "*Sea*ty gardens", accessible and enjoyable by all ages tourists.

Subaqueous soils are a modern frontier topic of Soil Science, involving both basic and applied researches. Conceptually, a "subaqueous soil" is an underwater environment, nearly permanently submerged by shallow water (2.5m) [2]. Up today, the most common and relevant interest for coastal, tidal lands, arises from their substantial profitable potential as natural – even if conditioned – nurseries and fish-farms for aquatic organisms in freshwater as well as in brackish and seawater lagoons. Indeed, we forecast an original, intriguing chance in considering shallow or tidal rocky / stony sea beds as a natural platform on which subaqueous soils can be assembled to sustain growth and development of terrestrial and aquatic plants, as well as to serve as a "pavement" for human social purposes. Such an objective is achieved by using adequate pedotechnologies, *i.e.* the whole of interventions aimed at designing and emplacing "Technosols" with specific mechanical and bio-chemical-physical properties [3,4], suitable to meet the requirements desired by the project.

As a case-study, we considered the seaside of "Cilento, Vallo di Diano e degli Alburni" National Park (in short, Cilento), a land of great landscape/environmental value and promising economic development. The Cilento coast often suffers for hard, rasping rocks cropping out from the shallow carbonatic seafloor, and frequently invisible at the sea surface, which hamper both walking and swimming.

This paper presents a concept for the restoration of an unusable portion of the seashore of Acciaroli town, one of the most favorite Cilento holiday destinations. Our multidisciplinary design plans the composition of a marine garden with seagrasses and threes, and sessile and vagile fauna. The garden embraces aquatic promenades, benches and spaces, whose shape and hydraulic morphology continuously are drawn and modified by tide and longshore wave.

2. Site characterization

Acciaroli town, a small hamlet of Pollica Municipality, also belonging to the Cilento, Vallo di Diano e degli Alburni" National Park, is located along the Tyrrhenian Sea coast, between Marina di Mezzatorre and Punta Caleo (Fig.1a,b). The project involves a sea water surface of about 10.000 m^2, adjacent, to E-NE, to Acciaroli seafront, and, to S-SE, to the old Franciscan convent complex, as well as a part of the same seafront overlooking the project area (Fig.1c).

2.1. The environment

Figure 2a reports a detail of the geological sheets n 519 (1:50.000 scale) Capo Palinuro [5]. The formations outcropping in the inland, hilly parts of study area, from NW to SE, are mainly constituted by arenaceous turbiditic deposits of the Pollica Sandstones and North Calabrian Unit deposits [6]. The deposits outcropping along the coast, from Marina di Mezzatorre to Punta Caleo, including Acciaroli, – belong to Sintema Palinuro (bioclastic calcarenites and cross-bedding sands in the lower and upper part, respectively) and Subsintema Le Saline (bioclastic conglomerates and calcarenites in the lower part, and cross-bedding sands in the upper part). Undifferentiated quaternary siliciclastic and carbonatic deposits - associated to Subsintema Le Saline - are detected near the Acciaroli harbor (Fig. 1c). Figure 2b shows a representative rock sample collected from the sea bed of the study area. It is hard, resistant to spade carving, with sharp edges and violently effervescent after strong acid treatment. The study area is characterized by a Mediterranean oceanic to sub-oceanic climate [7]. From 1971 to 2000, average annual air temperature and mean annual precipitation were 16.9C and 60.8 mm, respectively. October and November are the months with the heaviest reported rainfall, while June and July are the driest [8].

Wild flora is represented mainly by Carob, Wild Olive, Myrtle, Lantisk and Terebenth Pistache, Heather, Juniper; peculiarities are Sand Lily, Primrose, Rock Carnation; sea vegetation is signified by Rosy Feather Star, Neptune Grass, and Little Neptune Grass.

The wave motion in Acciaroli basin is governed by a semidiurnal tide. Hydrometric features were achieved on the basis of ISPRA (Rete Mareografica Nazionale) monthly and yearly data for Palinuro and Salerno stations. Figure 2d,e,f,g, shows water level, temperature, and wind direction and speed for Palinuro station. From data examination, we can assess: i) water level ranges between -0.30 / □0.25 m, with a tide width averaging 0.40 m, ii) water temperature ranges 13.5 □C - 28.0 □C; iii) air temperature ranges 6.5 □C - 31.5 □C, iv) wind has an intensity 2 to 5 m / s with a prevailing direction 220 □-255 □N, and, v) water pH varies 8.3 to 9.0.

2.2. Seafront and urban surroundings

The Acciaroli seafront is a short area of the urban road, stretching for about 250 m from the emerging reefs border (N-NO), to the old Franciscan Convent (S-SE), close to the marina (Fig.1c). The sidewalk along the sea, paved in local stone “Pietra del Cilento”, hosts deciduous trees, and gives access to a dock, bordering 1 m a.s.l. the sea cost and the old cloister courtyard. To the latter is annexed the “Annunziata” church, already testified in 1187, probably built over the remains of a Roman villa. Behind the church, the restored Norman tower stands, overlooking the sea. Also known as “Cannicchio” tower, it was utilized, jointly with that of Caleo point, as a coast watchtower, from Frederick II of Swabia up to Spanish reigns.

The seafront built environment is a typical example of poor, often pretentious, 50-60’s architecture. At the N-NO end, a huge and obtrusive building, popularly known as “The Mushroom” (Fig.1c), stands on the reef, as a disturbing blot on the landscape, marring the observer perception. On the side opposite to the sea, a curtain of two-level buildings borders a narrow, elongated open space with deciduous trees. During the summer, marquees, sheets and imitation roofing are placed to host a massive, but “hit and run” tourism swarming into the town.

3. Concept outline

The economy of a sea tourist destination clearly is greatly damaged by the objective inability to enjoy the town seashore. So, we envisaged to enable both shoreline and seafront to function as a “*Sea*□ty garden”, fully ready and available to citizens and tourist, through an integrate environmental restoration (Figs. 3, 4). To this aim, two intervention sets have been planned: i) a pedotechnical one, to amend the rocky seabed, providing physical grounds for Technosols design and emplacement, and, ii) an architectural one, to substitute a dynamic marine garden, with dry and aquatic settings, for the unusable coast stretch. The rocky seabed amendment is implemented by a series of excavations, modeling, emplacement of formworks by Lightweight Treated Soils (LWTS), and relocation of the rocky/stony material on which Technosols are built. Our concept also re-organizes the Zen garden, the Raumplan and the Ephemeral models. The marine garden is split by stepped levels, shaping promenades, pools and ”floating” squares, as well as the basement of the “Abalone” tower. The whole area is characterized by permanent Dry and Submerged Zones, as well as ephemeral Tidal-Mudflat Zones. The Technosols built in such Zones are respectively classified as Spolic, Subaquatic, and Tidalic, according to WRBSR [9]. The spatial distribution and consistence of the latter are governed by wave and tide motion. By this way, reversing the notion of the Zen Karesansui, both the elemental water component and the overall garden landscape continuously modify their shape and evocative role, enshrouding visitors with boundless suggestions. The first design process is the re-shaping of the seafront, by connecting it with the adjacent rocky seashore and dock through a garden hosting a mixed vegetation, progressively shifting from terrestrial to marine species. The access to the “*Sea*□ty garden” is a change of-course fork from the seafront walkway, opening new standpoints alongside two sea promenades (Figs. 4, 5). On the left, a multilevel promenade stretches among “floating” squares, pools, and gardens with marine vegetation emerging from sea water, in which visitors can choose their own preferred place in Dry or Submerged Zones, or in the coming-and-going waves environment of the Tidal Zone, relentlessly fluctuating and changing. The other promenade goes into a two-levels circular tower we named “Abalone”. We designed its roof with the shape of the sea snail “ear shell”, with a curved belt of opencast holes, through which sun or moon light paints the inner walls. The “Abalone” hosts an aquarium, naturally fed by seawater through masonry cavities, with floating and sessile plants, and small fauna. The interior corridor run around the aquarium, from the first floor entrance to the ground floor, from which it comes out to reach the marine garden through a “floating” square. The “Abalone” also serves to mask the “Mushroom” the landscape backdrop.

4. Concluding remarks

Natural environment, although suggestive, sometimes is unfriendly and practically worthless, then prone to be neglected and injured. The fruitful synergy between Architectural and Pedological knowledge can put into service actual strategies for the environmental restoration of impracticable sites, turning them in livable and usable commons for innovative, profitable urban planning.

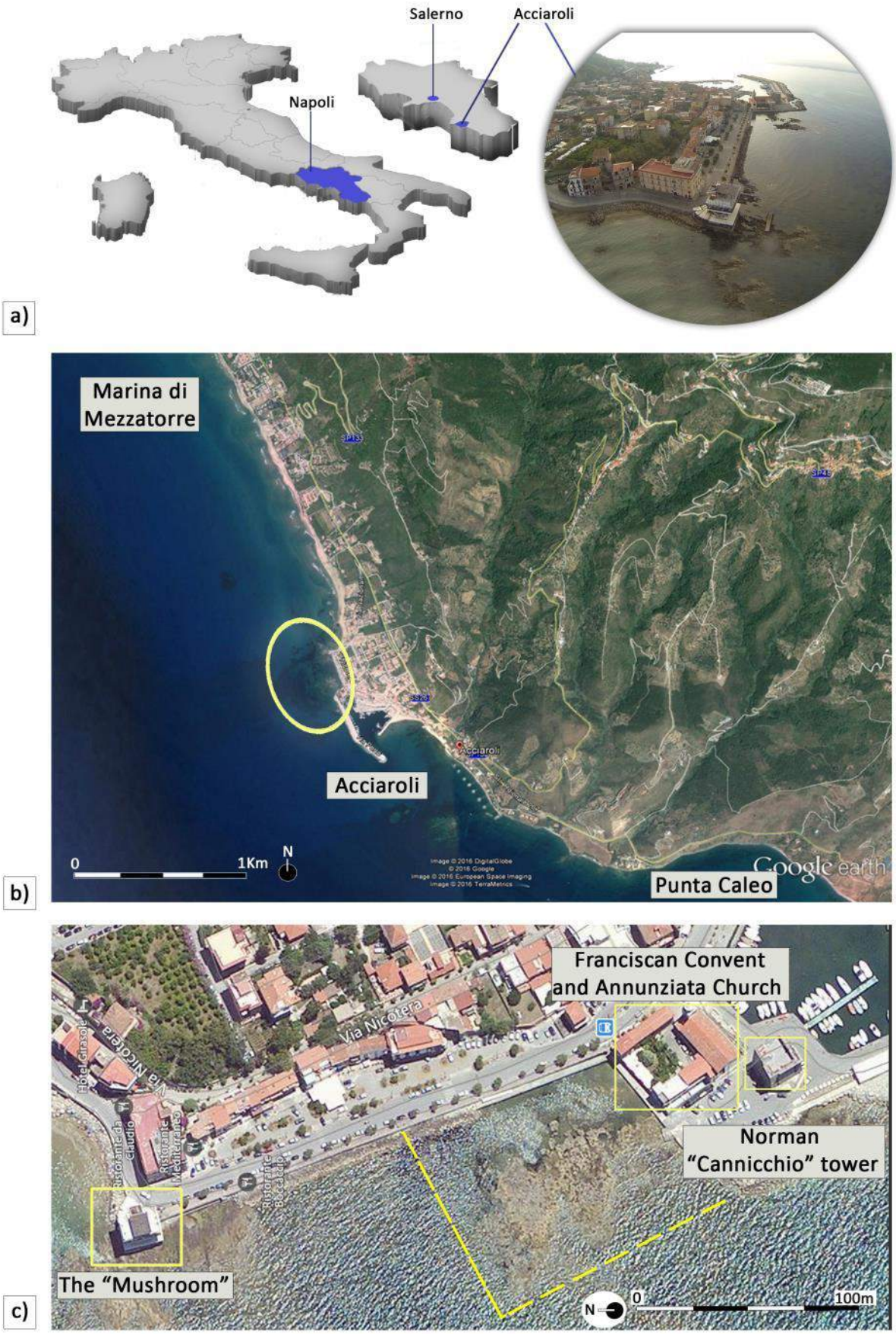

Fig. 1: The study area. a) Site location; b) □ellow ellipse circumscribes the project site; c) □ellow dashed line demarcates the project seawaters.

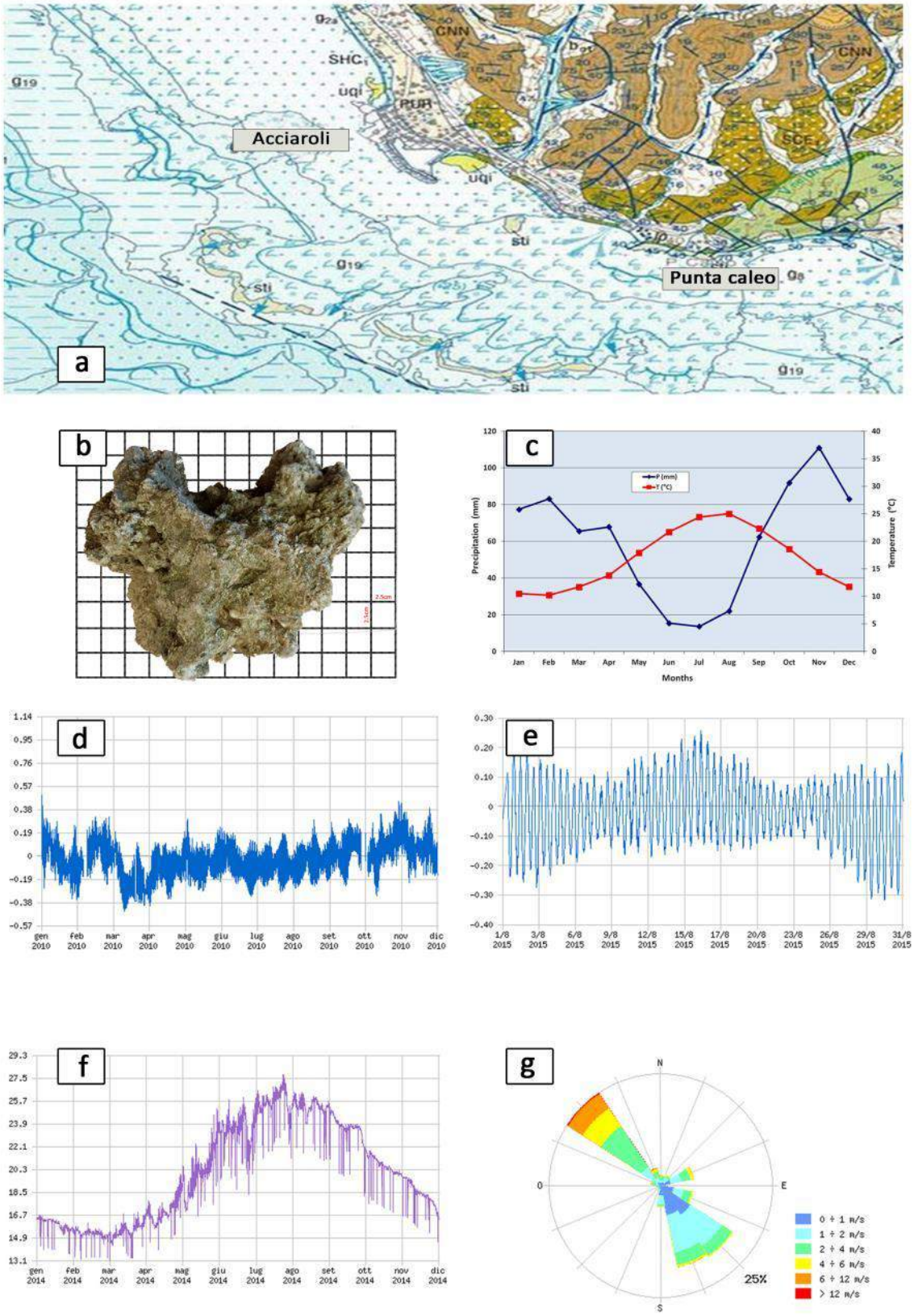

Fig. 2: Environmental characterization. a) Geology; b) A seabed rock sample; c) Thermopluviogram; d), e) Water level; f) Water temperature; g) Wind direction and speed.

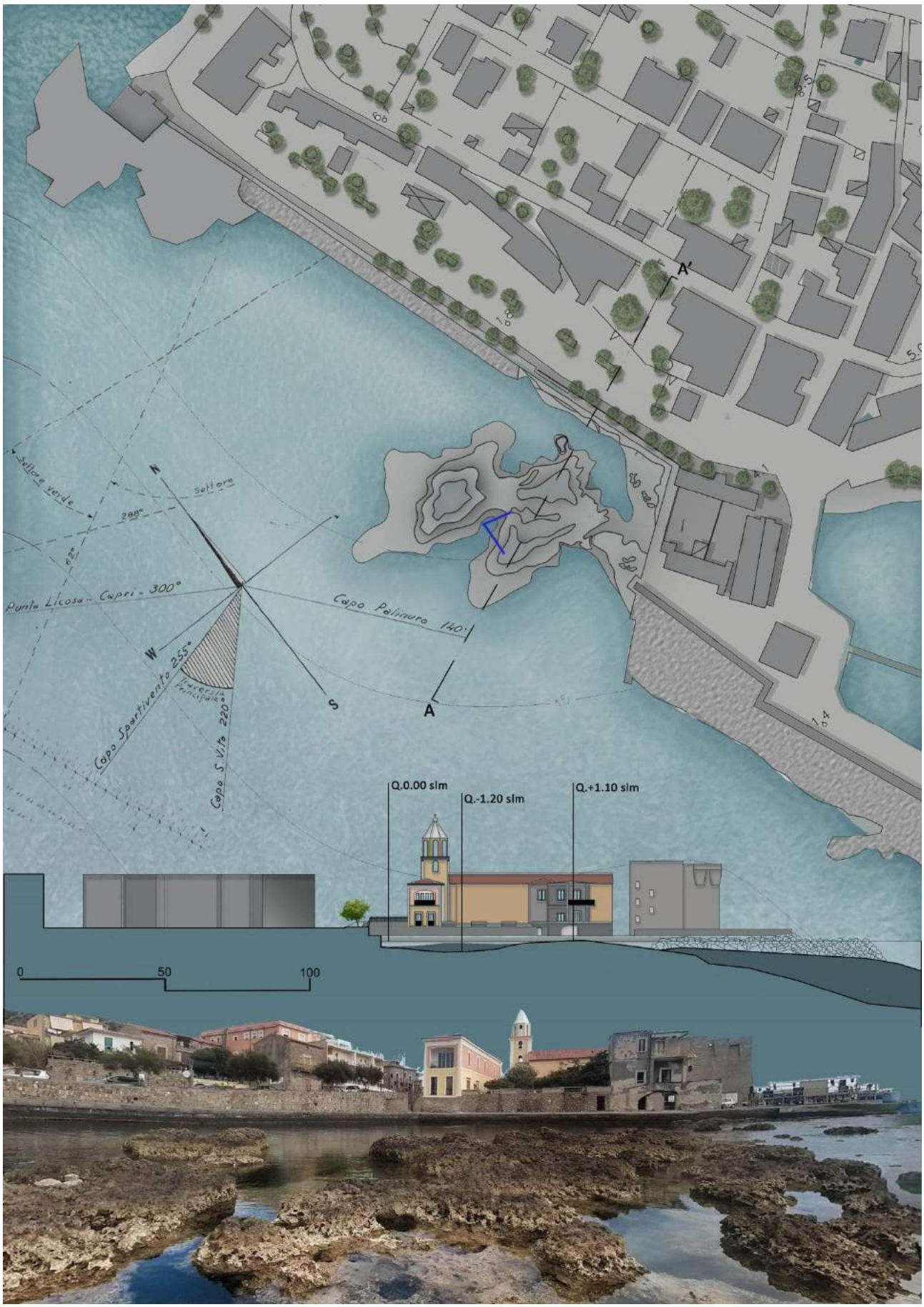

Fig. 3: Present state. a) Plan; b) Section A-A'; c) View from 1.

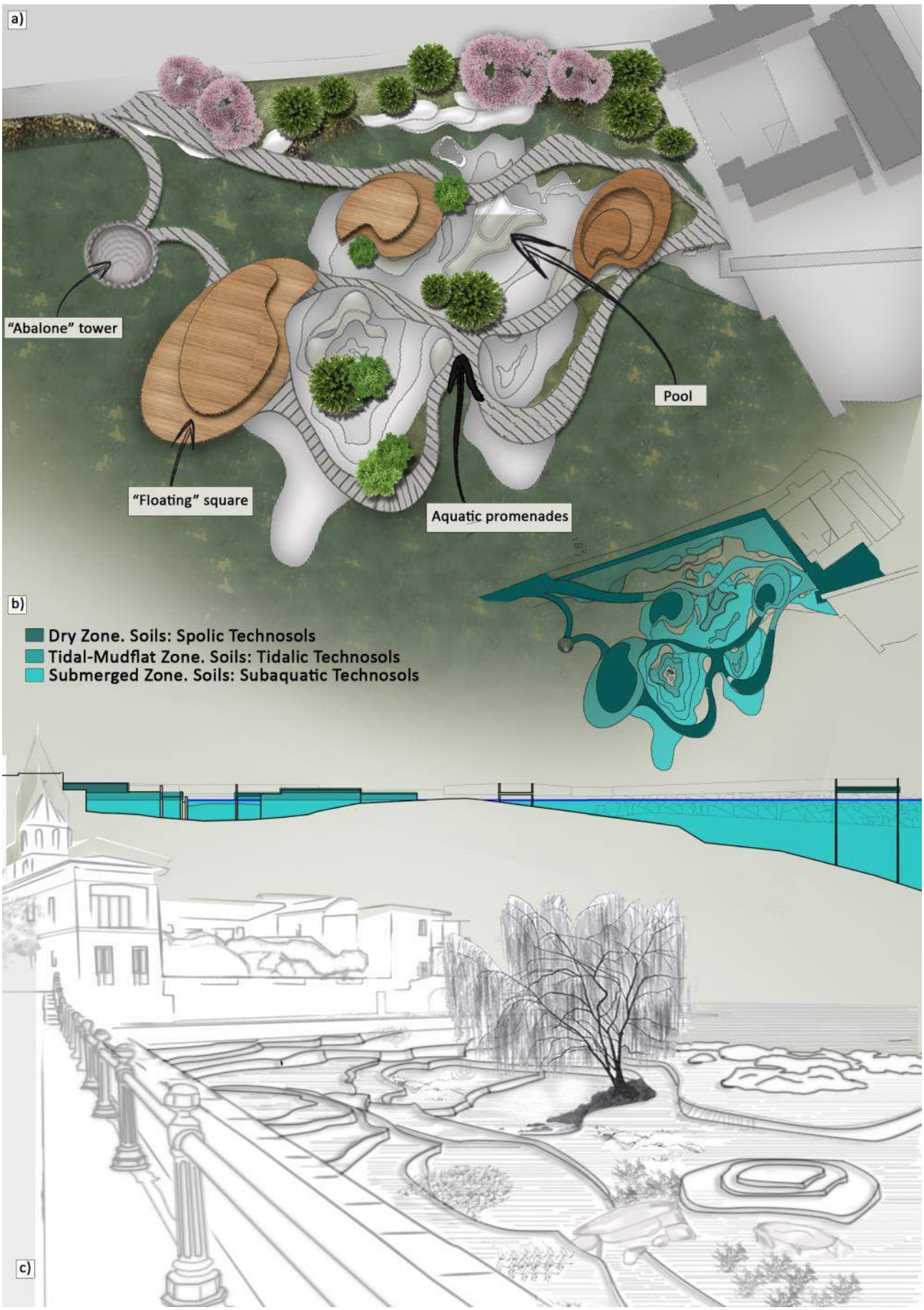

Fig. 4: "*Sea*□ty garden" concept. a) Project plan; b) Split Zones and Technosols classification; c) Concept design.

Fig. 5: Configuration state. a) Longitudinal section; b) Marine garden; c1) Ground floor plan; c2) First floor plan; 3) Roof plan; c4) Section A-A'; d) Entrance to "Abalone" Tower.

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Blue Infrastructures Re thinking urban space.

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Abstract
Always been the subject to binding rather than operational interventions, the landscape, in the last decades, took its autonomy in urban and country planning. The creation of new urban landscapes implies a reflection on open spaces and on elements that compose them, on their reuse and reclamation which followed the lost of usage value and of natural features. In urban transformation strategies the theme of river restoration is very relevant, in which watercourses, vectors of cultural, historical and landscape values are opportunities of territorial development by leveraging the relationships established, over the time, between urban settlements. Rivers are also components of the heritage of areas that placed them in a privilege contexts for urban renewal and environmental policies. Moreover the river are becoming objects of actions from the definition of new public spaces to the creation and strengthening of urban parks linked to soil protection. With a view on sustainable development, the objective is territorial, ecological and cultural enhancement of rivers for the definition of new synergic relationships between natural and anthropic components that will return to the city its narrative sense and the rediscovery of those places that have given to the city its territorial relevance.

Keywords: River – Blue infrastructures – Resilient landscapes – Urban space - Wetlands

1. Water course. Restore the urban landscape

Since ancient times the human lands settlement was influenced by different choices related to livability, safety, health and productivity. The transformations of these places bring the evidences of roads, sewage systems and urban settlements, and today represent the framework to rebuild a persistent character and a recognisable identity, to distinguish features defined by those marks that current urban transformations tends to forget and to conceal with indifferent structures. What today seems relevant, for the recovery of degraded areas and places called "marginal", is the relationship between geographical structure of the territory and the ways in which urban settlements and works related to its use are placed over the area.
As previously mentioned, planning requires a significant change of its principles and objectives, capable to rethink ecologically the landscape quality of our cities. In this context, leading to reflect on the development of urban system and planning, urban regeneration becomes a vehicle for the introduction of different key themes that should characterize the future of cities,.
They are:
- Waters, concerning climate changes and hydro-geological risks in urban areas

- Soils, scrap and waste, regarding reclamation works
- Energy, in relation to energy networks from renewable sources
- Sustainable mobility, so an urban accessibility without oil
- Renovation of existing buildings
- Progressive construction of green and blue infrastructures.

In particular we focus on the challenging aspects of water in urban areas and on the important role that blue infrastructure plays in the urban development, explained through different case studies that we report below.
Urban infrastructures form the public part of the cities and, taken as a whole, they can be public meeting spaces, an expression of the local culture, and a circularization system of natural resources. In particular blue infrastructures are all the elements that supporting the territorial progress, reach the goal of sustainable development and urban resilience. Considered as devices capable of restoring the conditions of natural processes in the city, the river corridors need to be strengthened and rebalanced so they can satisfy the needs of the population. In recent years we have seen a rethinking of the riverfront as public spaces and part of connective and recreational urban pattern. The importance of taking care of waterways is declared on EU Water Framework Directive. It establishes for the Nations of Europe the objective of achieving "good status" of waters in each river basin district by 2016. Compared to other European countries and the United States, only Italy recentlyhas shifted his interest on rivers and surrounding areas as ecosystems to be preserved.

"The river corridor is a strip of greener□that surrounds the channel where the water of the river flows. The band can contain onl□the Canal and its ban□s, or be so broad as to include also the floodplain, the hills or the surrounding heights " (Forman, 199□)

Fig. 1: 16 x 9,5 cm. Bagnoli Irpino Lake
From : www.bagnoli.laceno.it

These river corridors are dynamic places and they're subject to competition between humans uses and forces of nature, where human activities produce the double effect of decrease of river flow and its variability over time. In order to understand the fundamental relationship between watercourse and town here we report two case studies the first carried out in Los Angeles, Brooklyn and the second concerning a thesis project on the river Sarno in Scafati.

1.1 Los Angeles River, Los Angeles.

From large concrete channel to a Green Highway running through the city.

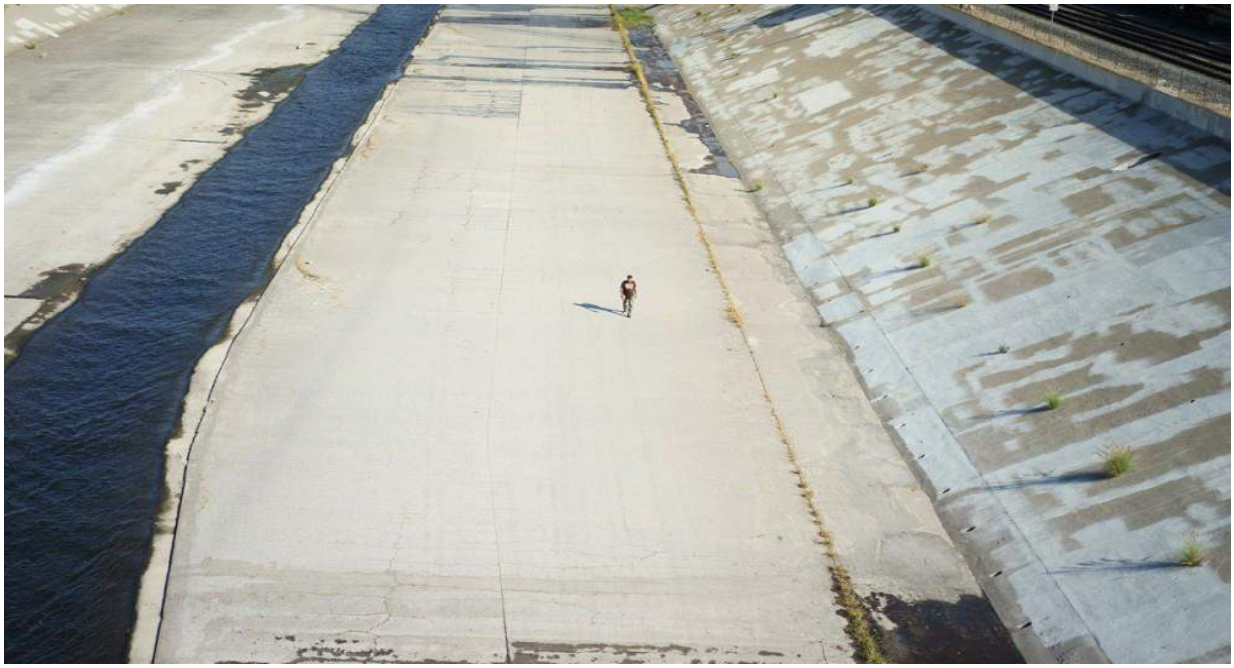

Fig. 2: 16 x 9,5 cm. A stretch of the concrete bed of the Los Angeles River, 2014.
From : Carolyn Drake/Panos Pictures/Sony's Global Imaging Ambassadors

Los Angeles has long been a battleground for the redevelopment of the river running through it. For over 60 years it was caged in a concrete embankment to prevent flooding: a water course stripped of its natural beauty and turned into a drainage channel and incredibly polluted. It's the story of a river erased by human intervention, where the naturalistic aspects are completely absent. The Los Angeles River, as environmental icon, embodies the need of transforming the urban built environment in place of rebirth and opportunities. For years environmental groups have mobilized to get the redevelopment of the Canal, on whose banks the railroad tracks run for over 60 Km and largely inhibit the access to people.

Fig. 3: 16 x 9 cm. Los Angeles against the background of a railroad track that passes beside the river.
From : Carolyn Drake/Panos Pictures/Sony's Global Imaging Ambassadors

A project has been elaborated, aiming at revitalizing the river ecosystem and making it attractive for residents and tourists. The project is known as "Greenway 2020" and sponsored by the River Corporation, which would see the river as green connection between the different parts of the metropolis and would allow citizens to move in a sustainable way.

1.2 Gowanus Canal Sponge Park, Brooklyn, NY.

Gowanus has a rich history. Originally a large marshy wetland the area was the site of early Dutch settlement, important Revolutionary War battles, and industry that includes the energy and construction sectors. Planners envision the area as a new site for large residential development, a controversial proposal in the face of climate change projections. In this context, working closely with local community organizations, government agencies, and elected officials, dland studio initiated and designed a new kind of public open space, a Sponge Park™.

Fig. 4: 16 x 9 cm. Gowanus Canal Sponge Park. Current state.
From : http://www.archdaily.com

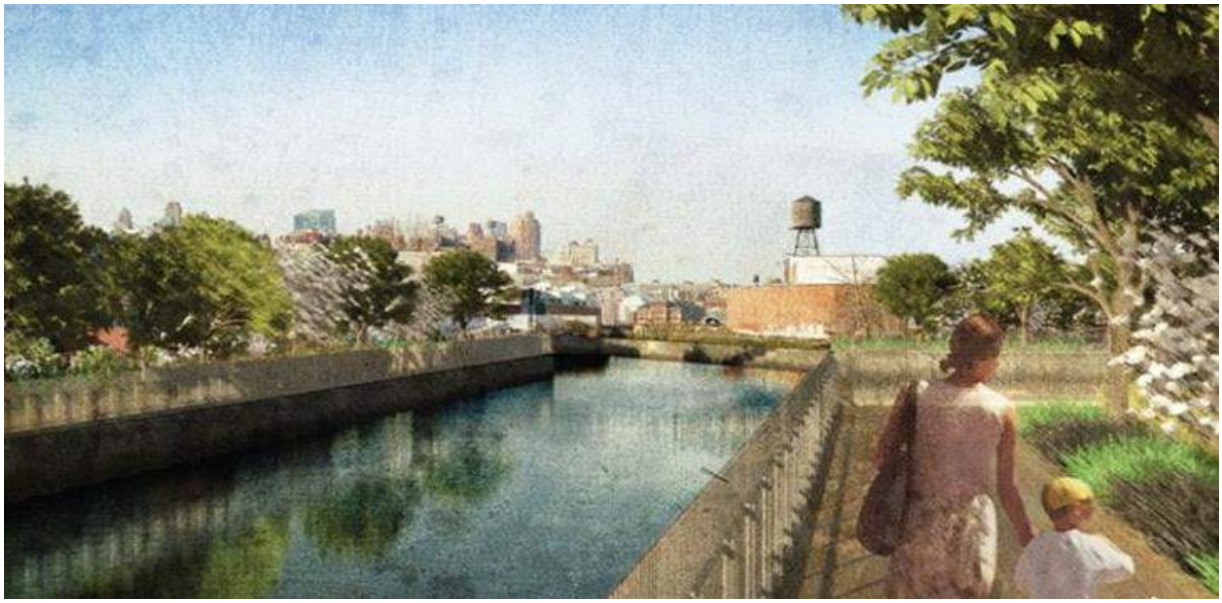

Fig. 5: 16 x 9 cm. Gowanus Canal Sponge Park. Project idea.
From : http://www.archdaily.com

The Sponge Park™ design equally values the aesthetic, programmatic, and productive importance of treating contaminated water flowing into the Gowanus Canal, an EPA Superfund site. The park is designed as a working landscape that improves the environment of the canal over time. This innovative plan proposes strategies to divert excess storm water run-off for use in the public park along the canal, reducing the input of rain water into the sewer system. The plants and engineered soils included in our design draw heavy metals and biological toxins out of contaminated water. Proposed floating remediation wetlands incorporate a mixture of aquatic organisms that absorb or break down organic toxins, heavy metals, and biological contaminants from sewage.

1.3 Linear Park, Scafati, IT.

The second project deal with the redevelopment of the former Real Bourbon powder factory of Scafati. Scafati is part of the geographic area of the Agro Nocerino Sarnese and is located in the central part of the Sarno valley. This position allows a direct connection to the archaeological area of Pompei. The territory is crossed by the Sarno River which underwent works of reclamation and rectification, by the Bourbon dynasty, mainly due to the construction of the Royal powder factory. The project concept is expressed in the construction of a pedestrian and bike path that from the historic center reaches the archaeological site of Pompei. A grand boulevard that will be a tool for understanding the urban system and perceiving the space; a walk along the river and through the places of the origins to observe and remember what, to date, is the memory of the past. It was so thought to realize, a linear park between the old town and the Bourbon powder factory that would be both element attractor for citizens of Scafati and of the neighboring towns. Thanks to the special bond and the geographical proximity to Pompeii, the intent of the project is to create a network between the two municipalities and a new tourist attraction in synergy at the archaeological area.

Fig. 6: 16 x 9 cm. Walking along the river. Scafati and the (re)discovery of the places.
Masterplan.
Santamaria L., Vittiglio V. Napoli, 2015

The intervention also becomes an alternative to the traditional concept of mobility through green infrastructure allowing decongestion of traffic for a new and more comprehensive vision of sustainable mobility. The oxygen produced by trees contributes reducing carbon

dioxide emissions and substances responsible for pollution, improving the healthiness of the area and the perception of urban space, as well as creating a number of opportunities for interpersonal relationships and new landscapes, now precluded. The intervention arises the dual purpose of rediscovering an area of high historical and naturalistic value and reconnecting it both to the historic center and to the touristic center of primary importance by returning the image of a painting no longer fragmented. We antagonize to a piece of monofunctional city .the choice of functional activities that can be used by functional mixité in which converge different utilities for most of the day, reducing the risk of disuse and decay.

Fig. 7: 16 x 9 cm. Walking along the river. Scafati and the (re)discovery of the places.
Project of public garden.
Santamaria L., Vittiglio V. Napoli, 2015

Fig. 8: 16 x 9 cm. Walking along the river. Scafati and the (re)discovery of the places.
Inside of the Borbonic Factory.
Santamaria L., Vittiglio V. Napoli, 2015

Finally, considering the hydrogeological risk to whom this area is subject, the original agricultural vocation, the presence of historical irrigation channels, it was decided to design a naturalistic area by placing a system of wetlands. The aim of the project is therefore to define new synergies between natural and anthropic components by mend, recovery and enhancement of tissues and ancient paths.

Fig. 9: 16 x 9 cm. Walking along the river. Scafati and the (re)discovery of the places.
Naturalist area inside the Borbonic Factory.
Santamaria L., Vittiglio V. Napoli, 2015

Conclusions

Rivers and canals have a relevant influence in the urban design. Restore the presence of water in urban areas means achieving benefits, including:

- Conservation and enhancement of biodiversity
- Mitigation of hydrogeological risk
- Achievement of educational, cultural and scientific purposes
- Physical-chemical risk mitigation
- Protection of ecosystem services

In the framework of planning is essential to ensure that waterways are no longer accepted as critical environmental factors but as potential qualifying components in the perception of the urban landscape. Ultimate objective is therefore to regard the River as part of nature in the city and this implies a profound reflection that allows a re-appropriation of decisive role of ecological infrastructures, building functional landscapes whose aesthetics is based on ecological awareness and environmental ethics.

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Valorization of the Neapolitan forestal landscape: the Camaldoli woods

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Abstract
The western area of Naples is characterized by the forestal landscape of the Camaldoli hills, the territory of which builds a system of cultural and environmental values that are very important. The Camaldoli woods are one of the city's most important landscape areas; conterminous with the Campi Flegrei Regional Park, the woods is in the perimeter of the Parco Metropolitano delle Colline di Napoli (Napoli Hills' Metropolitan Park) that includes the Selva di Chiaiano, Vallone San Rocco, Scudillo and the Conche dei Pisani. As residual green areas, these forestal systems work as diaphragm between the inner city and the suburbs, offering a wide-range *eco-s□stem service.* The valorization of the Bosco dei Camaldoli has to be aimed at matching, in eco-friendly terms, the imbalance of the metropolitan area whose demographic increase has determined an incredible destruction of natural resources generating several problems in the territory; to remedy the problem, the management of the city will have to consider the priority of the safeguard of biodiversity and the landscape heritage inserting within the planning processes the environmental and natural factors.

Keywords: Neapolitan Landscape, environmental monitoring, biodiversity, ecologic corridors.

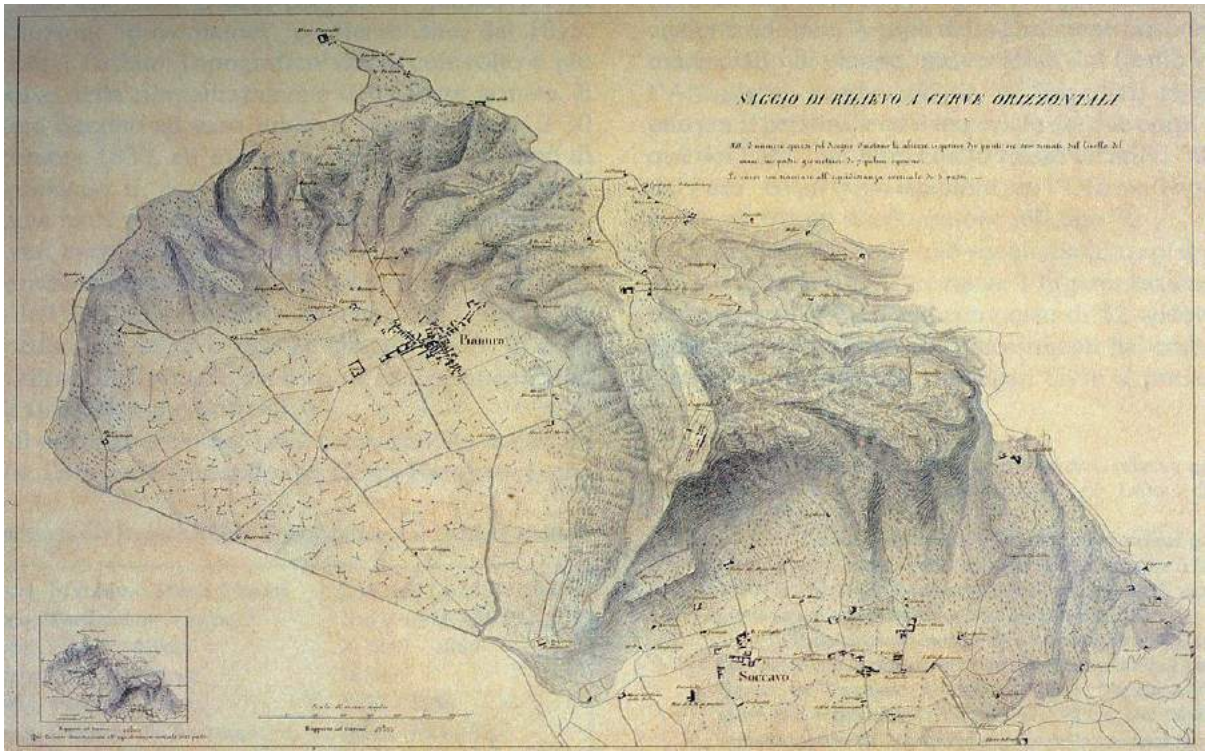

Fig. 1: Relief with hortizontal curves: the Camaldoli hill, Naples 1830.

1. The Colline di Napoli Metropolitan Park

The institution of the Colline di Napoli Metropolitan Park represents the first significant planning interventions for the safeguard and valorization of the forestal systems in the urban system of Naples' Metropolitan Area. The areas covered by the park that build up the green surrounding, delimit the historical city of the Campania Valley, performing the function of safeguarding biodiversity. The aim that the park of the Naples' hills has to pursue is the restoration and conservation of the physical integrity and cultural identity of the territory; in order to achieve it, the territory of the park has to be considered both for its specific environmental, natural and ladscape values and in ecologic terms, for its compensational effects on the metropolitan area in which it is inserted. These objectives are translated through modes of safeguard and valorization that are differentiated depending on the zone of the park, according to physical-environmental characteristics of each zone, the type of existing productive activities, compatible recreational activities and the anthropic presence. In some areas the conservation is preeminent, in other the educative activities, and more the development of existing forestal activities in urban areas as a supervising factor of the conservation and valorization of anthropized natural landscapes. The protected zones are territories that interact with all the neighboring territory, not as isolated areas. The adjacent zones in fact represent the natural continuum with the area of the park, the influence of which on the protected area have to be carefully planned. The protected area is 2215 hectares, which means that the park is about the 20□ of the territory of the city. Furthermore, if we consider the areas included in the Campi Flegrei regional park in the western area of the city, and the areas in the eastern part that are being destined to the formation of another regional park, called the Sebeto, the percentage of the territory environmentally protected becomes about the 25□. So it is fundamental, for a complete and precise comprehension of the context, to proceed with an analysis of the system of municipal territories that are involved in the protected area, to supply a complete view of the territorial context in which the park is inserted and the relations that connect this context to the surroundings.

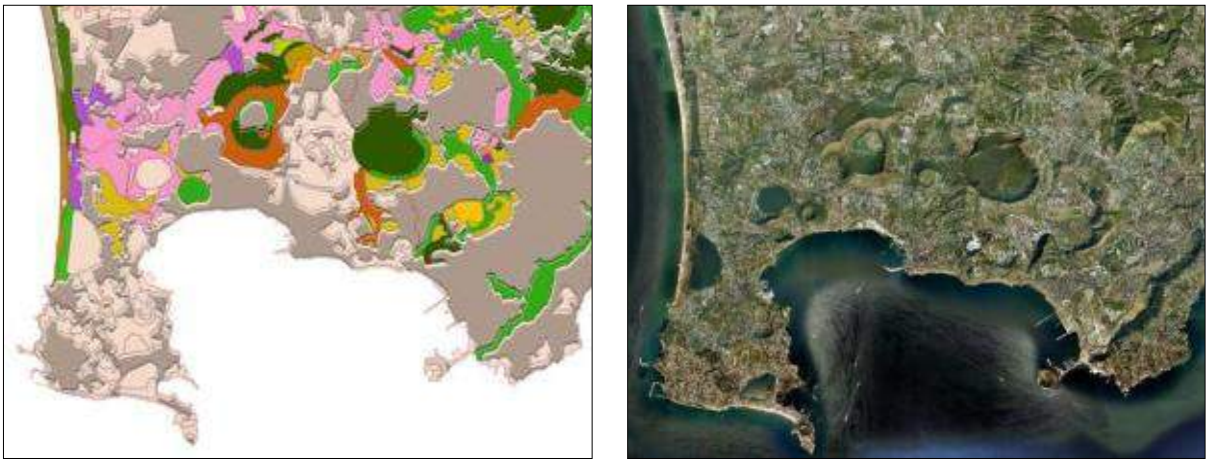

Fig. 2 - 3: From Campi Flegrei to the Hill of Camaldoli: the mapping was carried out using the GIS methodology. The land use data were extracted from CUAS 2009 – ortho image 2016 Google Maps/Google Earth

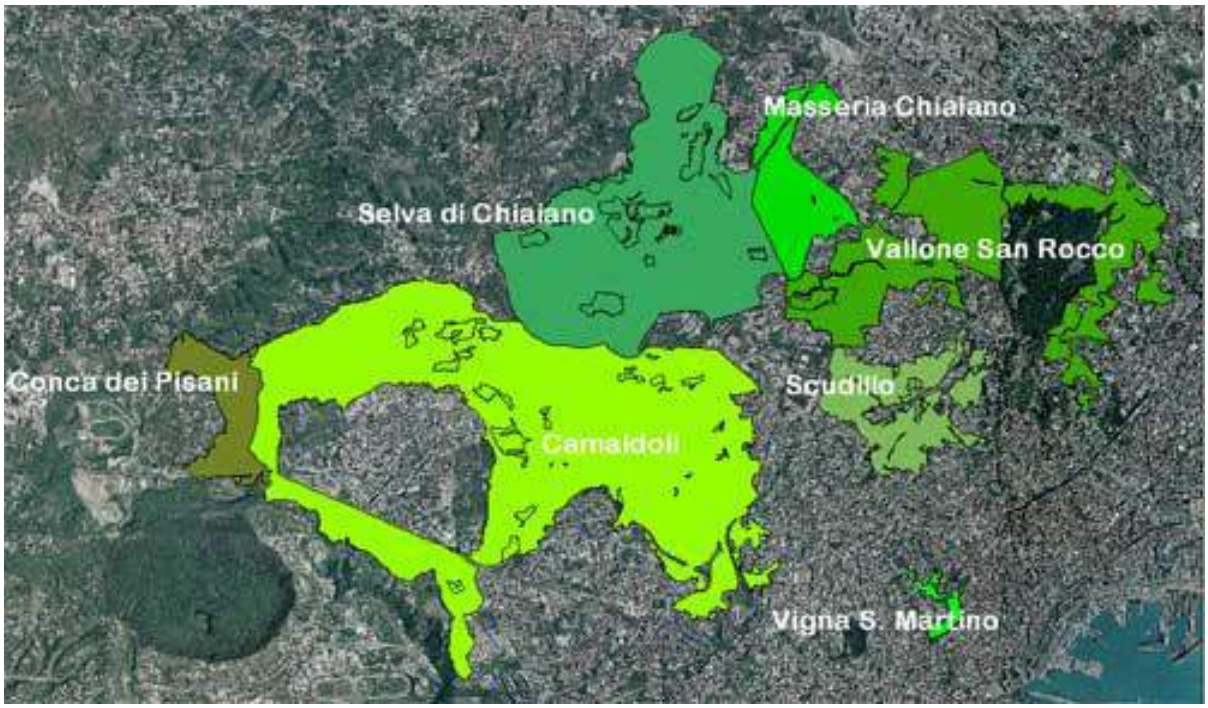

Fig. 4: The hill of Camaldoli: areas of the Hills Park and the Forest of Capodimonte. (http://www.parcometropolitanocollinenapoli.it)

The Agnano, Pisani, Pianura and Soccavo basins, with their crowded neighborhoods, are alternated with the cultivated slopes and the wood reliefs of the Camaldoli hill. North of the Parco delle Colline, through the slopes of Camaldolilli and the Vallone S. Antonio basin, there is, surpassing the viaduct of the bypass road, the margins of the Vomero Hill corresponding Via CIlea and Corso Europa; east in the zone of the Colli Aminei the park is linked to the Stella and San Carlo all'Arena neighborhoods through the Salita Scudillo. The park, following its eastern development, reaches through the Vallone S. Rocco the Ponti Rossi area and, bypassing on the north-south axis, reaches the Bosco di Capodimonte, not included in the perimeter of the Parco delle Colline even though it is strictly connected, reaching the Orto Botanico and Real ALbergo dei Poveri in Piazza Carlo III.

2. The scope of the Parco Metropolitano delle Colline

The Parco delle Colline is placed within a territorial surrounding built from Naples' northwestern part, placing itself at the center of the densely populated metropolitan area. This territory borders the Parco Regionale dei Campi Flegrei to the east, particularly in the part comprehended in the Comune di Napoli (Agnano, Pianura). The territory of the park includes some of the major morphologic formations

in the city: the Camaldoli hill, Chiaiano woods, the Vallone S. Rocco and the Scudillo. To the west, at the borders with the Comune di Pozzuoli, the park begins from the slopes of the Camaldoli which delimit the northern part of the Conca dei Pisani, that in the territory includes Posillipo and Agnano and reaches the southern margin of the Conca dei Pisani, where the Metropolitan Park begins. These park areas build up the green belt that naturally highlights the limit between the historical city center and the Campania valley. The Conca dei Pisani is the southernmost area of the Parco delle Colline, despite this volcanic crater actually belongs to the landscape of the Campi Flegrei. The park continues with the Camaldoli hill and the Chiaiano woods, which are mainly forest, and extends with the Vallone San Rocco up to Capodimonte and Capodichino. The Park is connected to the city center from the Scudillo area that includes in the western zone a chestnut forest; the Salita Scudillo valorization is aimed at the accessibility of the park and to valorize the frames of historic villas from the eighteenth and nineteenth centuries, which are part of the housing system build by the Neapolitan Kingdom surrounding the Reggia and the Parco di Capodimonte.

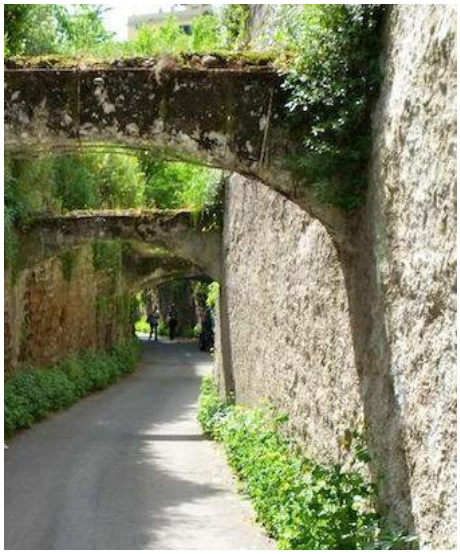

Fig. 5: Serbatoio street - Scudillo

Fig. 6: S. Fergola 1826. View of the Villa Ruffo - Capodimonte

3. Camaldoli's forest landscape

Unfortunately the Neapolitan landscape tends to transform and fade in a chaotic structure; in this fading the cultural and environmental peculiarities that outline and distinguish the cards of the landscape mosaic tend to disappear o to loose their specificity. Naples' landscape asset has always been characterized by a greatly important botanical heritage, the spatial continuity between urbe and territory has always characterized the landscape asset until the wild overbuilding took over. Starting from the twentieth century, the Neapolitan landscape has been object of intense changes; the asset of the ground has been invested by great damages caused mainly by the urbanization and development of infrastructures that lead to the abandon of the city's marginal areas. The overbuilding phenomenon has strongly altered the natural cycles generating phenomenon of ground deterioration; even the orography of the areas has been respected until the building speculation took over, destroying a great part of the ecologic and morphologic characters of the landscape's profile. The fragmentation of ownership has lead to the loss of parks, gardens eroded by building which, wedging in unbuilt areas, has destroyed green areas that characterized the architectural heritage. This was the beginning of a progressive loss of important elements of the forestal landscape, that in spite of the happenings are still readable in a range of stratified signs in the territory, survived to centuries of modifications imposed by nature and man. Despite the strong anthropization, the Neapolitan landscape keeps great natural vegetation areas; in the hill areas there are more natural areas, characterized by chestnut, holm oak and hardwood forests. The Bosco dei Camaldoli, made of a chestnut forest, is one of the most interesting natural and landscape areas; the vegetation that characterizes most of the Collina dei Camaldoli from east to west surrounds the hermitage and stops on the southern slope; the Hills, height 457 meters, is the highest point of the city of Naples. It's origin is probably about 35000 years ago, following the volcanic eruptions that touched the whole area of the Campi Flegrei; the slopes of the hill are characterized by several differenes; while the southern face is made of steep slopes made of tuff rock, the northern is a gentle slope covered by the forest. On the highest point of the Hill, the Hermitage was built in 1585.

Fig. 7: Hermitage of the Camaldoli.

The eastern part of the Camaldoli hill is divided by the Vomero one by the Vallone della Pigna, that continues north reaching the area of Cappella Cangiani; the western part, isolated by the Vallone del Verdolin, connects gently with the Soccavo valley; in the Torre dei Franchi zone the face reaches the Hermitage with a vertical trend. The extreme part of the Soccavo basin, where it meets the Pianur basin, the Camaldoli hill connects with the border of the Astroni crater, where it is crossed by the road to Quarto. The higher part of the hill, on which the hermitage is placed, is very articulated due to the formation of several deep valleys amongst which the one of Orsolone ai Guantai that has been totally touched be the edification plan of the Second Polyclinic.

Fig. 8: View of Camaldoli – aerial photo.

4. The forest of Camaldoli

The forrest is built by a *Castanea sativa,* shows a good natural degree, given by the richness and variety of the botanical species; the the undergrowth is made up of typical species of the southern Apennines and from coastal plants. With the chestnut there are the *□uercus ile□ L.* and the *□uercus pubescens□*furthermore we can find *Caprinus betulus L., Ostr□a carpinifolia, Acer pseudoplatanus L.* In the deep, shady and humid valleys there are *Alnus cordata,* while the bushes of the undergrowth are the *Cor□lus avellana L., the Euon□mus europaeus L.□*and more, we have the *Ulmus minor, Ruscus aculeatus L., Sambucus nigra L. and Sambucus ebulus L., the Spartium □unceum L., the C□tisus scoparius, Erica arborea L., and the Colutea arborescens L.* Even the herbaceous species are

quite numerous and include *Ranunculus L., Anemone apnnina L., Vinca minor L., C□clamen repandum Sm., Arum italicum□ Allium pendulinum, Muscari comosum, Orchis purpurea □uds, Dact□lorizia maculata.* In the forrest we can still find the *Daphne laureola, the □elleborus foetidus, the Smila□ aspera L., Clematis vitalba L., the Iris foetidissima L. and the hederae Dub□,* belonging to a parasite species. The flowering of the autumnal *C□clamen federifolium Aiton* is predominant in the undergrowth. Amongst the Italian endemic species that are in the forrest we find the *Digitalis micantha Roth* and the *Linaria purpurea.* We have to underline that the presence of the *Buddle□a davidii Franchet*, species that comes from China and introduced in Europe in 1887, found the Collina dei Camaldoli a very good place to grow. Several populations of Ivy (*□edera heli□ L.)* that can be found in marginal and artificial escarpments and clearings confirm the "natural character" of the forrest. Next to the streets that surround the forrest lives a "ruder margin" flora: *Chenopodium album L., Amaranthus retrofle□us L., Verbena officinalis L., □eliotropium europaeum L., Solanum nigrum L., Parietaria diffusa M.* and □. are just some of the observed species.

Fig. 9: Variety of the botanical species

5. The Camaldoli Hill in Historic Cartography

The analysis of historical cartography and of the iconographic repertory available to inspect the forestal aspect of the Camaldoli hill appears to be a useful tool to focus and record the complex dynamics that during centuries have run through the evolution and transformation of the landscape. The Camaldoli hill, that gets its name from the presence of the *camaldolesi* who occupied the hermitage since the fourteenth century, is 485 high and soars upon the Campi Flegrei volcano relief. The Camadoli hermitage is easily recognizable since Naples' earliest historical cartographic representations, was founded in 1585 from Giovanni d'Avalos, son of Alfonso di Aragona. It was built on the area of a church dedicated to Transfiguration, entitled to the Most holy Redeemer afterwards. Earlier, the hill was called the Monte Prospetto, name that derived from its privileged position from which the striking panorama of the Campi Flegrei, the gulf's islands and the Neapolitan valley - called the *Terra di Lavoro* - can be seen. The image of this isolated area has bee fascinating voyagers since the ancient times, whom described, represented and depicted its wild and fascinating image. The accidental orography of the area has always been perfect for meditation and contemplation.

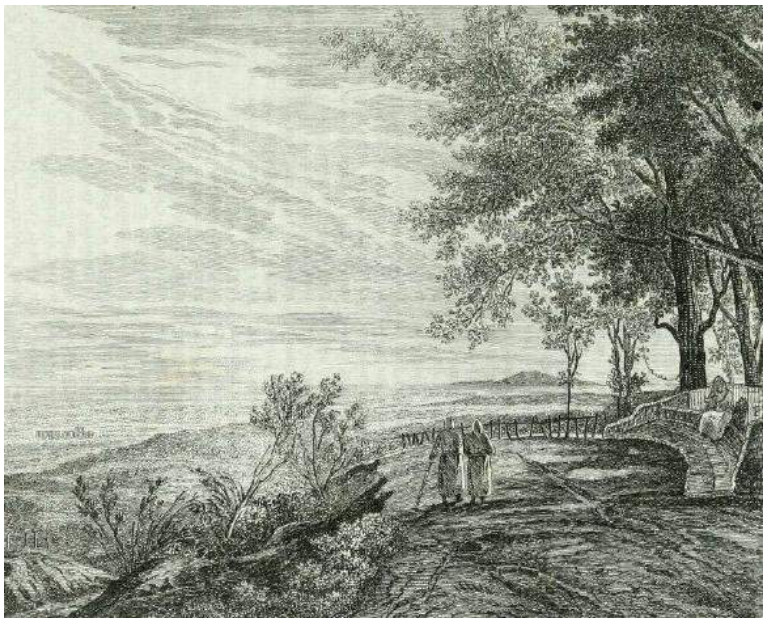

Fig. 10: Camaldoli hill in (1842).

In the cartographic representations from the seventeenth century the Camaldoli hill is always represented with a strong vegetation that surrounds the Hermitage, vegetation that interrupts in the southern part that is presented as a succession of bare and vertical cliffs. In these representations, in which the city appears in foreground, we can see on the background the Campi Flegrei area, represented as a bare and indented area characterized by reliefs, volcanic craters and ponds. Amongst these drawings, Alessandro Baratta's bird's eye view (1629) is fundamental as a rereading of the city in the seventeenth century. Drawn by an ideal point of view at the center of the Gulf of Naples, it shows the Sant Elmo castle and the Vomero hill in its main axis; Naples is here focused on in its whole, the hills "crown" is in the background with the raising of Camaldoli and the Flegrean area. In Baratta's specific view (fig. x), in the background we see the Camaldoli Hill, with the Hermitage further away and surrounded by a thick vegetation. The dense forest appears characterized mainly by tall trees, *Pinus Pinea L.,* *uercusile L.,* mixed formations of holm oaks and *uercuspubescens L.* and chestnut trees, typical trees of the Neapolitan hills' landscape. Beneath the foliage of the tall trees, smaller trees and bushes. Clearly visible are the southern steep slopes of the hill, that dominate the underlying villages of Pianura and Soccavo, which are mainly treeless and, on the eastern part, arranged in terraces with rows of straight trees. The steep slopes become more gentle north and west-wise, with denser vegetation that every now and then gives space to small paths and routes.

Fig. 11: Detail of Alessandro Baratta's view of Naples (1629), in the background the Camaldoli Hill with its hermitage.

Another interesting source is Antonio Bulifon (1685), as in his view the Camaldoli hill, in Baratta's same depicting fashion, is beyond the Vomero hill. The Camaldoli territory, pointed on the map at number 22, is a rich of vegetation that anticipates the rear volcanic area of the Campi Flegrei. The foothills of the Camaldoli seen in these maps is actually a boundary between the city of Naples and the Campi Flegrei. The dense net of paths and routes that link this area to the territory of Pozzuoli will undergo a strong increasing over the centuries. In the roman age the first connection between Pozzuoli and Naples was the *Neapoli-Puteolim per colles* road.

Fig. 12: Detail of the View of Naples by Antonio Bulifon (1685), in the legend n.19 solfatara, n.21 Astroni caccia del Re, n.22 Camaldoli.

The modes of the eighteenth century evolution of the territory are stated by the *Mappa topografica della città di Napoli e de' suoi contorni*, edited by Giovanni Carafa duca di Noja (1775). The detail of the map that show the Camaldoli area surrounding the Hermitage is represented by a composite system of manor houses and villages linked by several routes. The pattern of paths and streets develops from the lower part of the hill and goes up to the highest peaks of the Camaldoli. From the representation of the *Real Officio Topografico,* renamed *Carta Topografica ed Idrografica de' contorni di Napoli* (1817-19) the situation shown by the Duca di Noja has not been significatly changed, the hill is still covered by a system of manor houses, small villages, churches, connected by a net of small routes and paths that will basically not change until the twentieth century. The differences of the nineteenth century are mainly some urban or building interventions such as the Muro Finanziere.

Ancient cartography shows in general a territory that is hard to immagine today, an area covered with woods, made up of small villages, lived by farmers, speckled with manor houses with little churches and sometimes bigger houses, partly cultivated with vines, vegetables and orchard. The Camaldoli hill has kept its values till the half of the twentieth century, when the increasing of unruled urban planning began to notch wide green areas of the hill. The interventions that took place between the 20s and the 60s of the twentieth century, which lead to the construction of new roads, of the new hospital area and the connection to the aqueduct, unfortunately gave way to an impulse that begun a massive and uncontrolled urbanization that ended in several cases of illegal building. The city that in ancient times appeared to be far away, has progressively advanced, while the countryside, with its cultivated areas of vines, fruit and vegetable, seem to be suffering of the building pressure and have lost the diaphragm/boundary area.

Fig. 13: The Camaldoli Hermitage, detail of the Duca di Noja map (1817-19).

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Le Vie dei Mercanti XIV International Forum
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"Lanificio Gruber" in Terni: an ancient artefact of the industrial archaeology, across time of abandon and the new incentives of sustainable regeneration

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Abstract
The "Lanificio Gruber", is an ancient woolmill located in Terni, an Italian industrial town, called "the little Manchester", for its deep involvement in the industrial economy, with a weapons factory, an important steel mill and other textile manufactures.
The historical frame of the "Lanificio Gruber": its activity started in 1846, and end in 1939, that is very early compared to the life of the other factories, this is why the area has always be seen as a void inside the town, without any valorization, and completely left to a state of abandon.
The paper will present an architectural project that concern a complex intervention degree: in fact, it comprehends an architectural scale, in considering the ancient buildings of the factory, but it can also be seen as a more extended project, which involves the green area around the buildings and its relation with the territory around, according to its particular position, between the city center and the industrial area, directly related to the *Nera* river, and – in an even more ample scale – in connection with the extremely beautiful landscape of the "Valnerina", with its famous "Marmore waterfall".
The technical aspects of the buildings are been analyzed with the laser scanner technique for the metrical and topographical surveys; a multilevel approach has been used to combine the research data into three future scenarios of development: inhabitants participation, valorization of the historical aspects (as part of the "minor heritage"), potential connection with the surrounding landscape.

Keywords: industrial heritage, urban planning, vision, interdisciplinary analysis, requalification practices

1. Historical analysis

1.1 Terni: an industrial town

Terni in its origin was founded by the Romans (704 a.C.) as testified by the tipical urban plan, made from the development of the intersection between *cardo* and *decumano,* cardinal points oriented.
Sorrounded by walls on three sides and lined with the Nera river on the forth one (South-East side), Terni mantained the original roman urban structure untill the industrial revolution, which provoqued an intense and sudden demographic increasing [1]. This circustamce brought Terni to enlarge its surface for the first time outside the historical perimeter (in figure 1 the industrial area is compared to the historical center). The reasons why Terni became an industrial town has to be searched in its orography and geographical position: both were strategic for the industrial development. First, the orography of Terni is a valley, almost unique in the center of Italy, carachterized by medieval villages at height of mountains and hills. Second, Terni is distant no more than an hour by train or car from

Roma. This two aspects made Terni an important center where it was possible to install a diverse range of factories on one side, and easily trasport the manufactoring for economical exchanges with Rome on the other side. Today Terni counts 111694 inhabitants, and it is a medium size town (small and medium size towns host the 40% of the inhurbate people at the european level) [2].

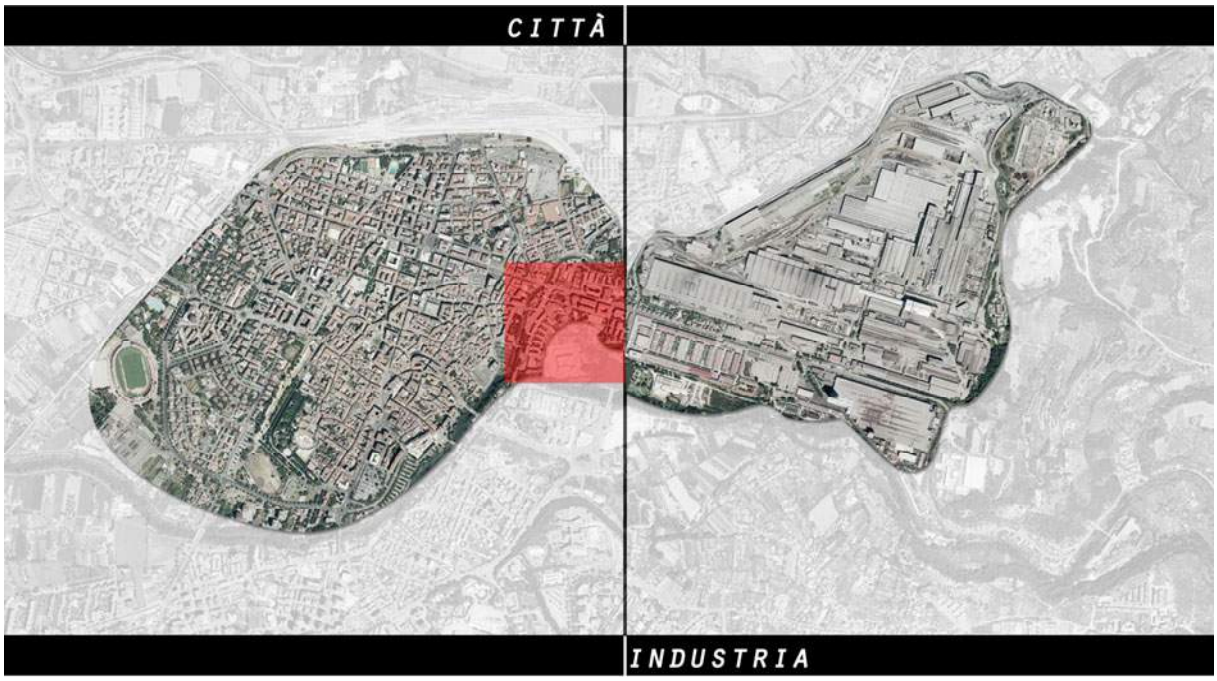

Fig. 1: The city centre compared to the industrial district.

1.2 The working-class district and the Lanificio Gruber

The area where the Lanificio belongs is the historical working-class district (figure 2), in which the presence of industrial activities and worker's residences was preponderant. This area is defined on the East side by the industrial district (*acciaierie* and *fabbrica d'armi*), on the North side by the Serra torrent and, beyond it, the historical Sant'Agnese village, the first working-class district, which today is almost entirely inhabited by Indians immigrants; on the West side there are the limits of the ancient historical city center, today with Chinese and South American immigration; lastly on the South side, a new building area, which is populated by South Americans and Africans. This cultural melting pot mark a truly crucial point for the area, invested by a new working class, which respond to the potentiality of a multicultural society.

Inside this area described above, we found a sort of black hole on the map: the ancient Lanificio Gruber. As it is abandoned and dangerous, it works as an interruption on the urban pattern, that exclude a real connection between two area of the same city.

The Lanificio Gruber was born in 1846 as a cotton weaving factory; with the passing of time the production increased and extended also to the wool. After the Unification of Italy, the Lanificio Gruber went by a crisis, due to the interruption of the customs tax and the competition of the weaving factory of Piemonte and Lombardia. In 1868 the activity will be completely converted to wool textile production for economic reasons, this fact brought the increasing from one to five production buildings, for a total of 65000 m^2 of surface. An interesting aspect of the production line is that the manpower was almost just "womenpower", with 11 working hours per day, and piece work salaries. After several crisis of production the following years, the Lanificio Gruber closed definitively between 1937 and 1939, but during the II World War, in its buildings will be located military activities, such as infirmary and soldiers residences.

To better understand the deeply interdisciplinary aspects of the following project, which are linked also to the fundamental role played by historical and social memory (and which represent the construction of the Terni's identity) it will be useful to give an excursus on the story of the industrial evolution in Terni [4].

The Lanificio Gruber is one of the most ancient weaving factories in this area, followed by the settlement of other industries. Among the most important ones there are the weapons factory (1881) and the steel mill (1884). This last one is still operative, specialized on manufacturing heavy metals in order to produce special metals, thanks to an exclusive patent. In Terni it is called "Le Acciaierie" and

it has constituted the most important income source to a conspicuous number of people in Terni and for a long period, giving birth also to a social housing process, in the 70's, the famous "Quartiere Matteotti" (1970-'75), very innovative residential urban planning, which was developed by the architect Giancarlo De Carlo together with the participation of the future inhabitants [5]. The Lanificio Gruber on the contrary, could be defined as a complementary politic significance, inasmuch the working class was prevalently feminine: in Terni the social consciousness and the need to see recognized the fundamental working class rights weren't separated from the process of a feminine consciousness birth on the equal opportunities rights, since both, women and men, participated to the productive sector in an active way.

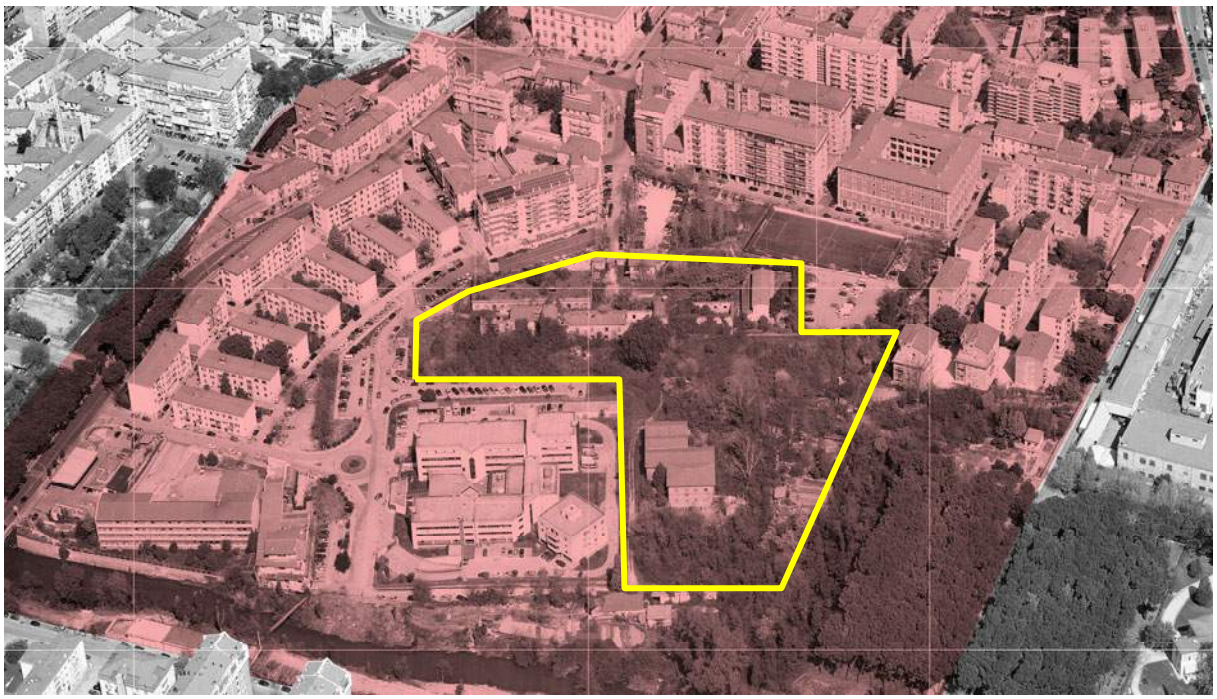

Fig. 2: Working-class district and the Lanificio Gruber.

2. The actual conditions

2.1 Buildings and perimeter survey

The Lanificio Gruber remained abandoned for over an half of a century, today just three of the original five buildings of whose it was made of are still visible (figure 3). The structures of two of them are completely decayed, only one is still accessible [6, 7]. In the last past years they are studied by laser scanner technique, which showed in detail the criticalities and the restoration chances.

From the main entrance we see the keeper's house on the left, in structural masonry, two levels and pitched roof, good conditions; on the right we found instead the weaving building, with an interesting structural feature, little steel pillars and clay vaults, an open space of about 500m^2; in front of the entrance there is the main building, which produce a sort of a curtain, it was composed by three levels, today only the façade is still standing, even if completely absorbed by the spontaneous vegetation, in this building there are nevertheless some interesting parts for the industrial archeology, such as some capitals and rose windows belonging to liberty stile; the last building, beyond the central one, and surrounded by vegetation, has the best structural conditions In the Lanificio Gruber the textiles manufacturing were tinged, and the lack of environment care at the activity time, let us think about a severe pollution of the area.

Concerning the present vegetation: high trunk plants, black poplars, black locust little forests, trees of heaven and rushes. Furthermore, the area is crossed by two canals and a basin for the cloths washing.

2.2 The connection with the urban background

The Lanificio Gruber is abandoned since the '40's, and its presence marks an important and deep urban void, an interruption inside the stable city: this area is indeed perceived as a suburb, although the proximity with the city centre (figure 4), due to the lack of an adequate pedestrian passage [8].

The only existing activity is a *centro sociale autogestito*, the “CSA Cimarelli”, where several cultural events are hosted, from the theatre studios to the fair trade agricultural market, as well as conferences, debates and live music sessions. As told before, the district today is multiethnic, overlapping the important industrial background and the working class consciousness.
From an architectural point of view is interesting the *Palazzone* (1888): as a workers dwelling it represents a symbol and an experience of sharing, thanks to its own structural elements, such as the internal court and fountain, the stores on the ground floor, the walkways turned to the internal court. In 1984 the owner *Società Terni* sold it to the *IERP*, who realized a restoration in order to allocate the dwellings to needy people.
Also interesting is *Borgo Sant’Agnese*, the first working class district and the most extended, with houses of one or two levels. In its origin it was a spontaneous choice of the workers, due to its proximity to the factories, and to the presence of many canals. Although many dwelling are being demolished by the years, in order to improve the hygienic situation, many spontaneous and characteristic views are still visible and they offer a beautiful and typical idea of the ancient village.

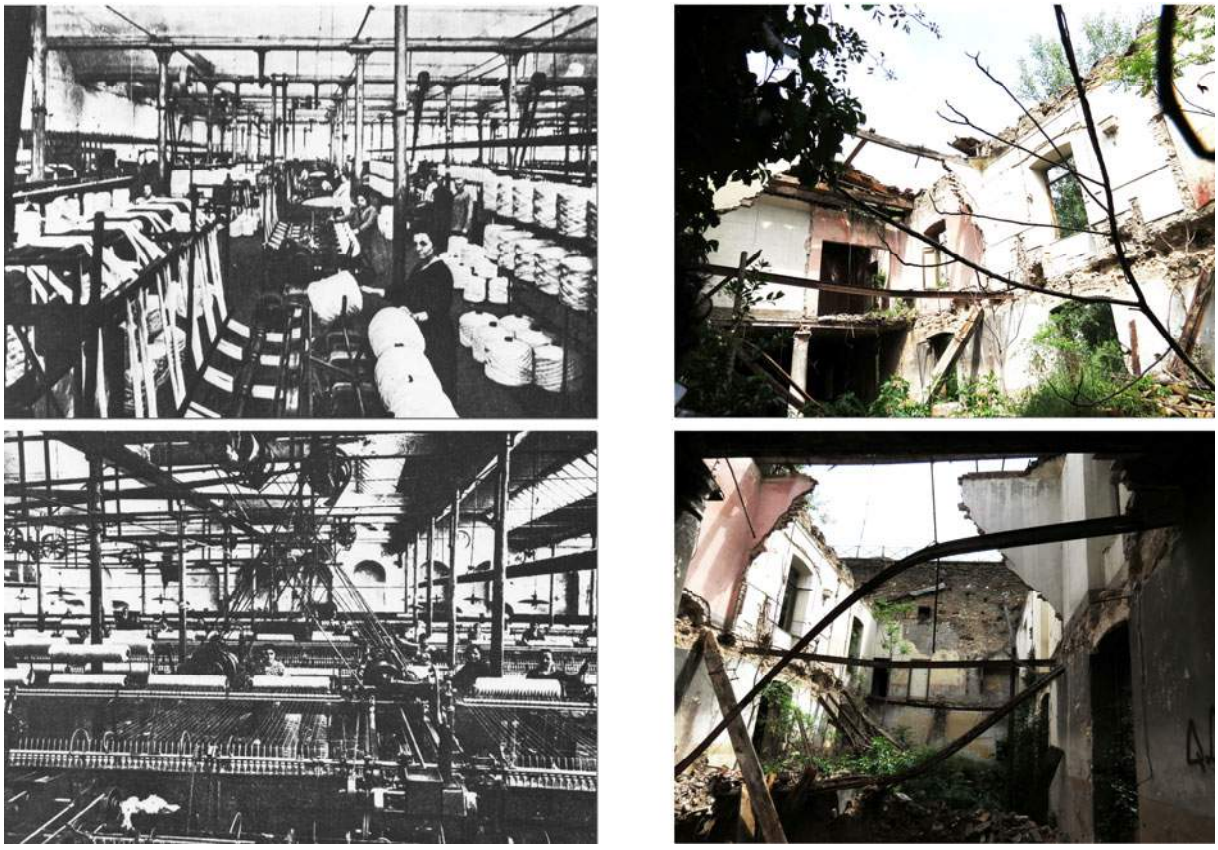

Fig. 3: Historical pictures and actual conditions of the Lanificio Gruber.

2.3 Relation to the landscape

Beyond its proximity to the city centre, this area is also well connected to the *Valnerina* landscape (figure 5), and thanks to the *Nera* river it represents the access point to all the excursionists, both on foot and by bike. From the *Centurini* bridge starts infact the green itinerary on the river banks, trough the natural heritage of the *Valnerina*, until the famous *Cascate delle Marmore*. This green walk/bike ways need to be promoted and managed, because they are an important resource for Terni, unfortunately forgotten for too many years, owing to the heavy industrialization. This last one, carried with it not just the economic advantages and the population increasing mentioned before, but also a diffuse disinterest toward the naturalistic aspects of the surrounding environment, whose were instead in a deep an synergic connection with the city [9].
The area of the Lanificio Gruber works as a true “natural gate” between the city and the landscape, and the intention would be to improve an integrated urban and landscape planning, able to promote the whole territory.

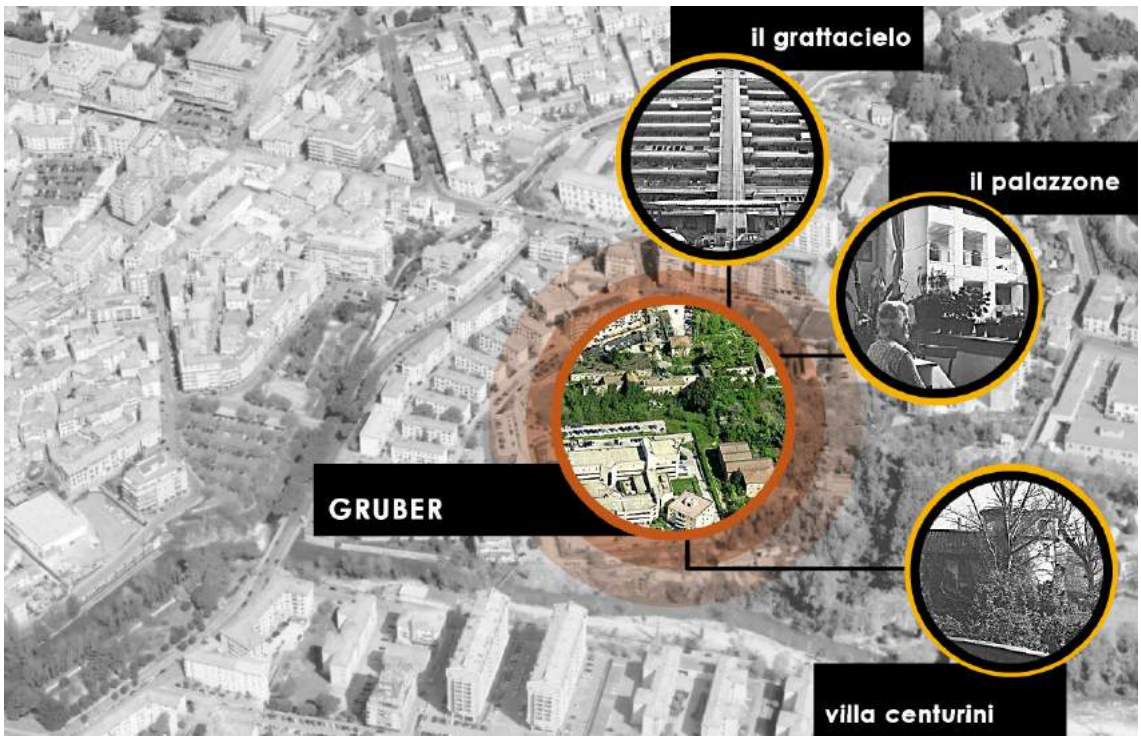

Fig. 4: The urban system surrounding Lanificio Gruber.

Fig. 5: Green system.

3. Analyzing the future

3.1 Tangible and intangible cultural heritage

The following project would be the development of a multidisciplinary analysis, referred to the complexity of an urban planning which wants to maintain all the social and historical aspects. These aspects together constitute the urban character, at the same time tangible and intangible, beacause the area is rich of meanings, from a social, natural, architectural points of views. An ambitious method is here proposed: a triple concept project, based on the analysis of the possible and foreseeable future developments (economic, social, politic ones), integrated with an anthropological approach based on interviews and questionnaires (figure 6) [10].

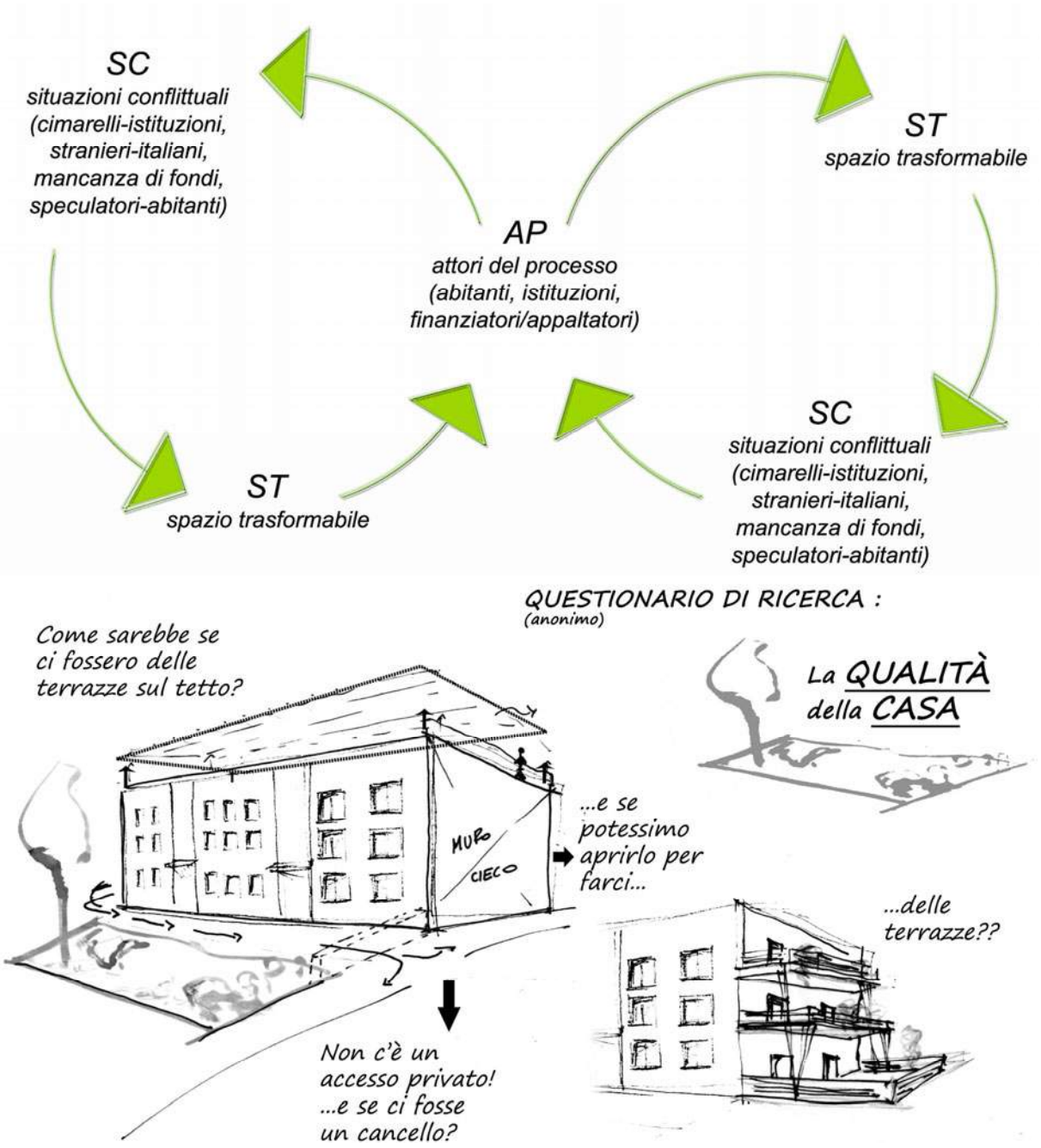

Fig. 6: Process methodology and part of the questionnaire.

The fourth dimension is the key to approach the future foreseeable transformation of the Lanificio Gruber, this decision follows the complexity of the area previously exposed. Crossing the study of the development by the last 50 years with the imagination of the transformation by the next 50 years, the result would be a “multidisciplinary prevision” not just from an architectural point of view but also social and economic, regarding the political territorial management [11, 12].

Fifty years ago the character of the area was changing from an industrial to a residential function: in the next fifty years, what kind of transformation could we imagine?
Nicholas Habraken considers architectures as living organisms [13], insists on the fact that is just with the passing of time that a new architecture becomes part of a space, *belongs to that space*, and the historical significance makes it coherent with the surrounding environment. The project investigates three possible alternatives for the future of the Lanificio Gruber.
Each scenario is approached by a poetic subdivision of transformation: according to Kandisky [14], the transformation will be analyzed by following the point-line-plane sequence.

3.2 Scenario #1

The first *scenario* concerns a linear development which follows the actual trends: the ongoing demographic stagnation and the re-orientation of the economic system (from industrial to post-industrial economy) are the most relevant trends today, therefore the scenario approach a smooth transformation, linked to the necessity to "overwrite" the city above itself, as it has been for centuries. The "urban stratification" is the main concept of this first scenario, and it is developed in its structural properties, stressed until the excess, with a literal new layer superposed on the ancient ground level. A new structural ground is placed on the actual one, in order to foresee a pedestrian level to the new ground level, and leave cars and traffic on the ancient one, the new "underground".
POINT. The actual dwellings are implicated in a composed operation of overlapping new structural addictions, punctual composite and spontaneous. These structures will be the results of the association of the ancient (actual) dwellings with new balconies, walkways, extensions… (figure 7).

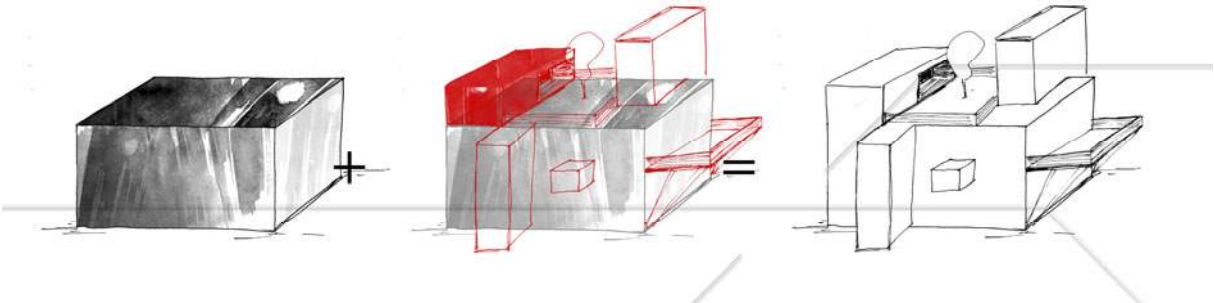

Fig. 7: Scenario #1 point concept.

LINE. The infrastructure system will be on two levels: underground the "obsolete" (in the future…we hope!) car "ways", on the new ground level the pedestrian and bike ways, which guarantee a more elevate degree of accessibility (figure 8).

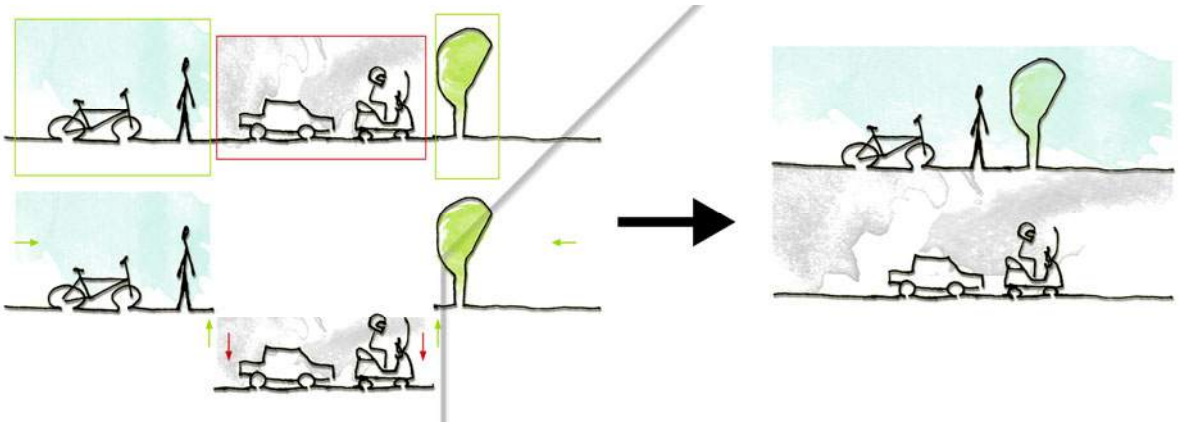

Fig. 8: Scenario #1 line concept.

S□RFACE. The new physical level of the "artificial elevated ground floor" is the main result of a trend which contains the combination of environmental factors, and economic motivations. The idea of a

connection between past and future, creating a literal new level, goes together with the wish of a sustainable and fair development, able to influence positively the environment (figure 9).

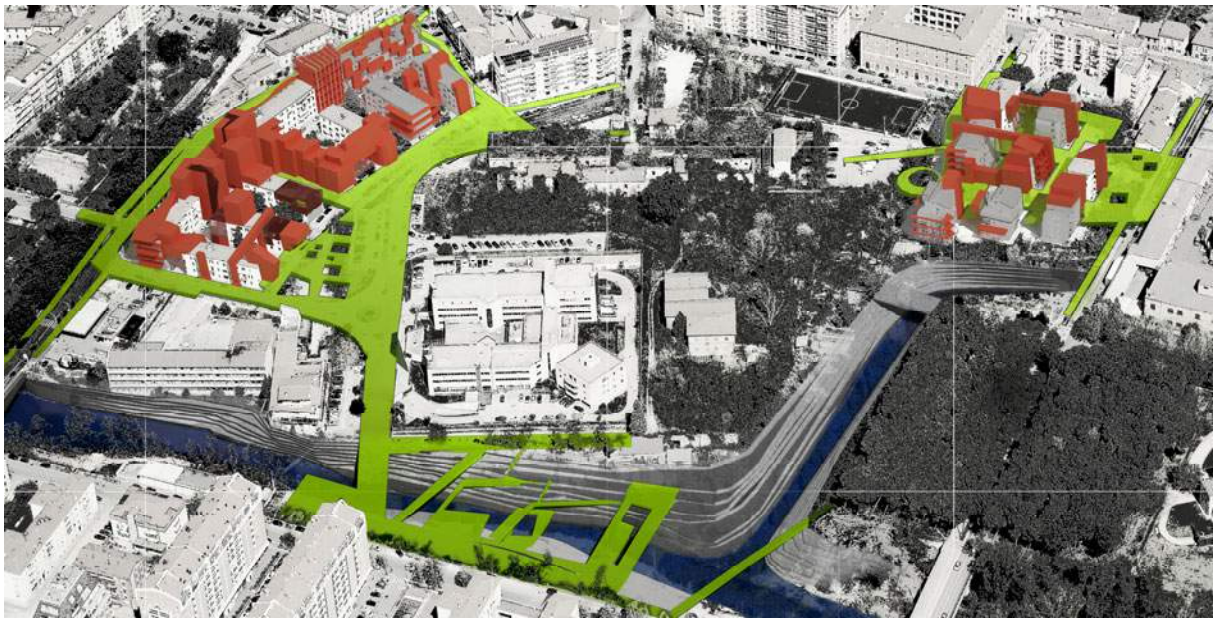

Fig. 9: Scenario #1 surface concept.

3.3 Scenario #2

Scenario number two tries to explore a future transformation turning in a negative way, emphasizing the factors of degradation that could affect an urban environment (fig. 10). “Wild urbanization”, sprawl, it the nightmare contemplate here. The risk is the complete alienation from the natural potentiality of the area previously mentioned. Nevertheless, photovoltaic is also present, as symbol of technology to the service of the economic power, due to the potentiality that the actual financial market gives it [15].

POINT. In the area actually occupied by the Lanificio Gruber, punctual parcels will be multiplied in order to realize others built compartments, which will allocated to dwellings, shops, activities, without consider green areas as a value, but also not considering the fact that perhaps this speculation will be a failure, and the area will remain in abandon after the building works, due to the lack of prosperity of the residents.

LINE. The area will be “cut” by linear street, designed to be functional and for a vehicular traffic. No squares, no green rest areas: just connection, fast and loud.

S□RFACE. The surfaces of the future buildings are seen as the natural “refuge” for street art, like an underground river which bring with it the seeds of an hypothetical regeneration by an artistic invasion.

Fig. 10: Scenario #2 general concept.

3.4 Scenario #3

In the third scenario the guide lines of the urban development are integrated in a sort of “heaven” oriented vision, where the positive utopia could finally be realized (fig. 11). Nowadays we discover that our resources are limited, and actual standards of wasting are no longer sustainable, the progressive impoverishment of the ecologic system is sadly guaranteed. Therefore values such as *care, reuse, attention*, are the pillars for a changing world. Urban development is here integrated with a deep ecological engagement. New eco-cultivations and a bio-market, an educative park, a sport area, a spiritual room, open to the multiculturalism: all those tools perceived nowadays as positive inputs. The most important precondition to this scenario is the implementation of measures taken to reclaim [16].

POINT. Re-install the “natural relation”, as Habraken said, is the unique point of the intervention: the water source is seen as the symbol able to unleash a positive change. From the water source, a consequent expansion of water lines is foreseen.

LINE. The river has the main importance in this scenario, and the canals constitute the “water lines” which will be extended all over the area, following the multiplication in rivulets. This canals will be a citation of the ancient canals which characterized the whole city. They will originate from a unique source (the point), cross the whole area and arrive to the main square, in a fountain, which will be the “water surface”.

S□RFACE. The fountain will host water features, integrating the district with the element of water in all its forms, as a fundamental element, removed in the past for the hygienic problems (in fact the ancient canals were closed), but today needy to be re-integrated in the urban system.

Fig. 11: Scenario #3 general concept.

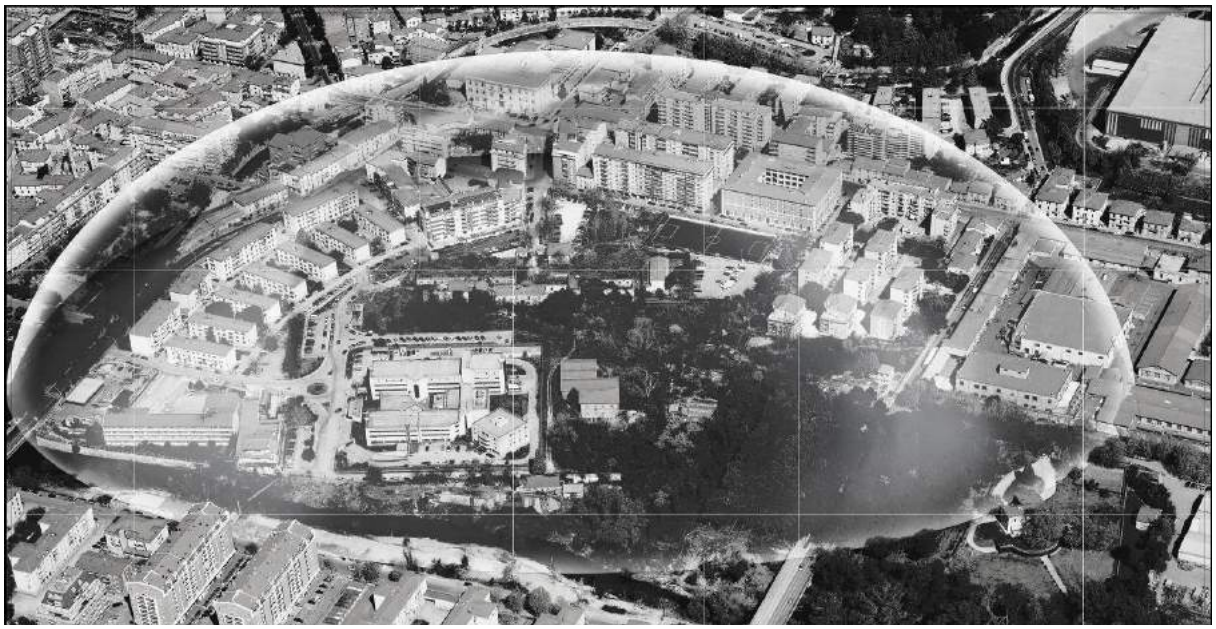

Fig. 12: Buckminster Fuller’s dome applied to Terni.

4. Future developments

These three concept designs are nothing but a theoretical dissertation above the possible evolution of a urban space (figure 12 shows an extreme and paradigmatic scenario), where the intentions of inhabitants, economic trend lines and politic interventions are considered as keys of a urban transformation/regeneration. Obviously the aim is not just to make an exercise in style: more important is to underline the possibility of regeneration of the area, the great potentiality it has, and the risk in which it incurs if the trends of economic speculation encounters a social background disaffected, indifferent and apathetic.

Today the Lanificio Gruber is in a political critical point, because the real threat of a mere speculative process are emerging. Several groups, formal an unformal, composed by activists, young architects and artists, are starting to focus their attention on the area, trying to diffuse and make people aware of that risk. After having imagined three "futures", we found ourselves more aware about the present. The trends we imagined with these scenarios are partially real (the speculations forces and the activists fight): we should be aware that any real orientation in the future time, of what the Lanificio Gruber will became, depends on us, on the value we would assign to it [3].

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Inaccurate Geometric Design of the Guarda Cathedral: vaults as the cause of its defficient structural behavior

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Abstract
Located in the northern region of Portugal, the Cathedral of has been submitted to works of rehabilitation of its vaulted roof due to the state of instability that had affected it for several times and in different periods, at the eminent risk of collapse, which has determined successive works that did not solve the problem in a definite way. These works of rehabilitation were executed without a specific study about the real reasons of the instability that the cathedral has been gone through along the centuries.
In the research that we are conducting, we have studied the structural behavior of the Cathedral with a special incidence in the analysis of the vaulted roof, using the finite elements technique. We have concluded that the geometric design of its spatial conception presents an error that is responsible for the several and successive instabilities that were registered throughout the times. The main goal of this paper is to describe the executed analysis and present the conclusions achieved by the study on the geometric plan of the cathedral.

Keywords: rib vaults, structural efficiency, Gothic, structural geometry.

1. Introduction

The works of the building of the Cathedral of Guarda were initiated in 1390 and they were prolonged for more than 150 years, having reached its end, only in the year of 1540. These facts are apparently due to the several architectural styles that one can appreciate, from Gothic to Rennaissance and a particular national style identified by some historians as Manueline, both in the interior or the exterior of the edification.

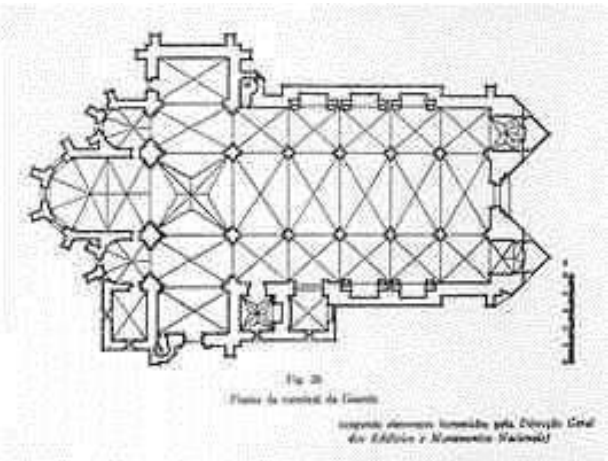

Fig. 1: Plan of the Cathedral of Guarda. Credits due to SIPA:

Having been the works of construction conducted morosely, and only in the reign of D. Jo□o III definitely concluded, already on the 16th century, the Cathedral consisted in one of the most recent monuments inscribed in the times of the late Gothic. This work has been completed essentially due to the efforts that Bishop D. Pedro Gavi□o, in the reign of D. Manuel I, to whom the elevation of the walls and the construction of the vaults of the towers and the main portal is owed.
The vaults were then built in the late part of the Gothic, which signifies that on the structural plan, the technical bases of construction of the style were already properly defined and consolidated by the European Masters. There had by then been going already four centuries of Gothic. Nevertheless, though the Gothic structure was already mastered and stabilized, there were committed some mistakes related to geometric conception, with negative effects in the performance of the building throughout the times. We are aware that the monarch D. João I "ordained its project to be designed" [i], being plausible to admit its hypothetical authorship to be attributed to Master Afonso Domingues, since there is a certain resemblance with the Batalha Monastery, in which he had been the architect-builder responsible for the edification.
Under the stylistic classification point of view, the building of the Guarda Cathedral demonstrates a miscellaneous juxtaposition of religious architecture like Romanesque, Gothic, Manueline, Mannerism and even Barroque, The roofs might be interpreted as being rib vaults, star-shaped and multi-nervured, but in fact they are not so, and that seems to be the main conceptual mistake that is continuously responsible for the poor performance of the vault structure that has been the reason why corrective works had to be undertaken throughout the times.

Fig. 2: Lateral aspect of the Cathedral of Guarda showing the abside. Credits due to the authors.

The building presents the common clerestory, but bearing the characteristic shape of the Romanesque, which tends to prove the long duration of the construction of the building, and these reminiscences are also visible in the existence of some round arches, of the presence of cruciform pillars and in the decorative themes of some capitals with naturalist representations of foliage, typical elements of Romanesque architecture program of ornament
The building of the Cathedral attests that the passage from Romanesque to Gothic did not occur in well determined and precise time, due to an invention that occurred at a moment in time. It was not like this that the transition did take place. What we might call the passage from Romanesque to Gothic

was a slow evolution, using the method of trial and error, with much ignorance, lack of knowledge and failure through the way. It did not occur to any particular invention produced by a sole individual, any sect, any corporation or any free-mason brotherhood. There was not any secrecy pertaining to a specific order or enterprise.

To sum it up, even though the elements pertaining to the Romanesque, the Manueline or the Barroque may be present, we might well postulate that the Cathedral of Guarda is characterized by a late-Gothic, in the structural point of view, even though the geometrical error is patent and naturally that the diversity of styles present reflects the long lapse of time that mediated between the beginning and the end of its building.

On the exterior, it presents fortified features, while in the interior, the multiplicity of styles is overwhelming and the attention of the observer is drawn to the unusual shape of the vault that escaped to the geometrical rules of the Gothic. The façade of the Cathedral presents two robust towers that protrude from the delimitating perimeter of the plan. Of octagonal shape set on a quadrangular base, thus suggest that the Cathedral has been conceived and built to serve as a fortress when military invasions occurred, for its massive character can be considered rather suggestive. The polygonal bell towers are crowned by battlements, elements that are features of military architecture, built either in fortresses or castles. The simple presence of these particular elements suggests very clearly that the Cathedral was conceived not only to assure both defensive functions and those related to the cult.

The side façades reveal flying buttresses and these latter present the typical pinnacles of the Gothic, that keep for intrinsic mission the well-known structural goal of rendering vertical the loads transmitted to the walls by the roofs.

The interior puts in evidence a plan in Latin cross, with three aisles with five spans and these are supported by slim cruciform pillars, with half columns addorsed, though the last two ones display spiraled shafts.

Fig. 3, 4: Rib vaults on the co-lateral aisles. Credits due to the authors.

The central aisle is illuminated by the typical Gothic clerestory and the roof that is assured by a vault that is wrongly classified as rib vault. In the co-lateral aisles, the façades are in masonry of apparent granite, in isodome apparel; they include a cornice, with the above mentioned battlements, with

gargoyles, throughout and along its perimeter. The Cathedral of Guarda has been classified as a National Monument by law decrees dating from 10th January 1907 and 16th June 1910.

2. Restoring and repairing works

The Cathedral of Guarda has ever since, in the course of its life as a building, been submitted to works of restoration. Despite this continuous effort keeping these works going on, it has never been attained the real solution for the problem. The main pathology derived from the opening of fractures and fissures on the roof, through which water from precipitation invaded the structure, thus causing constant damages, related to the presence of infiltration of water.
Associated to the opening of fissures in the vaults, there occurred horizontal and vertical dislocations that affected the whole and compromised the stability of the considered works. These problems went on aggravating on the decade of the 80's of last century and in 1986 it was necessary to promote urgent works of consolidation that involved the Laboratório Nacional de Engenharia Civil (LNEC). The technicians involved in these works of repairing elected a solution of reinforcement that does not in fact respect the structural performance and the material "truth" of the Gothic, since the executed reinforcement was implemented though the construction of a roof wall strapping built in concrete. It was a form of surpassing the primitive conceptual mistake of the historical building.

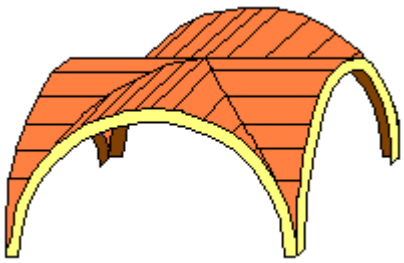

Fig. 5, 6: Schematic drawings putting in evidence the design of the Gothic rib and vaults.

Fig. 7: Simplified model of rib vault.

3. The Essence of the Gothic - The Secret

Even nowadays, centuries, having passed by since those times, the performance of the Gothic in terms of structure is not understood, including by the academic community. Many Historians and Architects generally assume that, besides the flying buttresses and the buttresses, the essential elements that determined and potentiated the Gothic style were the rib vault and the groin vault. A

whole and vast literature on these matters sustains this point of view. Nevertheless the essence of the Gothic is much more related to the geometrical proportion of the localization of the columns or pillars, in the interior of the aisles, than to the supposed geometry of the pointed arches or the rib vaults.

3.1. The Buttressing force - The Horizontal Component

With the use of stone, architects can only conceive forms that develop forces of compression, for this material does not resist to the stress of traction.[ii] Hence, with stone masonry we have to consider problems every time that there is a horizontal force, for this later provokes tractive effects. The use of stone masonry to solve roofing through vaults puts problems for many of the vault geometries produce traction, which is an effort that the material in question does not to endure.
The Masters of the Romanesque adopted the round or semi-circular arch, in its many variants, not because they attributed to this, aesthetical or special qualities, but because they had not acquired consistent knowledge about the advantages of the paraboloid arch on the structural level. There is a certain amount of naiveté when some theorists write about this and postulate that the Master masons used the circular arch for they believed in the purity of geometry, the simplicity and the perfection of circular forms. Although they knew that this does not imply a good structural geometry, since it is susceptible to introduce traction in the system. Therefore, we realize that the geometry of the round arch, due to the eminence of inducing traction, does present a lot of limitations when creating spatial enclosures. They were not aware that with paraboloid geometry, traction disappears, thus implying its main structural advantage.
The builders of the early Gothic did not know these facts, for in the first stage of the Gothic design, the paraboloid arch was not used and they continued to use the circular arch. There is a basic module in the Gothic that in plan is a square and this is the essence of the Gothic. In each angle of this square there is a column from the top of which, there are launched six circular arches: two of them crossing each other, corresponding to the diagonals of the square and the rest of the four arches being related to the square, two of them perpendicular to the central aisle, and the two others parallel to the longitudinal axis of the church. The essence of the Gothic lies in the above referred square acting as a modular element establishing convenient proportion.

Fig. 8: Baptisterium,in the co-lateral aisle; corresponds to the protruding towers. Credits due to the authors.

This is a geometrical proportion that has consequences in the geometry of the vault that results from the closure of the space between the six considered circular arches. The square has all its sides equal in length, but the diagonals have lengths superior to that of the sides of the square. Therefore, the diagonal arches have always a longer span that the four circular arches, and thus derives that the central point is positioned higher that the rest of the points considered in the rest of the circular arches. In the early Gothic, all the arches are circular, according to what the interior photos illustrate. Nevertheless, as the height of the central point is more elevated, then the vaults that enclose the space between the arches, those are paraboloid, so not submitted to traction. The paraboloid vault transports the loads for the six semi-circular arches, without producing traction – the secret of the Gothic.

From Fig 10, we may infer that the most elevated point of the vault is the point where the circular arches do cross each other, precisely at the middle of the square, on the axis of the central aisle. All the other four central points of the rest of the four arches present their higher points in an inferior level comparing to that middle point at the crossing of the diagonal arches. As this central point is the most high of them all, it bears as a geometrical consequence that the vault of the roofing is a paraboloid shape. In terms of statics, the vaults of the roof transport their own weights to the circular arches that are submitted, not only to their own weight, but also to the loads that are transported by the vaults, as Fig 5,6 and 7 suggests.

It is imperative that in the Gothic design that the referred central point be the highest point. In that figure, one will easily conclude that the geometry of the vault results from the disposition of the six arches according to a square, thus assuming the paraboloid shape, and with the enormous advantage of not producing traction. Through this solution of the basic square, builders have overcome the problem that was present in the Romanesque, being this the secret of the Gothic. As forces were then transported towards four discreet points, where the columns or the buttresses were, there no longer makes sense under any aspect whatsoever to consider the existence of the lateral walls. Moreover, now that the forces flow through the circular arches, they originate a lesser value of horizontal force, so that thicknesses may decrease.

3.1. The Cathedral of Guarda - Geometries of the Romanesque and the Gothic

Fig. 9: Works of repairing and rehabilitation above the co-lateral aisle; view of the flying buttresses. Credits due to the authors.

In the Cathedral of Guarda there occurred tractions in the vaults, since there have been opening some fractures and fissures, which effects still last as we may verify observing Fig 10. This fact implies that

the geometry of the Cathedral's vault was not correctly elected from start and there has been an original mistake in the initial design.
The builders of the Gothic had, then, to overcome the limitation of the semi-circular arch. They managed to develop a geometrical solution that contributed to solve this problem implicit in Romanesque architecture, though we are absolutely convinced that they have not effectively understood the intrinsic solving phenomenology, for even afterwards they have continued to implement use the round arch.
So, the solution is not in the geometry of the arch or the vault but in the adopted proportion for the implantation of the pillars and the aisles. This thesis derives from the fact that many Gothic churches built in a late phase of the Gothic, present an original defective design and, therefore, they present a bad structural behavior. This is the case of the Cathedral of Guarda that, when was first designed in the 15th century, there had been Gothic throughout all Europe, for more than four hundred years, and nevertheless, was presented a wrong geometrical conception, thus being proven our thesis that implies that the solution for the problem was not fully understood.
So the Masters builders, as we have mentioned, did then believe on the purity of geometry and on the simplicity, and perfection of the circular forms. At the time, it was not understood the structural advantages of the paraboloid arch, for it was not known that the efforts of traction disappear with the use of this later, hence its efficiency and structural superiority.

Fig. 10: Interior showing the central aisle. Credits due to the authors.

The arches are all circular, as the illustration of Fig 10 puts in evidence, Between the semi-circular arches, there are the vaults that delimit the space and form the roofing of the church, that use as a support the set of the referred six arches.

Observing the figure, we understand that the highest point of the vault is the crossing of the diagonal circular arches, precisely in the middle point of the central aisle. In terms of statics, the vaults of the roofing transport their weight to the round arches that are submitted not only to its own weight but also to the load that is transported by the vaults, according to Fig. 5, 6. We should insist on the fact that the geometry of the vault that results from the disposition of the six arches, forming a square, assumes the paraboloid form, therefore, not producing any traction, and in consequence not presenting the problem generally present in Romanesque architecture. This is the secret of the Gothic.
We may easily conclude from the interpretation of Fig 5, 6 and 7 that using either the rib or the groin vault, it is not possible to attain the paraboloid geometry for the roofing that is necessary to escape traction, for these geometries are not recommendable. As all forces are now transported to discreet points, where there are the columns or buttresses, it no longer makes sense considering the existence of the lateral walls. Furthermore, the forces flowing through the semi-circular arches now originate a lesser value of horizontal impulse, for thicknesses may diminish.

4. The geometric mistake of the original Conception of the form of the Cathedral of Guarda

In the Cathedral of Guarda, despite the roof having been completed only in the 16th century, with the Gothic technique fully implemented and defined, the Master-builders adopted for their roofing a solution with a geometry based on rib vaults and with pointed arches parallel to the longitudinal church axis.

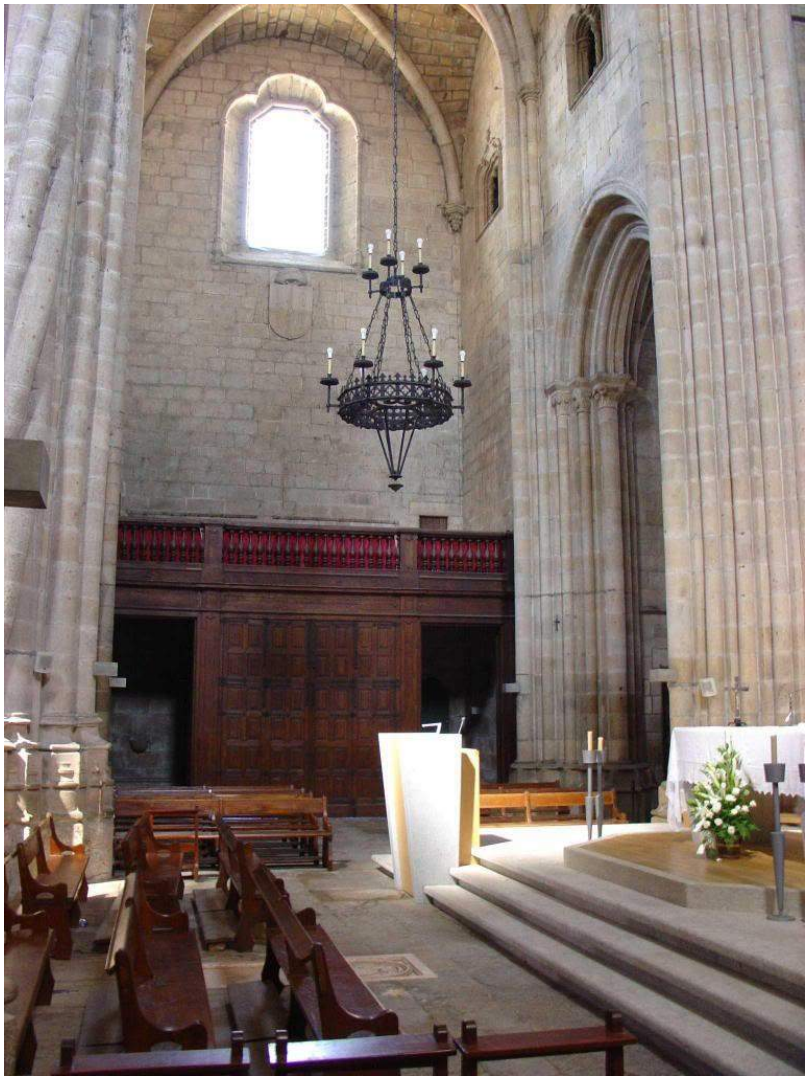

Fig. 11: Interior showing the central aitransept. Credits due to the authors.

This geometry was the error of conception introduced in the geometry of the edification, due to what there has been a deficient structural performance throughout time, with successive works of repairing. In 1986 there was felt the need to undertake a work of a bigger scale,

Since the fissures that had been making their way through the vaults attained a considerable importance, there was the need to proceed to a work of considerable importance, with the adoption of measures of reinforcement through the use of a slab of concrete built above the vaults.
On Fig 10, we may observe that the roofing of the central aisle is a rib vault and the geometry present there is circular. As we know, as a rib vault results from the crossing of two barrel vaults, therefore, circular, this resulting vault assumes a circular and non-paraboloid geometry, and the first develops traction, which is incompatible with the use of stone masonry.
On the photos we may prove that, though, there has been used the modular square as the grid for the implantation of the columns and as definition of the localization of the arches, whatsoever, as the height of the central point of the vault, measured in the vertical of central point of the referred square, is of the same order of nature of the central point that composes the center of ribs of the vaults, thus resulting that this vault does not have a paraboloid shape in the transport of the loads until the columns. The consequence is the installation of traction with the consequent opening of fissures in the roofing.
We now understand the reason why it has been necessary to implement many works of physical rehabilitation of the roof in the Cathedral of Guarda, that ended up with a deep intervention that has misrepresented the material "truth" of the building, since there was built a concrete slab involving the vault, even if is not apparent for public eyes, being concealed under the pavement slabs that were installed on the roof.

5. Conclusions

In this paper, we have tried to evaluate and conclude on the reason why the Cathedral of Guarda was behaving deficiently under the structural point of view. From the research we have conducted, we conclude that what originates this performance lies mainly in the fact that there is a conceptual error produced when the vault was originally built. Being the central point of the square of the modular geometry of the vault of identical height as to the points of the ribs resulting from the intersection of the barrel vaults, it has resulted in the fact that the geometry of the vault does not reach, in its plenitude, to be a paraboloid shape for the transport of the loads. Therefore, there were produced efforts of traction, resulting in the opening of fissures in the structure of the vaults.
This building, compared to all the others built in the Gothic period with the above described deficient geometry, defies some of the confidence in our expecting that the builders of the Gothic had any real phenomenological knowledge on the effective way the design of the structure in that period real worked.

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Notes

[i] Originally in the texto:*"mandou a traça della".*
[ii] Traction or tractive effort is the force used to generate motion between a body and a tangential surface, through the use of dry friction, though the use of shear force of the surface is also commonly used.

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Ethics of Form and principles of structural design: the path of the forces

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Abstract
The study we are presenting is focused on the architectural forms and the way they may express by their design and structural behavior, through the analysis of two works of reference works considered in the universe of Architecture: the Portugal Pavilion in the Expo 98 (Lisbon) and the Washington Dulles International Airport terminal (Washington DC). Thus we may infer on their "formal truth", along with their structural efficiency. The scrutinized buildings are composed of a large roof supported by cables under the form of a catenary arch; this solution presents a great structural efficiency and allows the designer to generate huge spans of a considerable slenderness. Notwithstanding its efficiency, the adopted solution in both cases generates considerable horizontal forces. The formal solutions diverge in the way they articulate the knowledge of structural mechanics, thus presenting different aesthetical parties and different levels of structural efficiency. Through the comparative analysis of both buildings, we become aware that the Portugal Pavilion reveals an inferior control of the phenomena resulting of the horizontal forces and presents an inferior standard of efficiency and economy while the Dulles Airport Terminal expresses a truth proceeding from the structural behavior of the system that enables it. The simple fact that the solutions conferred by the structural forms are not distinct in many cases from the architectural object, resides in options that extend far from its mere tectonic viability. These result from the dialectic synthesis that conforms the plastic, aesthetic, structural and ethical qualities involved in the process. This conceptual methodology, expressed in a constructive efficiency generated by the optimization of the structure revealed by the slenderness of the conceived shapes, consists in an effective way of encouraging the plastic and spatially driven expression of the Architect.

Keywords: shape; canopy; structural efficiency; structural economy, architectural idealization.

1. Introduction

The aesthetics of the architectural form depends directly on the perception of the user. Each and every subject that uses any building is the center of perception of architecture in a phenomenological approach. It is in some sense implicit that there is a fruition of form, light, temperature, sound as well as other perceptual data. Sometimes and furthermore perceptual data of the referred senses tend to mix and bring about some sort of synesthetic phenomena.
Aesthetics is the branch of Philosophy which origins can be traced back to the 18th century, from the founding work *Aisthesis* (1750), by Alexander Gottlieb Baumgarten (1714-1762). The meaning of the title, an expression derived from the ancient Greek, is "sensation", but the thinker used the term in the delimited sense of "beauty" or "taste". "Good, Truth and Beauty" is a triad defined by Baumgarten that can be considered the basic theoretical principles set by that founding work of him.
The evidence of the efficiency of design of forms resides in the premise that there can be established an aesthetical criterion or principle, directly related to the distribution of material and therefore mass, in accordance to the work of the atomic structure of materials.

This same approach presupposes the work of the distribution of the forces in the interior of a form, considered as a body or matter. The model is based in considering structures as if they were determined by organic analogies, especially the possibility to establish some kind of relation with the conformation of the skeleton of animals or other forms of life.
The work of such an architect and designer as Santiago Calatrava (1951) is susceptible to be interpreted in terms of formal analogical relations that one can establish between structural solutions and organic, natural forms, especially the bone structures that give consistency to various forms of live organisms. We consider another most prominent architect's work, dating back to the 50's and 60's of last century, that of Eero Saarinen (1910-1961).

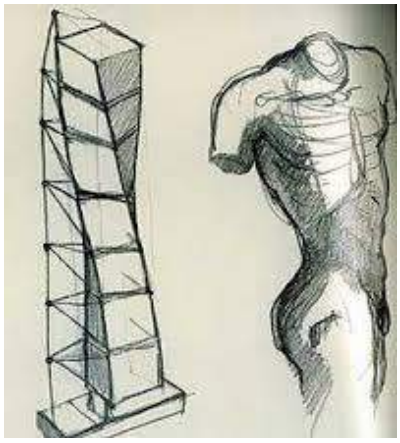

Fig. 1, 2: Santiago Calatrava, Tower of the turning torso, Switzerland and conceptual preparatory *cro□uis*. Credits due to https://www.pinterest.com/pin/325103666830629692/

Hence, in an architectural object, more than in a structure, there can be identified a structural function. Even Galileo asserted that there is no such thing as a material that does not accomplish a structural function.

2. The transport of the forces

Robert Hooke contributed towards understanding the nature of matter and he was the first man, after the ancient philosophers, to understand that matter was not continuous. In a simple model that he elaborated, known as Hooke model, he postulated that matter is composed of little particles joined by some sort of elastic connections. Modern Physics came to prove that the perception of Hooke was right: that in the atomic scale, every material implies a structure and accomplishes a structural function.
Forces are generated and act over the materials that compose the buildings, due to the forces of gravity, winds, temperature variations or any other cause, being afterwards conducted to the foundations of the buildings.
This transport is due to the relative movements of the atoms among themselves, according to the sense of the forces, thus causing volumetric alteration that we call deformation. This is the internal phenomenology that does occur in the material that composes the structure, once it is submitted to a force or an action.
Therefore, structure can be assimilated above all to function, that of conducting the forces. Hooke postulated that the forces are finding their way throughout the materials. Today we are fully aware of this and equally we understand that the fuel to the reason that allows this kind of transportation to take place is the deformation taking place in the atomic structure.
As the atom moves it produces work, designated as the internal work of the atomic structure responsible for the transport of the force. There are many possible modes for the displacements of the atoms. The engineers tend to designate these different forms of displacement as axial force, shear and bending. These three different entities are the synthesis of the internal work produced by the atomic structure of the material.
We can realize therefore that the structure can be considered as no other thing but a "way", a sort of "path" through which the forces are led to the foundations, their supports as they are considered in science of Statics. Every material existing on earth has this structural function, for at least the atoms have to transport their own weight, due to the action of gravity.

When a designer is conceiving a structure, the operative procedure of the creation of the form is related to understanding the role it is going to develop and related essentially to assuring the existence of a “way” for the forces that reach the building to reach the foundations.
Thus one can easily understand that the structure’s global form can be determined by a whole range of shapes integrating a whole lexicon, depending largely on the choice of the length or the space to design. It is as if one had to set on different elementary typologies that can be conformed and defined by the structural forms of the building.
Therefore we are sure that only through creativity and talent, considered as operative instruments that contribute to aggregate the basic typologies, can the designer achieve a more complex and higher level of forms. The initial stage of structural conception is processed in the field of creativity and in the epistemological level, structure assumes the dimension of structural form, with all the range of emotions and meanings that the activity of designing and that of the apprehension of a form may possess and transmit.
This reality has more than often been ignored, neglected or even misunderstood in the subject of architectural design. If our article does contribute to alert the scientific community to some sort of epiphany, then we must be glad for we have reached a step forward in achieving our main goals.
For the architect involved in the act of designing it is fundamental to create the architectural form, because it is intimately connected to the basic structural types, which condition and determine the final form of the structure.

3. Integrating architectural with structure design

So that he may create the architectural form, the architect should know the variety of basic structural typologies among which he may make choices. Naturally for this same process of election one may possess a deep knowledge about their characteristics as well as behavior to the forces and loads.
Even though there is a strong intuitive component in the conceptual process used by the architect, there is always in some way and implicit to his mechanism of creating the architectural form, a choice of simple structural forms, even if occurs in a most empirical way.
Both the experience and individual culture of the architect contribute to this basic knowledge (even if it is not entirely organized or systematical) in what regards the basic structural typologies to be used in the structural solution. It is this same empirical knowledge that supports his preconceived idea of an architectural form supported by the structural plan. The catalyst to creativity is knowledge and the more embedded this is in an individual, the more he can produce in terms of creativity, for no one can conceive creativity without knowledge.
The Knowledge of the vocabulary of basic structural typological forms, as well as the cognitive domain of their structural behavior are of fundamental importance of variables in the mental act of creation of form in architectural design by the architect.
There is no creativity without knowledge. This is a psychological feature of human behavior that the community of architects should understand, and of course include in the architecture student learning process. To create is only possible when the mind has a large and wide range of knowledge and information, in order to enrich the association of ideas, thus facilitating and promoting the ability of any creative individual helping him build or rebuild his ideas, transforming reality.
This process of association allows anyone to attain new ideas and new concepts, unique and original. Knowledge consists, therefore, on a sort of “fuel” to creativity. It is therefore imperative for the architect the mastering of a structural lexicon, capable of supporting the definition of the idea achieved in the ideational process, including the choices of aesthetic parties. Bearing this in mind is essential for the practice of architecture: understanding the intrinsic structural phenomenology of the basic structural typologies, in order to dominate their behavior, informing and taking advantage of the structural designs, in the creative act of designing.
The awareness of the structural importance, associated with a refinement of structural sensitivity, enables the architect to carry out a design synthesis, informed by structural principles, so that the management and manipulation of the structure not only takes part of it, but also informs ideational process.
The behavior of the form as a structure, is based both on the understanding of the geometry and structural mechanics principles. The architect should to fit in and realize that a structure has a shape and this latter has an implicit structure that takes up space, participating in plastic seizure of the architectural piece. It conforms an sort of aesthetics having the observer as a subject.

Structure then takes a role of structural form and is no longer only a functional character, of building stability function. The structural form acquires other dimensions that not only of resistance, the usual role, played by the structure. A methodology that keeps this multidimensionality view and deals with the implications of structural knowledge, confers to the ideational process a conceptual substrate which strength bears implications in the formal expression of the architectural “artifact”.
The above described process is a part of the ideational and qualitative evaluative phase, which aims at establishing and enhancing the aesthetics of the structural form. This qualitative phase is the first of several phases that are present in the concept space cycle of the building project, and this cycle also integrates the design of the form structure, although sometimes this phase is carried out empirically by the architect.
Only after the phase stabilization of the shape, comes the measurement phase that will validate structural schemes, confirming their viability and performance. There is a difference between the qualitative phase presented in the conceptual process of architecture and the quantitative phase of design of the structure, which validates the safety of the structure.
The design of a structure capable of enabling an architectural piece is revealed as a crucial moment in the production of architectural artifact, being relevant and absolutely fundamental in the design and management of structural forms.
The design of the structure is within the ideational process of the architectural form; mingles with it; it is not possible to create the shape of the building, without chosen and available form for the structure. The conceptual cycle of a structural shape is completely different and has a completely different nature of the cycle and task of calculating and sizing.
Still in the structural design stage, it is intended to create a structural concept allowing to manage and manipulate the flow of forces resulting from the spatial form generated, which will determine and affect the performance of the structure, defining a bearing strategy, it is possible from these assumptions to define a form with structural character.
This approach focuses on understanding the "walking forces" (Morais 1997) along the way, the understanding of these phenomena allows to manage f*lowcharts* of forces that allow the definition and manipulating of the shape.
The design phase of the structure catalyzes the formal creativity of the architect, unrecognized aspect but absolutely crucial in structural efficiency, and that goes for the design of structural forms based on existing trilogy between shape, span and the material used.
One thing is to design a structure, another will be to size it in order to support the working conditions which will be submitted. To conceive is understanding and this latter is being able to explain. The design of a structure is previous of its dimension, quantification step. It is an attitude at the same time methodical and intuitive. Designing a structure is to be aware of the possibility of its existence and the way to make it possible; It is to understand their relationship with the generated space; It is to understand the system or systems capable of transmitting the loads to the ground, in the most effective way; It is to identify the materials that are more capable to adapt to these systems. It is not possible to imagine a shape that does not require a structure or a structure that does not have a shape. Any shape has a structure and the whole structure has a form. So, it is not possible to design a form without automatically designing a structure or vice versa.
It is very common within the community of architects to think that is possible to conceive shapes independently not only of the structure and of the materials they are made of, but also of its construction process. In reality, though, the design of a form implies the design of a structure, and consequently, materials and processes that materialize. The structure and shape are one only object, so shape design emerges from the interaction with the structural design. What really happens is that not always the creative agent of architecture is aware that the creative act involving its spaces, is intrinsic to the creative agent of the structure act. They are fused, closely linked.
We recall the words of Salvadori in 1994: "*There isn□t an□ doubt in the minds of both engineers and the architects of the modern structural concepts are used properl□ onl□ when the architect has an accurate understanding of the structures. This does not mean that all architects should become mathematical□it is suggested simpl□ those who wish to e□press themselves through the structural forms that must first □ualif□ to use the □uantitative anal□sis tools. So the□ will be surprised to find out later that □our intuition often grown comes to correct structural solutions without much mathematics □oint*."
Predominant phenomena and principles present in typologies and structural systems, introduce principles of “truth” in the creation of form, understood as container of space and a result of the articulation of the parts that make part of the whole. Therefore, shape emerges as an informed response by the tectonic, functional and spatial requirements that arising from the need to express the

program. The structural shape result from a creative synthesis process based on the rationality based on the knowledge that the creativity provides, not being the result of an empty formal intention that depletes itself, devoid of intentionality. This process does not curtail creativity or plastic architect expression, but confers it before a truth that depends on a holistic view of the production of architecture, thus a part of a dialectical way the concept and materialization.

This approach takes advantage of the creative needs resulting of the functional program and the technological requirements, for the materialization of the architectural work piece, and the structural shape stems from the crystallization of these assumptions. This implies that structural shape does not result from a desire devoid of sense and objectivity it becomes a serious response to the trilogy technical, functionality, poetics. The methodology based on these principles result in a formal "truth", characterized by a strong expression, and an optimization means and processes. This structural, formal and functional "truth" brings advantages in economic terms and over the methods involved in its production.

In the case of an architectural program where the dimension of height is important, for instance the example of a tower, the structure implies the need to conceive and adopt a structural subsystem that is in charge of resisting to the action of the winds, the so-called lateral bracing. This need will lead to a way of designing in an integrated mode, from start. Due to the scale of the building, it is essential that the architect is capable of dealing simultaneously with architectural and structural forms, for designing structure *a posteriori* would prove to be inadequate to the problems involved.

As different structural typologies and different structural systems are susceptible to be used in architecture, one should proceed to choices. This process defines and is interaction between the architectural form and the chosen basic typologies. They determine one another mutually; either the type of structural system to be used, depending on the needs and form of the edification or the height and the space that one desire to create dictate the level, capacity and the type of loads to be supported by the building. Once associated to the characteristics of the building, they delineate and establish which structural system to materialize it, as well as the structural basic typologies that should therefore be chosen.

In order to attain a high degree of freedom in the idealization of architectural form, it is required that the architect detains organized and systematic knowledge concerning the above referred structural typologies at his disposal, and we may acknowledge that there are not so many in fact.

Under most of the academic and professional scopes, structures are considered as a field that concerns mainly a restricted dimension of engineering, which essence resides in the calculating and dimensioning, so that the aesthetical apprehension of the structure does not exist.

In this unique dimension, the relation and commitment with the process of designing architecture is limited to assure the stability for the idealized form of the building and through this point of view, structure assumes an external, subsidiary role when relating to architecture. It is necessary and tolerated but does not determine or is relevant for the expression of the plastic composition of the building.

One should establish that in this unique dimension of stability, the structure must have its own place and in consequence contribute to designing architecture. The architectural object has to contain the structural elements and provide for suitable spatial conditions. Otherwise, it will work deficiently. Therefore, one cannot imagine a completely separated conception between architecture and structure. Within its stability dimension, structure possesses another place in architecture, considered as a whole. Often, structure contributes to defining the material envelope of building, organizing and delimitating spatial programs for collective use by people; that is the case of pavilions and cultural or sport venues.

Recently, the need for the integration of architectural design with structure design has become patent in the academic world, and the works of several architects such as Santiago Calatrava, Laurent Rey and Philippe Samyn.

Form is the determining parameter of structural behavior and this is totally evident in biological forms, such as plants and trees for they adapt, growing in height, and resisting to the actions of wind and gravity, often through the variation of the diameter of their stalks or boles.

Through this variation in section, accordingly to the quantity of matter that is needed, nature optimizes, in an intelligent way, structural forms and facilitates the gain in structural flexibility, necessary to endure the action of winds, giving way to the so-called material efficiency of biological life.

Frank Lloyd Wright (1867-1959) used to say in what concerned structures, that architects should take profit of the constructive properties of each material and learn how to use them. Also, structural forms should reflect the potentialities of new materials that imply either new forms, or a new use, according to their "nature". Therefore, it is a mistake to think that the architectural form may be created independently from that of the structural form.

Niemeyer (1907-2012) also postulated that architecture and structure should be conceived together: *"[…] there is no such thing as architecture without structure. When the theme allows, it is necessar□ to invade the fertile field of imagination and loo□ for a different form, the architectural surprise. And then*

there ta□es place the innovative structural con□uests□the free lengths, the ultra slim shells, thereb□ ever□thing that can be demonstrated by the progress of technique in all its plenitude."

Among the conceptual tasks related to structural design there is no need to recur to the knowledge pertaining to mathematical analysis that is the base of Theory of Structures, thereby the object of the activity of the structures engineer. This discipline is mainly used for the calculation and dimensioning, having no such thing as a major contribution for the stage of the idealization of the structural form, it is important only in a second stage of the stability project.

Nowadays, digital processes and technological informatics tools facilitate and explore the integration and merging of architectural form and structure, dealing with the concept of structure as a geometric form of the entity that is responsible for the stability of the building. These creative processes supported by design digital methodologies such as *form-finding* and *parametric design* promote the integration we designers aspire to: that of architecture and structural form. Therefore, computation has an important role to perform, that of approaching and integrating the structure of the architectural design, bringing it to the level of global integrated project.

4. Two cases: Saarinen and Siza Vieira

We would like to detain ourselves on two apparently similar architectural pertaining to the second half of the 20th century, one in the USA and the other in Portugal. There are more than thirty five years of distance between the two buildings.

The article presents a case study that compares two buildings designed by two different architects. The Dulles airport in Washington, designed by architect Saarinen, and another, the Pavilion of Portugal in Lisbon, designed by architect Siza Vieira. From a structural point of view, the two buildings are similar because they make use of to the same basic structural type, the catenary. But the final aesthetic objective has not been achieved also in the two projects, as described and analyzed in this article.

The Portugal Pavilion building which was designed by Alvaro Siza Vieira (1933) is composed of two volumes and a ceremonial square covered with a roof. The first volume, with a horizontal formal predominance is defined by two porticoes built with concrete, between which there is a slab suspended by steel cables that could be compared to a sheet, due to the fact that it is very thin. The other volume, slightly higher presents the configuration and their façades are characterized by a regularity of the fenestration. The façade that opens onto the river is defined by a portico of pillars (columns), supporting the roofs and simultaneously articulating with the rhythmical design of the windows, doors, and a terrace.

On the opposite façade, the windows from the first level relate to Portuguese traditional erudite architecture. The Pavilion was distinguished by the award *Pr□mio Valmor* (1998) and one could consider under the point of that there are some Italian references such as Terragni (1909-1997) or Rossi (1931-1997), along with classical Portuguese architecture.

Fig. 4: Plan of the Portugal Pavillion. Credits due to http://pavilhaolusitano.blogspot.pt/.

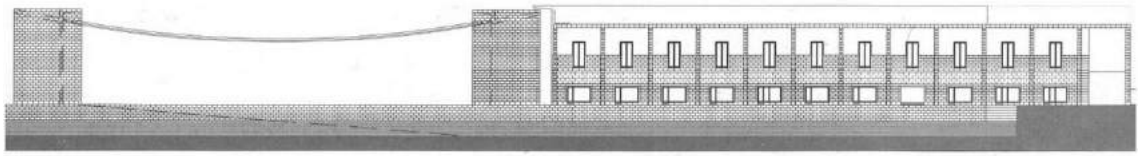

Fig. 5: Section of the Portugal Pavillion. Credits due to http://pavilhaolusitano.blogspot.pt/.

Fig. 6: Plan of the Portugal Pavillion. Credits due to http://www.patrimoniocultural.pt/pt/patrimonio/patrimonio-imovel/pesquisa-do-patrimonio/classificado-ou-em-vias-de-classificacao/geral/view/5667074/

Fig. 1: Aspects of the canopy of the Portugal Pavillion. Credits due to https://www.pinterest.com/pin/56083957832396053/

The roof of the Pavilion that was initially conceived in 1998 to receive the Portuguese representation covers an ample exterior area with pre-stressed concrete and apparently is supported by two “blocs”. Opening to the urban space, in order to receive various events that a facility of this scale may allow, it integrates the volumes, under the aesthetical point of view. The building, characterized by austere, classical features, works as the connection between the portico that opens onto the river and another solid volume that is all covered of reflecting tiles in his interior side.

Fig. 7: Panoramic of the canopy of the Portugal Pavillion. Credits due to http://estudio4tecnologia.blogspot.pt/2012/09/mariene-rocha-silvana-assuncao-pavilhao.html

If we compare the aesthetical dimension of this slab with the roof of the Dulles Airport (Virginia State), designed by Eero Saarinen, we do realize that it in this case bearing an apparently similar formal solution, the second performs the function of covering a considerably large space. Besides, the way it was designed taking into account the formal relation to its foundations relates to the balance between the tensions generated by its own weight of the roof itself.

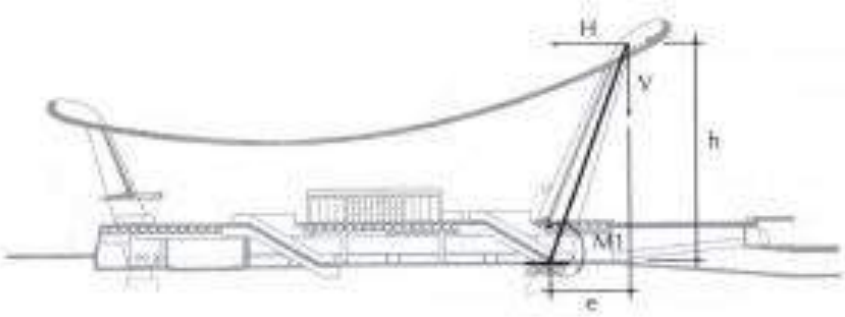

Fig. 8: Panoramic of the canopy of the Portugal Pavillion. Credits due to http://yinrongdesign.blogspot.pt/2013/07/the-similar-case-study.html

5. Conclusion

The knowledge of the behavior of structural forms is, according to our point of view, vital and tends to determine the full development of the architect's creativity. This absence of knowledge naturally is translated into the aesthetical quality of buildings, especially buildings covering wide spans, pertaining to the domain of the so-called structural architecture. Let us consider the examples that illustrate this problematic: i) the terminal of Dulles Airport, by Eero Saarinen (Washington DC); ii) Portugal Pavilion by Alvaro Siza Vieira (Lisbon).

On the structural level, buildings used the same typology. Both of them are the natural form of the catenary supported by vertical elements. Though formal language may seem identical in both buildings, aesthetical quality should not be put into comparison. Plastic expression in Dulles is most powerful. Saarinen elevated the use of curvilinear forms to a level of extreme simplicity and beauty, with huge power of enchantment due to the compositional harmony and the smoothness of the sinuous contours, from where is put into evidence the balance of the proportions along with constructive details. Saarinen achieved an elegant form, surprisingly simple bearing an admirable and graceful asymmetry.

Fig. 9: Panoramic of the canopy of the Portugal Pavilion. Credits due to https://pt.pinterest.com/pin/301107925056906219/

The Portugal Pavilion tends to present overall somewhat unbalanced formal features, resulting from a contrast between the vertical elements and the catenary. On the other hand, the Pavilion globally presents a form less harmonious, thus implying a structural unbalance, in terms of proportion, since the canopy is solved with a considerable thickness. Creating his amazing shape, Saarinen demonstrates to possess a deep knowledge of the structural phenomenology, namely the catenary typology, along with the structural interaction of the tilted vertical elements.

In the Portugal Pavilion, the massive disproportion that characterizes the shape of buttresses that contrasts with the slenderness of the canopy, ignoring the basic set of structural principles that inform a properly structural conception, implied in the system of the catenary. Could be intentional, not being necessarily, according to our point of view, the result of a theoretical mistake.

We would assert that Saarinen looked at the structure as a form of artistic expression, through which could potentiate its architecture, taking advantage of the aesthetic potential offered by the structure, considering this as a structural form and not as an element that provides stability only. Saarinen went further in the apprehension and understanding of the dimensions of the structure of power and realized that a structural form is much more than a simple structure. For Saarinen, a structural form has other dimensions that not only the structural function.

In the Pavilion in Lisbon, Siza Vieira may have understood the structure as some sort of appendix that only provides stability function. The structure in this case, and for this architect, presents itself as something constricting, in some way alien to the project, so Siza was forced to conceal the structure.

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Alcoba□a: innovation and continuity in the erection of a Cistercian monastery

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Abstract

Alcobaça is the first *cistercian* monastery that has been founded by the order in Portuguese territory just after the conquest of the land to the Muslims or the Moorish. The lands of Alcobaça were donated in April 1153 to the Order by King D. Afonso Henriques, the first Portuguese monarch, close to the date of the foundation of the kingdom. The foundation of the monastery has contributed to the development of cattle raising and agricultural activities of the entire region, along with the population growth, since the 12th century, even if the population that spoke a muslim dialect, had at the time already practiced some agriculture and commerce.
In our study, based on elements in local archives and the survey of the original buildings we aimed at bringing to light, through the presentation of evidences, the fact that initially the original geometrical design predicted to the building a barrel vault to cover the aisles and the transept. Some experts are convinced that the church is an example of a *hallen□irche.*
Finally, what was achieved in the definite formal solution was a building composed of three aisles, which covering was solved through the use of rib vaults. The central aisle and transept are very close to the collateral aisles in what concerns their height (20,10 and 19,40m). The Order prescribed approximately a *ratio* of □ between the height of the central to the secondary aisles. The pillars that support the vaults bear addorsed columns that seem suspended above the pavement, thus creating a somewhat abstract area that contributes to keep elevated into the air this construction system as a whole.

Keywords: cistercian architecture, gothic, vault, monastery.

1. Introduction

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St Bernard[i] had founded in 1115 the Abbey of Clairvaux, with some monks that came from C□teaux (Cistercium, lat.), having succeeded to Dom □tienne de Harding. C□teaux, to the south of Dijon, in Burgundy, had been found in the Spring of 1098, by a group of twenty monks, following Robertde Molesmes. “Cystel” was the designation adopted to name a soil that was marshy. These later were benedictine monks that came from Molesme.and called Cîteaux the “new monastery”.
C□teaux flourished and, some time, later founded La Ferté (1113), Pontigny (1114), Claraval and Morimond (1115). For practical purposes, the order was divided between those five mother abbeys. It is still in the 12th century that the Military Order of Avis becomes *cistercian.*
On the death of the Pope Honorius II, in 1130, there was a schism that caused Louis VI of France to promote a council with the French bishops, where Saint Bernard had to judge among the rivals for pope and gained political relevance.

Around the 12th century, is the time when the High Scholastic, together with the architectural phenomenon of the High Gothic, with Chartres and Soissons, was being initiated (Panofsky: 12). A decisive, or "classical" period, was afterwards attained in the reign of St Louis (1226-1279). Philosophers such as Alexander of Hales (1185-1245), Albert the Great (c.1200-1280), William of Auvergne (1180/90-1249), Saint Bonaventure (1221-1274), Saint Thomas Aquinas (1225-1274), flourished in that time, altogether with architects of the High Gothic such as Jean de Loup, Jean de Orbais, Robert de Luzarches, Jean de Chelles; Hughes Libergier and Pierre de Montereau.
We may assert that the terms in what the High Scholastic differs from the primitive Scholastic, are very similar to the differences we might find between the primitive and the High Gothic, as in the sense that the *Summa* diverges from the Encyclopedia and Libri Sententiarum of the 11th and 12th centuries.
The men who entered the monasteries in the 12th century or chose Christian *anachoresis* imitated, under a certain point of view, the true Christian philosophers, answering to the nostalgia of Saint Hieronimus (4th century), respecting the rules of a number of latin priests. They aspired, like the first apostles to leave everything to follow Christ philosopher, so that they could dedicate themselves in all free spirit to Philosophy.
The philosopher Origen (2nd-3st centuries) said:*"If you have understood, what peace brings the path of wisdom, what grace, what sweetness it offers […] enter that path and do not bac□ off before the solitude of the desert. B□ sta□ing in those tents □ou will receive the celestial manna and □ou will eat the angels bread."* (Davy, 1980: 95).
In those times, in the monastic sense, the term "conversion" had a restrict sense and it signified entering a monastery, as a school of wisdom, where the pupil devoted himself to the apprenticeship of the divine philosophy. Therefore, conversion to philosophy demanded abstaining from the world, avoiding secular wisdom, so that one could proceed definitely to the domain of the celestial. (Davy: 97).

2. The Abbey of Alcoba□a

Fig. 1: Aspect of the Alcobaça Abbey. Credits due to the authors.

The Church of Abbey of Alcobaça can be considered (Pereira, 1995: 345) as the first work built in Gothic style in Portuguese soil. Its foundation derived from a political and strategic intention, together with spiritual reasons.
The foundation of the Abbey dates from 8th April 1153, as the document that referred to when the territory was effectively donated to the Order by D. Afonso Henriques. Its origin is possibly related to the Monastery of S□o Jo□o de Tarouca. The monks established themselves in precarious conditions,

“the old monastery”, only achieved the financial conditions with a much more considerable community, by the year of 1178. For decades, the works proceeded, being conducted by a whole sequence of Master Masons.[ii]

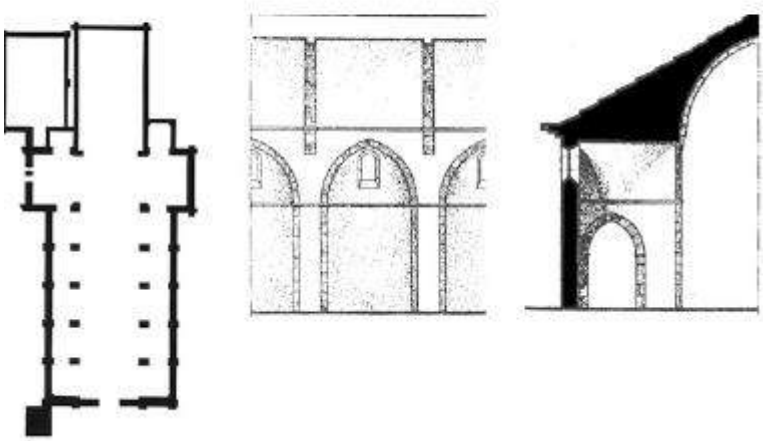


Fig. 2, 3: Monastery of S. Jo□o de Tarouca; façade, plan and sections. Credits due to: SIPA; Paulo Pereira.

Saint Bernard intended to promote the mystical mobilization through contemplation and a preparation that included the recognition of the inner beauty, giving praise to the work of the soul: “Oh soul, who are truly the most beautiful, even if you do not occupy an inept body […] the divine light has not repelled you.” [iii] In the mystical conception of Saint Bernard, true beauty is found through the light of the man and nature, or through divine creation, *“[…] as lantern found hidden under a bushel.”*
Built between the 12th and the 14th centuries [iv] the buildings of Alcobaça consist in what the *Cistercians* call the regular places of the Rule. The *Instituta* were the compilation of the General Chapter of the Order of Claraval that described the program to be implemented in the following order: Church, Refectory, Dormitory, Cloister, Guest House, and Porter House. These were the first elements of the facilities of the religious order to be built, as a program. It resulted from the works of different Masters and Architects.[v] Set in a territory fertile provided with an abundance of water resources, the community that depended on the Abbey that founded the new community was generally, - like Saint Bernard had done having left C□teaux to found Claraval Abbey, - organized with a group of twelve monks, owing obedience to one Abbot.
There were two kinds of monks, the regular ones (the Professed), submitted to the vows of Order and the other monks that did not obey to the Rule, the so-called Converse Monks, who worked on the

lands, explored other resources, and were craftsmen. The text of the *Instituta* does not refer the areas dedicated to the premises occupied by these later.

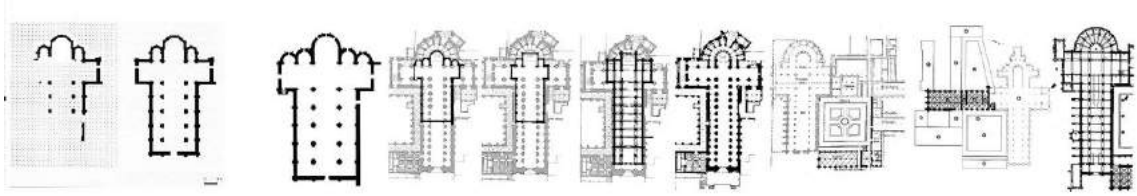


Fig. 4: Examples of different plans such as the primitive Abbey of Salzedas, of the plans of Alcobaça and of cistercian abbeys, including the C teaux II. Credits due to Paulo Pereira.

In Alcobaça, along with the nucleus that is composed by the different buildings, there were added the areas that were built in the 16th and 18th centuries, to which the public does not accede, and the kitchen set in the 18th century in the place of the ancient *calefactorium.*
To southwest of the Monastery, inside the cloistered walls, there were magnificent gardens in the French style that the travelers of the 17th century described with great enthusiasm. The Monastery walls contained orchards and kitchen gardens that were, among others, mentioned by the Marquis de Alorna in his "Memoirs". The *Rossio,* a sort of square that preceded the façade of the Monastery was originally more extensive than the actual square (Cocheril, 1989: 39).
From the 15th and 16th centuries, masculine monasteries were abandoned to the Commendatory Abbots, nominated by the monarch that left most of the buildings falling into ruin. In 1567 there was the creation of an autonomous congregation.[vi] Set free from their Commendatory Abbots, the monks regained new life, thus reopening their noviciates and have risen in number.
There is not any description of the original façade that we suppose that has been very simple, without any exterior ornament, such as the ones in the northern part of the territory, namely S. Jo o de Tarouca. Probably and according to this model, the portal should have had a *rosacea*, with two windows that cast light onto the co-lateral aisles. Possibly this original façade should have had a cross crowning it. There was a staircase preceding it, like in Santa Maria do Bouro (established in Minho, the northern part of Portugal), or Casamari (Italy) that is referred by the chronicle Fr Hier nimo Rom n.[vii]
Normally the churches of this order were anteceded by a *narthe* . In Alcobaça, this was erected to contain the tombs of the Duques of Burgundy. The rules of 1134 prohibited the burying of people inside the churches of the Order. Later on, this has been overruled in the statutes dating from the second half of the 13th century.
The dimensions of the Church of Alcobaça were about 106 m in length, the height of the central aisle and transept of 20,10 m and the co-lateral aisles of 19,40 m. The rule recommended a relation of about 1:2 between the height of the central aisle and those of the co-lateral aisles. These later were half the width of the central one. The relative proportion of the aisles in the Church of Alcobaça imbued the subject of a sentiment of austerity and asceticism. The model of Alcobaça, in what regards the plan is inscribed in Claraval III.

3. The Cistercian models and innovation in Alcoba a

In the period when St Bernard was still alive, the churches of the order obeyed to a simple model: a central aisle and two co-lateral ones, a transept and a presbyterium not too deep, rectangular in shape, integrating rectangular chapels. S. Jo o de Tarouca is a model that derives from Fontenay.[viii] [1]
Henri Focillon studied the aesthetic sense of the Cistercian churches and declared that the pillars constituted an admirable interpretation of the *cistercian* theme of the interrupted columns. The volume of the pillar with the addorsed columns, implying a complex mass that seems to be suspended above the ground, generates a whole abstract area that seems to bear as a function the illusion of "levitation" of the building (Cocheril, 1989: 47).
The vaults are rib vaults. The lateral arches - very robust and of square section, - are supported by the two chapters of the addorsed columns to each face of the pillars. The diagonal arches, much frailer, are supported by the cornices on the angle. In the Monks choir, the cornices are supported by columns at the angles, continuing downwards, until meeting the base (COCHERIL: 47). The pillars in

the medieval adopted models were known as “pilliers-murs” and were justified probably because of the necessity to juxtapose the seats of the choirs that were generally ranged into two rows.

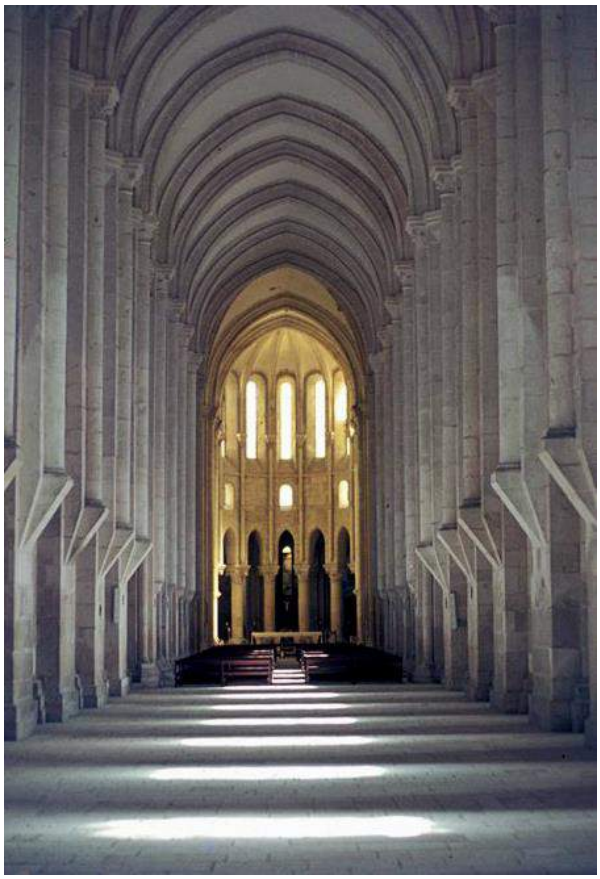


Fig. 5, 6: Central aisle and *presb□terium* with *deambulatorium*. Credits due to the authors.

The unusual height of the co-lateral aisles in the example of Alcobaça, seems to be, according to our source, Fr Maur Cocheril (the expert in *cistercian* architecture), consists in an artifice of the construction. There have been some historians who wanted to interpret the Church of Alcobaça as an earlier example of *hallen□irche,* similar to the ones we can find at the Poitou,in France, or in the German region of Rheinland. We do not agree with this interpretation, since in the *hallen□irchen* examples there is an impression of a unique spatial conformation and, in our example, we must interpret space, divided into three compartments, the aisles.
The relevant fact, that has not been scientifically explored until nowadays, is that there are several clues of the original intentions, as to how develop and implement the first plan of the church.
The high altar of the church is circular and there is a *deambulatorium* with nine radiant chapels that do no protrude, of trapezoid shape, built in the continuity of the presbyterium. They are separated by a straight wall, a formal solution that emanates from the adopted model of Claraval III. The deambulatorium is divided into sections by arches that rest their loads on the pillars, aligned with the walls of the above referred chapels.
The walls are built of stone masonry, carefully cut and appareled. Solidity is assured by the reinforcement of the thickness. There are no buttresses either on the northern wall of the aisle or on the west wall of the north wing of the transept.
The cloister, one of the best examples of Cistercian architecture, that was built on the location of the original cloister, and is known as Cloister of D. Dinis results of the work of two architects that succeeded one to the other, Domingo Domingues and Mestre Diogo. Its first stone was founded by the Abbot Dom Pedro Nunes (1346). The galleries that composed the cloister used to receive different designations.
The basis of our study derives from some vestiges related to a discontinuity on the thickness of the walls that may indicate, as Fr Maur Cocheril put as premise that the original purpose in the model brought probably from France was to build lower barrel vaults, covering the co-lateral aisles.
We show in the figure 8 to 10 the discontinuity in one of the co-lateral aisles that puts into evidence a sort of cornice where probably the first Masters intended to direct the loads eventually transmitted by the barrel vaults.

Fig. 7: The co-lateral aisles originally used to assure the function of a passage when the three choirs, namely those of the professed monks, the sick and the converse monks, occupied the central aisle. Credits due to the authors.

We have understood that the model that was used in the 13th century, with the heights of the aisles very close in the values (20,10m and 19,40m).[ix]

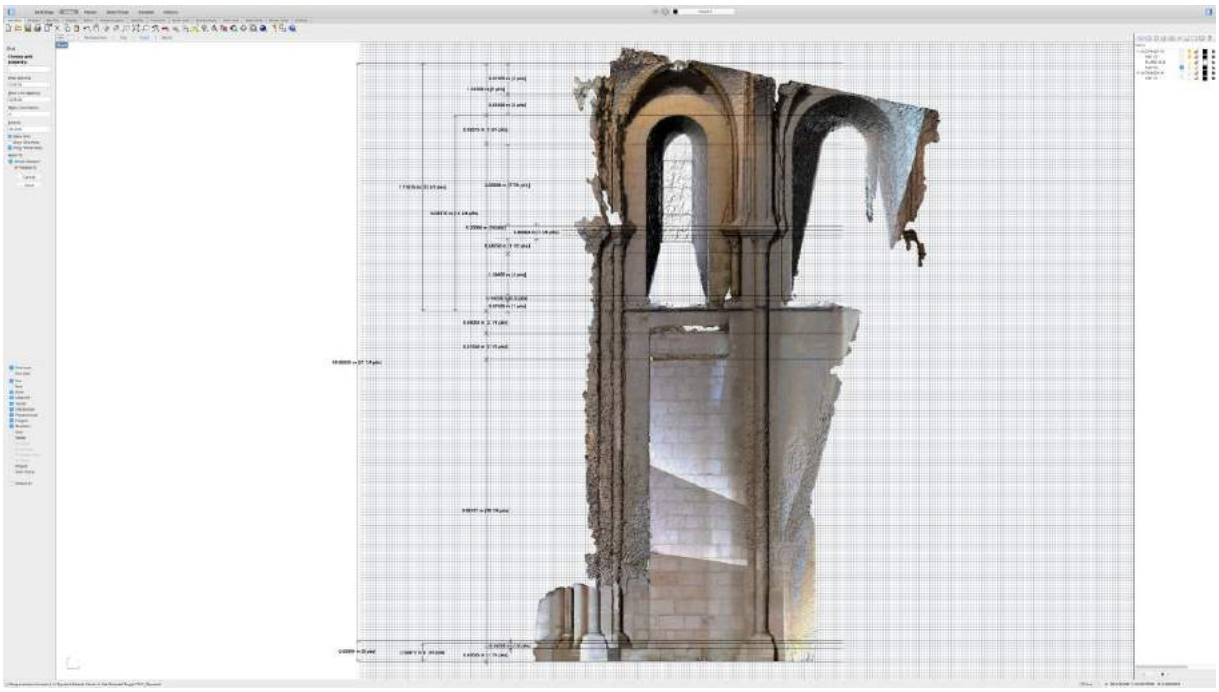
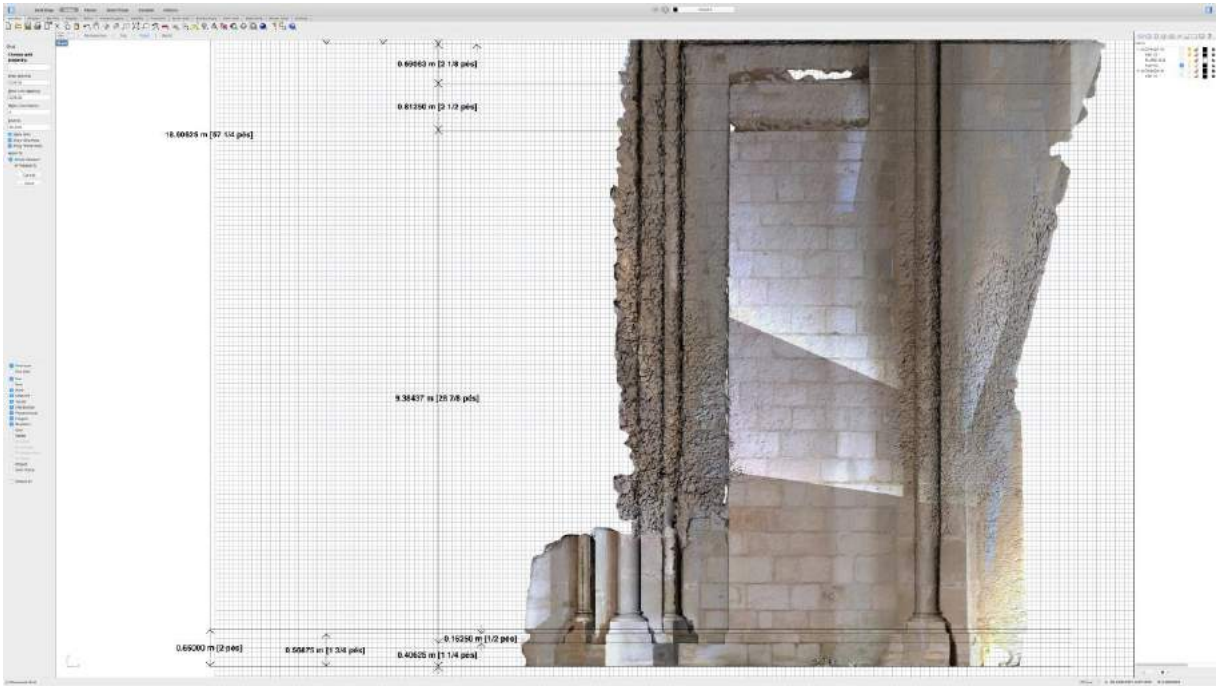


Fig. 8: Digital model based on photogrammetry through Agisoft Photoscan and scaled and manipulated by Rhinoceros. Credits due to Pedro Janu□rio.



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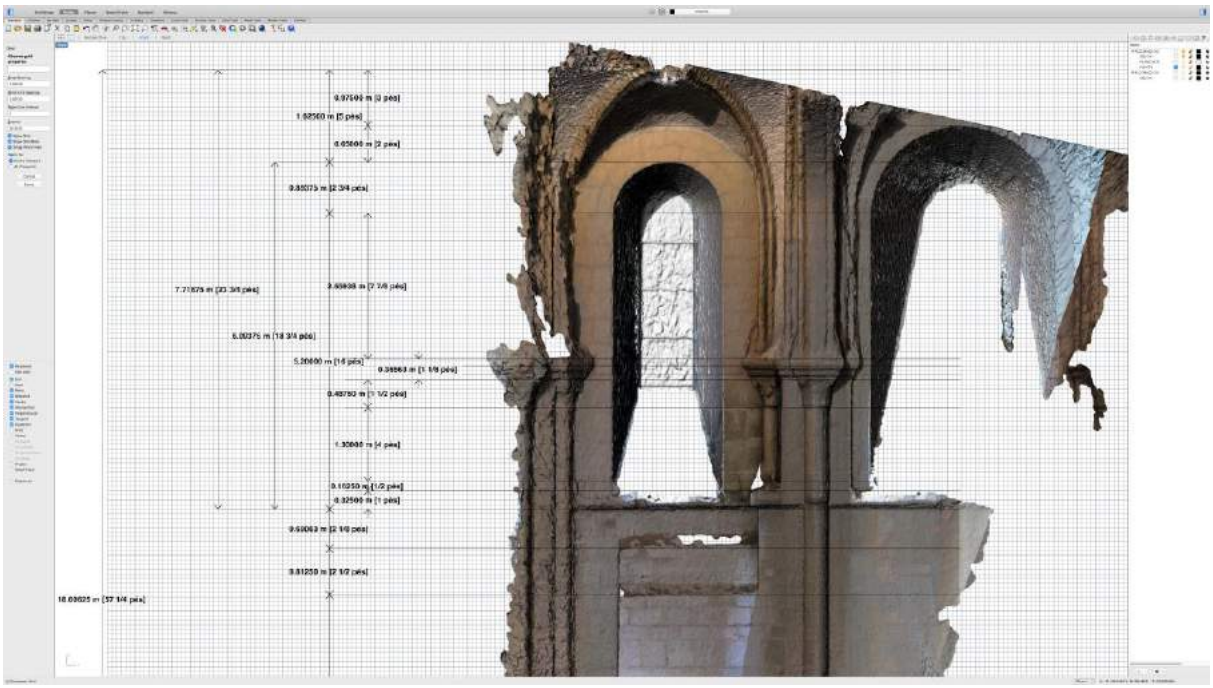

Fig. 10: Digital model based on photogrammetry through Agisoft Photoscan and scaled and manipulated by Rhinoceros. Credits due to Pedro Janu□rio.

Fig. 11: Digital model based on photogrammetry through Agisoft Photoscan and scaled and manipulated by Rhinoceros. Credits due to Pedro Janu□rio.

Fig.12: Digital model based on photogrammetry through Agisoft Photoscan and scaled and manipulated by Rhinoceros. Credits due to Pedro Janu□rio.

Fig. 13: Digital model based on photogrammetry through Agisoft Photoscan and scaled and manipulated by Rhinoceros. Credits due to Pedro Janu□rio.

4. Conclusion

The term “Gothic” does not correspond to any terminology used in the Middle Ages, being depreciative (Pereira, 1995: 335) when later on used by the humanists of the Italianizing period, when referring to those dark ages, according to their belief rooted in the tradition of the Antiquity. They called those buildins as having been built *alla maniera tedesca*, *a la maniera dei Goti*. Moli□re refers to those “odious monsters from an age of ignorance”.

Clearly the precepts of the conceptualization that we have been following in our studies imply that shapes characterizing structures have evolved, along with the formal geometries of architectures, accompanying the development of the techniques and technologies.

There is no such thing, and in that point of view we disagree with many historians, even some of those to which we pay tribute for having contributed to disseminating the historiography of architecture of those epochs.

Of course there are not compartmental styles, with different characteristics to which we can in a attribute the different buildings, not only for they have been built along decades or centuries, in different campaigns of works, directed by different Master masons (or architects), but also because as most things in the history of culture have resulted from the process of successive essay, trial and

correction, through experimentation and the application of what has been assuring positive results. The history of building has been a path much supported by the conditions of Empiricism

It may be considerably controversial the idea that Romanesque and Gothic were different ways of building, even if there are many examples that seem to attest that they do not relate and use different properties and behaviors of the materials.

We are absolutely sure that the evolution of the buildings that anteceded the 14th century had the necessity to surpass the handicaps of the roman arches, the barrel vaults, and accede to the liberation of the walls from opacity, in order to elevate buildings, in a conquest of space in the fulfillment of and endeavor related to the forces of gravity and mastering the laws of materials.

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[12] PEREIRA, Paulo, 1995. "O Modo Gótico" in *□ist□ria da Arte Portuguesa,* C□rculo de Leitores, Lisboa.

Notes

[i] Bernard de Fontaines.

[ii] According to Paulo Pereira, 1995.

[iii] Paulo Pereira quoting *Sermones Super Cantica Canticorum,* Opera I.

[iv] The abbatial church was initiated in 1178 and dedicated, later on, in 1252.

[v] Master Desiderio,(latin name of Didier 1152-1178□); unknown masters (1178-1195; 1195-1208; 1208-1308) Master Domingo Domingues (1308-1311); Master Diogo (1311-□) (D. Dinis Cloister); Mateus Fernandes (1508); Jo□o de Castilho (1509-1520) (upper storey of the main cloister; new and old sacristy nova); Master Machyn (1519-1521) and Master Jo□o Alem□o (1519-1533) (cadeiral manuelino); Jo□o Turriano (1702) (church's façade); William Elsden, 1770 (Royal Pantheon).

[vi] On the 26th October 1567.

[vii] This latter quoted by Virgílio Correia in 1929. APUD Cocheril 1989.

[viii] Paulo Pereira, "O Modo Gótico" in *□ist□ria da Arte Portuguesa*, vol. I, p. 348.

[ix] The measures used in the building of the first Cistercian monasteries were supposed to be the *pied du roi,* Maur Cocheril does not mention this measure when he describes the different monasteries in his works, using the metrical system.

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Effect of degradation of constituents on global performance of historical masonry

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Abstract
Conservation and valorisation of World Heritage often overlap with assessment and analysis of masonry historical constructions. Masonry is characterized by the large variability of its components. Parameters like strength, bond, workmanship defects in construction and material decay strongly influence the performance of the overall structures.
Even equal unreinforced walls tested in laboratory show very different behaviours and the test results can be very scattered. The large scatter experimentally observed can be explained not only by considering the scatter of basic material properties, but also the effect of defects, which are more significant in the case of a natural stone.
Numerical analysis provides some useful insights on the simulated experimental tests on tuff masonry. The results of the preliminary FEM analyses provided satisfactory results. Natural stone imperfections and defects were simulated in the models. The effect of joints not fully and not uniformly filled were considered, influencing global capacity and cracking: two types of crack patterns were observed involving only the mortar joints or both mortar and tuff bricks.
Degradation impacts differently mortar and bricks. Such variability has been simulated by means of validated FEM models to evaluate global decay of masonry capacity depending on expected decay of the components of masonry, namely mortar and bricks.

Keywords: Masonry, Degradation, Mortar, Diagonal Test, Tuff Brick, Micro modelling

Introduction
In this paper, the influence of masonry constituents has been evaluated in terms of global impact on the behaviour of historical masonry. Degradation of mortar and brick modify the mechanical characteristics of the constituents and in some cases the geometry too. This aspect is very important both to estimate the residual capacity of masonry structures during time and to guide the eventual restoration works having in mind not only the compatibly of new added materials, but also the impact of potentially different mechanical behaviours, namely brittle or more ductile.
In fact, it is well known that masonry is usually made of different types of bricks and mortars and the structural behaviour depends not only on the mechanical properties of the constituents, but also on their texture and construction modalities (Lippiello et al. 2016 [1]).
Due to the exposition to external agents, as pollution and weathering, masonry is particularly susceptible to degradation which could alter the appearance and performance of heritage buildings. The mortars revealed to be the most vulnerable constituent of historical structures and defects, desegregation or detachments are frequent.

1. Numerical modelling
The aim of the study is to evaluate numerically the effect of degradation of constituents of masonry. To this aim a numerical Finite Element Model (FEM) has been calibrated based on experimental tests. The calibrated model has been further adopted to evaluate the effect on global performance of degradation of constituents, by means of parametric analyses where the main parameters were their width and mechanical behaviour. The nonlinear refined model requires in input some mechanical properties, neither always available from experimental report nor available from characterization tests.

In particular the results of the experimental test have been adopted to calibrate fracture energy of tuff stone and mortar, while other properties were derived directly from experimental tests.

1.1 The experimental test

The experimental program consisted in a diagonal compression test carried out on a masonry wall made of Neapolitan yellow tuff stone. Bricks have dimensions 390 mm x 250 mm x 110 mm and have been supplied by a local quarry located near Naples. A pozzolanic and lime based mortar was used for the bed joints, with a thickness of about 10–12 mm. The resulting wall was ten courses high and one brick wide (single Wythe), having final dimensions of approximately 1200 mm x 1200 mm x 250 mm (Fig. 1).The masonry wall was tested in a steel frame set-up that allows the direct application of a compression load along the diagonal of the wall. The maximum load capacity of the system is 500 kN with a total stroke of ±75 mm. The test has been performed according to the procedure described in ASTM E 519-07 [2].

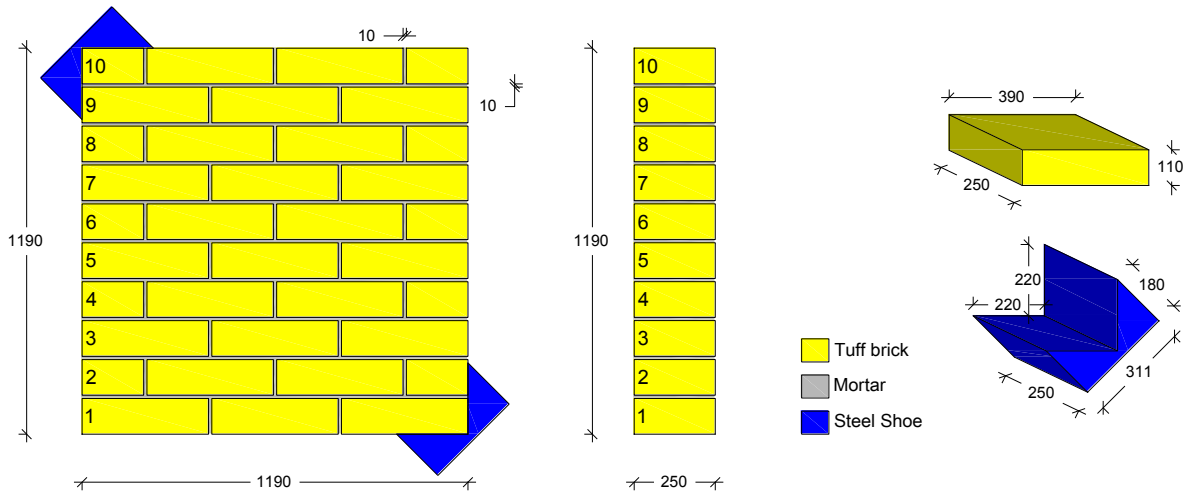

Fig. 1: Geometry of wall (dimensions in mm)

The test was carried out under displacement control with a displacement rate of 0.02 mm/s and was stopped after the complete failure of the wall. The entire set-up system is externally supported by a steel frame and does not weigh on masonry.
Four linear displacement transducers (LVDTs) with a gauge length of 400 mm were installed on each wall side, along the two diagonals of the masonry wall to monitor in-plane displacements.
Mechanical properties of tuff bricks, mortar for joints were determined by means of experimental tests according to EN 196-1 [3] standard. The flexural strength, $f_{fl,m}$, was obtained by means of three point bending tests carried out on 3 standard prismatic specimens (40 mm x 40 mm x 160 mm), while the compressive strength, f_{cm}, was determined on the halves of the specimens tested in the bending tests (loaded side 40 mm). In Tab. 1 the average values of the mechanical properties of materials are listed together with Coefficient of Variation (CoV).

Material	$f_{fl,m}$ MPa	CoV %	f_{cm} MPa	CoV %
Tuff Brick	1.45	12	5.13	10
Mortar Joint	1.65	9.5	6.10	5.8

Tab. 1: Mechanical properties of materials.

1.2 Description of numerical model

Experimental test has been simulated by means of Finite Element Code DIANA [4] on the basis of a micro-modelling approach (Fig. 2a). Mortar joints and tuff bricks were modelled separately (Lignola et al. 2009 [5], 2012 [6] ; Parisi et al. 2013 [7]; Giamundo et al. 2014 [8]) and their mechanical properties have been obtained from experimental tests. A plane stress model has been considered for simulating the behaviour of the masonry (loaded in its plane only and no out-of-plane actions were considered).
The experimental load set-up was reproduced in the numerical model; the boundary conditions of the walls were assigned to the model by means of two steel devices applied to the corners of masonry wall. A monotonic increment of the diagonal displacement has been applied at the upper load steel device, while the bottom steel device was fixed.
The geometry of the numerical wall exactly reflects the dimensions of the experimental wall.

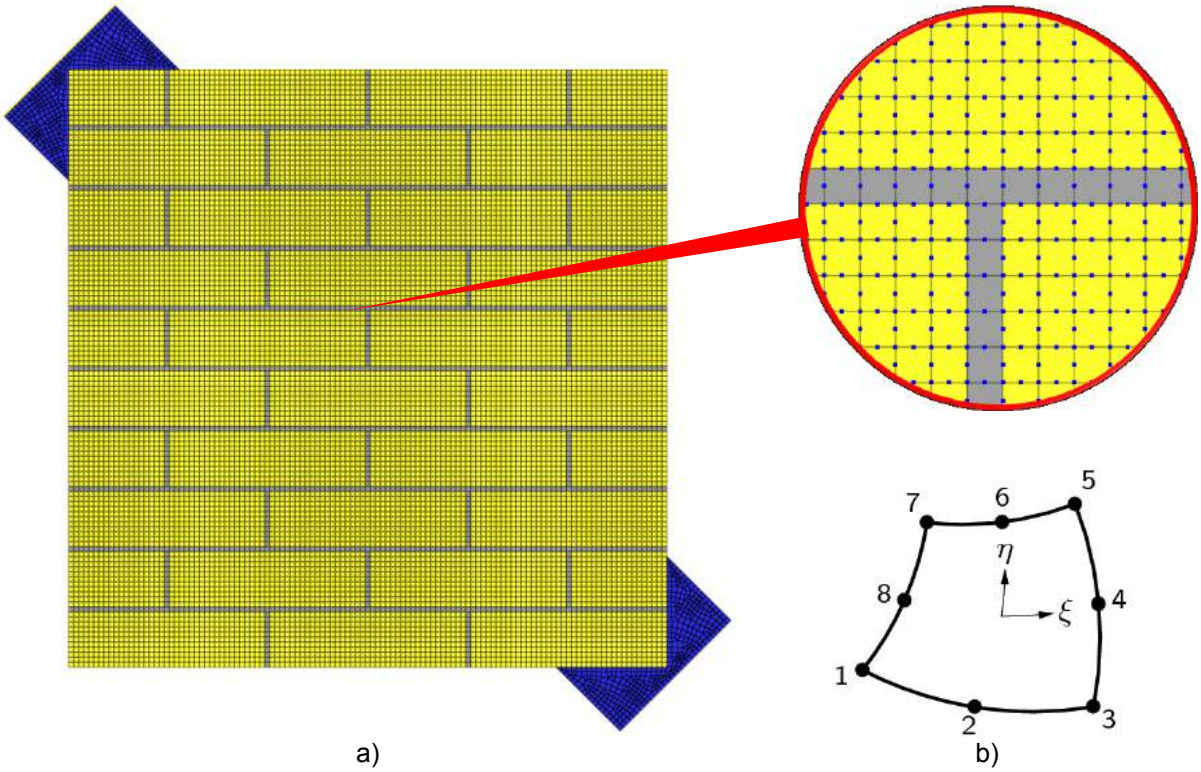

Fig. 2: a) FE Model of the wall under diagonal-compression test, b) Finite element (CQ16M)

The mesh of the wall is composed by 14931 elements, with a total of 45318 nodes and is made of plane stress elements: the eight-node quadrilateral isoparametric plane stress element CQ16M was considered (Fig. 2b), based on quadratic interpolation and Gauss integration between nodes.
The dimensions (X,Y) of the single element are 10 mm x 10 mm. The behaviour of tuff brick and mortar has been simulated by means of Total Strain crack models, which describe the tensile and compressive behaviours of a material by means of a stress-strain relationship. After the first elastic branch, the post peak behaviour was described by exponential curve for tension (Fig. 3a) and parabolic curve for compression (Fig. 3b) [4]. The fracture energy, unavailable from the experimental phase, represents the only calibrated parameter of the numerical curve, based on best fitting of numerical curves compared to experimental results (see Fig. 5).

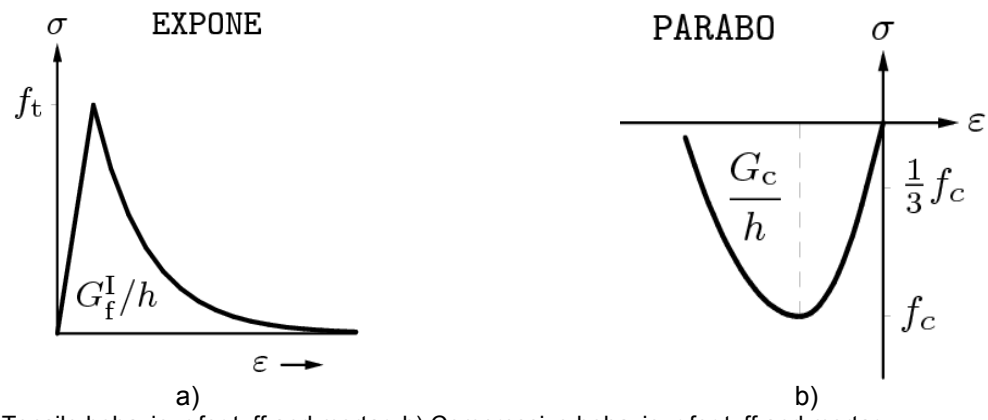

Fig. 3: a) Tensile behaviour for tuff and mortar; b) Compressive behaviour for tuff and mortar.

The fracture energy calibration was limited to the best fitting of the global strength of the walls and the final values are listed in Tab.2 both for tension and compression behaviours.

1.3 Validation of numerical model

The numerical model was validated by comparison of the global shear stress vs. shear strain curve and crack pattern. The LVDTs were virtually reproduced by monitoring in-plane displacements of the two ends of the gauge length. The experimental shear stress τ, the shear strain γ and the shear elastic modulus G were calculated as follows, according to ASTM E 519-07 [2]:

$$\tau = \frac{0.707 \cdot P}{A_n} \qquad \text{where} \quad A_n = \left(\frac{H+L}{2}\right) \cdot w$$

$$\gamma = \varepsilon_v + \varepsilon_h$$

where P is the applied load, A_n is the net area of the specimen, H, L and w the height, the length and the total width of the specimen respectively, ε_v and ε_h are the vertical and horizontal strains given by displacement measurements of the two couples of LVDTs, respectively. The comparison between experimental and numerical result has been carried out by vector components of the displacements of the same points (Fig. 4b, c).

$$\Delta A = \Delta B = (TDtX - TDtZ) \cdot \frac{\sqrt{2}}{2} \qquad \varepsilon_h = \Delta A - \Delta B$$

$$\Delta C = \Delta D = (TDtX + TDtZ) \cdot \frac{\sqrt{2}}{2} \qquad \varepsilon_v = \Delta D - \Delta C$$

The Shear stress-strain curve has been obtained by the composition of vector component and by the reaction Fxy of the 4369 Node, application point of displacement (Fig. 4a) in calibrated model.
Fig. 5 shows the theoretical-experimental comparisons for the wall obtained by means of several parametric analyses.

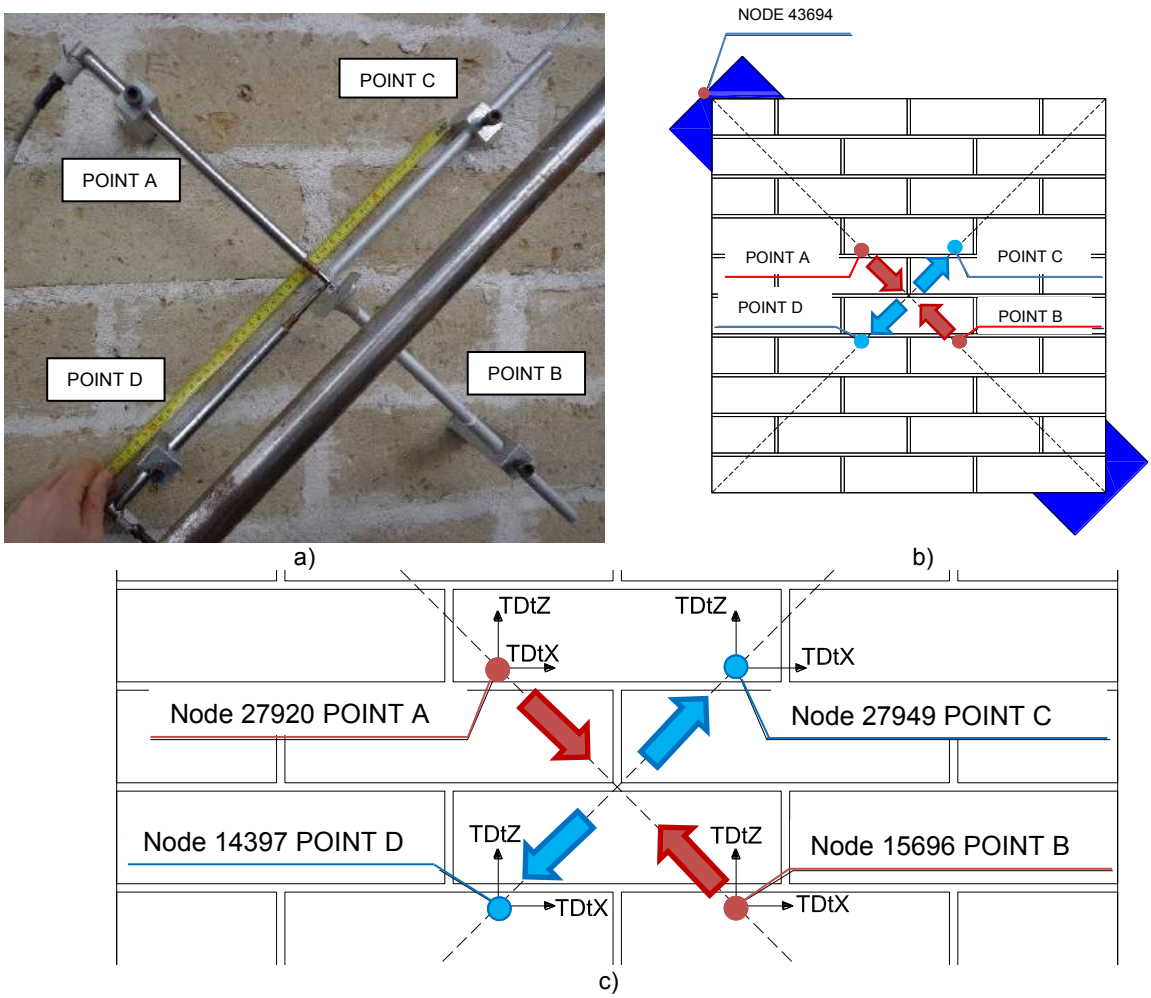

Fig. 4: a) layout linear displacement transducers (LVDTs); b) measurement locations; c) vector components of the displacement

Element	E [GPa]	f_c [MPa]	f_t [MPa]	Gc [N/mm]	Gfl [N/mm]
Tuff Brick	2.5	5.13	0.4	1.5	0.001
Mortar joint	2.0	6.10	0.2	2.8	0.001

Tab. 2: Mechanical properties of materials in the FE model

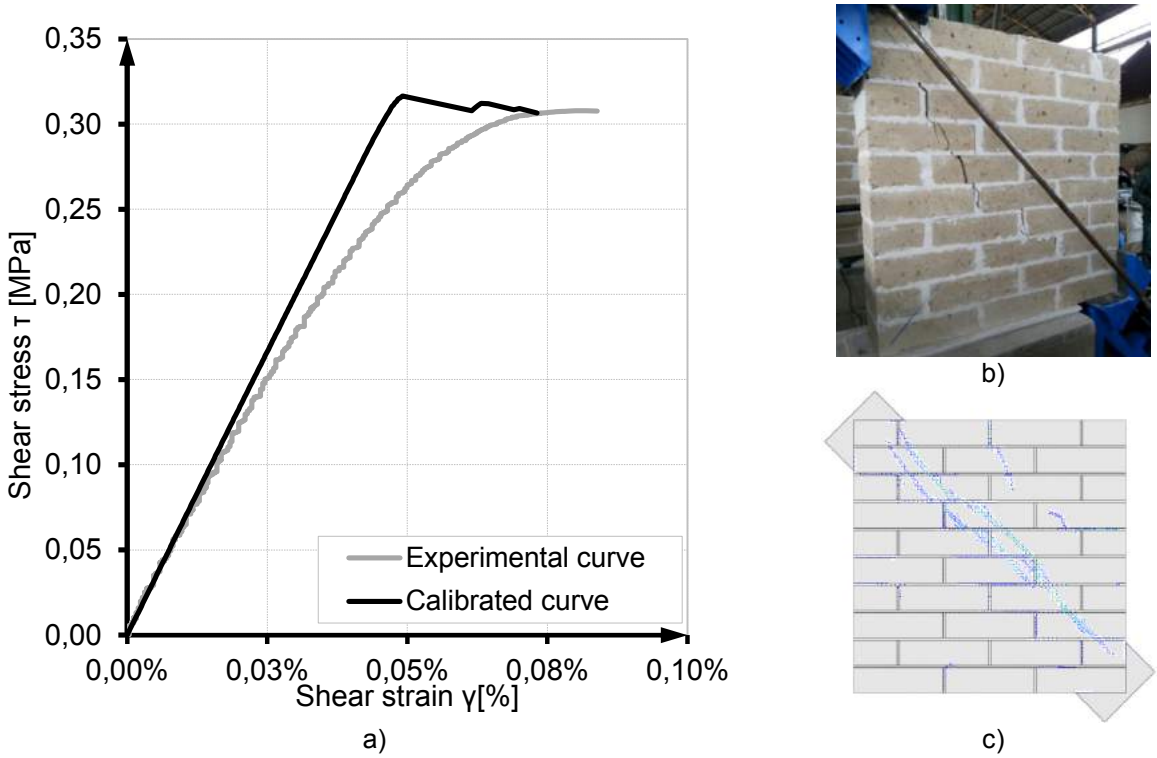

Fig. 5: a) Calibrated vs. Experimental comparison, b) Experimental failure mode, c) Numerical failure mode

Curve	E [ ]	ΔE [%]	τ_{max} [MPa]	Δτ [%]	γ [%]	Δγ [%]
Experimental	640.4	-4%	0.312	-1%	0.084%	13%
Calibrated	667.9		0.316		0.073%	

Tab. 3: Calibrated vs. Experimental comparison

2. Parametric Analysis

The influence of each constituent on the response of the wall has been evaluated by a sensitivity analysis, the limit behaviour for mortar and brick has been considered adopting two extreme tensile and compressive behaviours. The degradation of mortar has been accounted in terms not only of mechanical characteristics, but it has been simulated by means of a width reduction of the joint, accounting for the typical erosion of joints during time. The parametric analyses allowed to define the level of susceptibility of the global response, in particular the post-peak behaviour. The calibrated curve was compared to the curves obtained by varying mortar width as well as compressive and tensile behaviour, so as to measure the reduction of global response.

2.1 Modelling of degradation

The degradation of the constituents was modelled primarily in terms of embrittlement of materials, hence of reduction of ductility. To stress the degradation effect of embrittlement for a constituent, the brittle (B) behaviour of a constituent, has been associated to a ductile (D) behaviour for the other one.

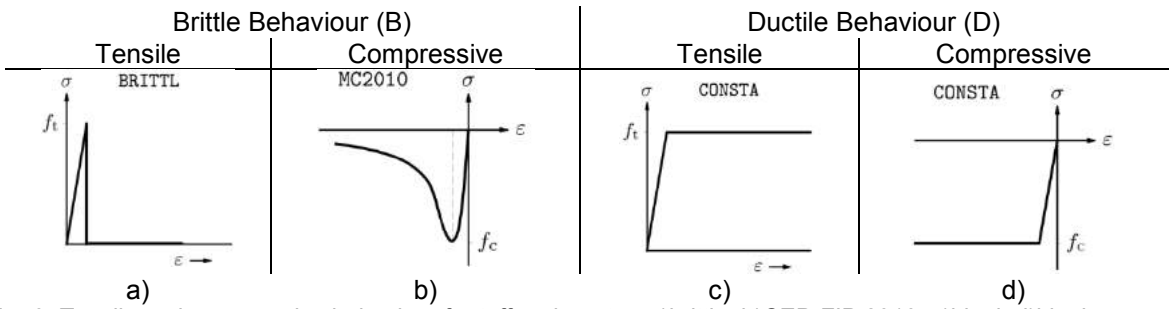

Fig. 6: Tensile and compressive behaviour for tuff and mortar, a)brittle; b)CEP-FIP 2010, c)ideal, d)ideal

Fig. 6 shows the functions used to assign a ductile or brittle behaviour to the constituents, in particular an ideal function was adopted to describe compressive and tensile ductile behaviours (Fig. 6c, d),

while a brittle function was adopted for tensile and compressive brittle behaviours (Fig. 6a, b). Moreover the surficial degradation, in particular for mortar, was considered by reducing the width of the mortar joints (Lignola et al. 2009 [5]) . Two reduced widths 200 -150 mm were considered to estimate such effect on the global response (see Fig. 7).

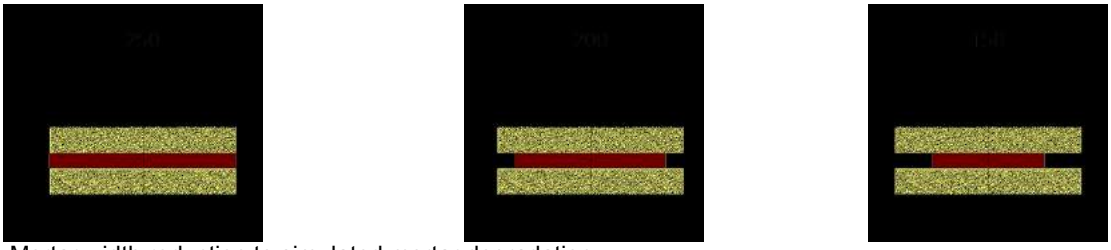

Fig. 7: Mortar width reduction to simulated mortar degradation

Eleven non-linear analyses were carried out considering various permutations of the ductile and brittle functions, in addition to the calibrated model. The outline of the analyses, involving different combinations of functions and widths, is shown in Tab. 4. The brittle behaviour has been assigned first to the mortar, then to the brick and finally to both mortar and brick. This latter situation is representative of an extreme degradation of the entire masonry.

SIGN	Mortar behaviour		Tuff Brick behaviour		Width
	Tensile	Compressive	Tensile	Compressive	[mm]
Calibrated	EXPONE	PAROBO	EXPONE	PAROBO	250-200-150
M(B,B)-T(D,D)	(B)	(B)	(D)	(D)	250-200-150
M(D,D)-T(B,B)	(D)	(D)	(B)	(B)	250-200-150
M(B,B)-T(B,B)	(B)	(B)	(B)	(B)	250-200-150

Tab. 4: Parametric Analysis outline

In Fig. 8 the calibrated shear stress-shear strain curve, τ-γ, is compared to the curves obtained by reduction of width and ductility.
Reductions of width of the mortar joint yield to a reduction of shear stress τ and increase of the ultimate shear stain γ (grey curves). The reduction of mortar ductility (blue curves) leads to a significant decreases of peak shear stress but a small increase of ductility and of ultimate shear stress compared to calibrated model. It is noted that a mortar width reduction (yellow curves) does not affect the simulations with brittle tuff stone.

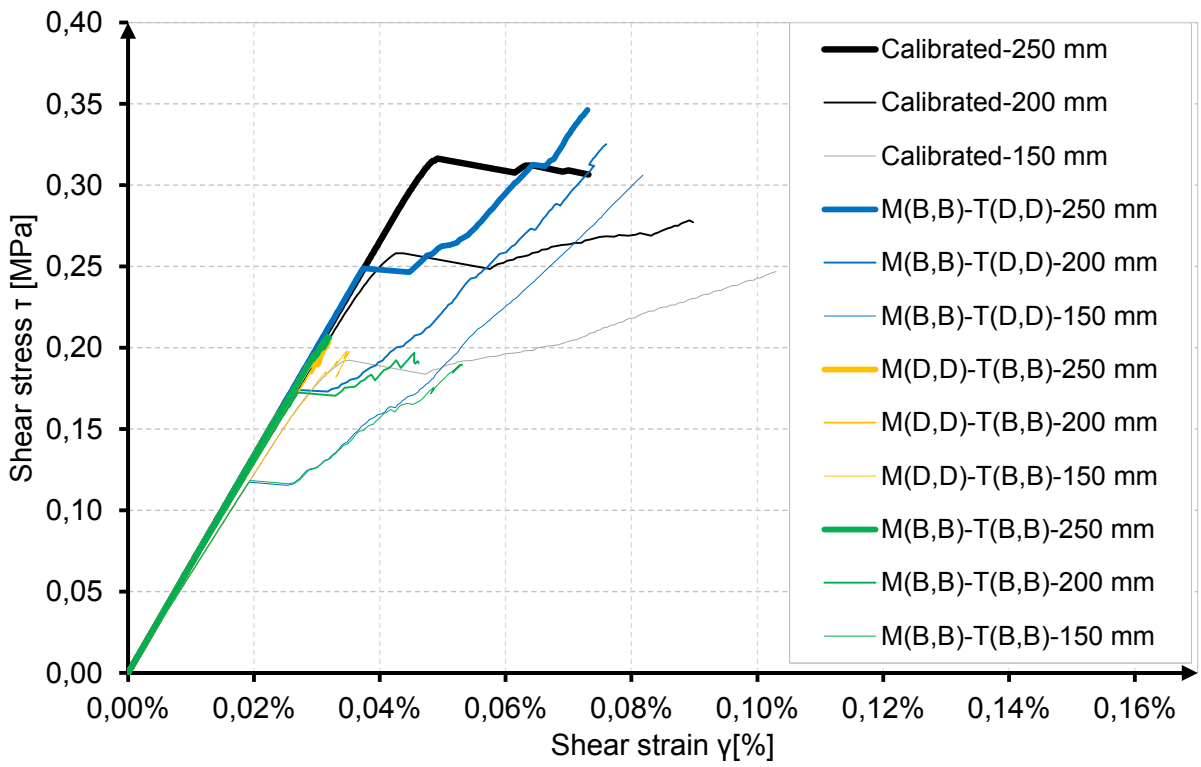

Fig. 8: Shear stress vs. strain comparison

The curves with brittle mortar and brick have shown that reductions of mortar width yields to ductility increases (green curves).
To focus on the dependency of peak shear stress to reductions of mortar width and limit material behaviours, a plot is provided in Fig. 9. For instance, the horizontal yellow line shows the independency of shear peak stress to mortar width if tuff is brittle while mortar is not. In all the other cases the peak shear stress increases with mortar width.

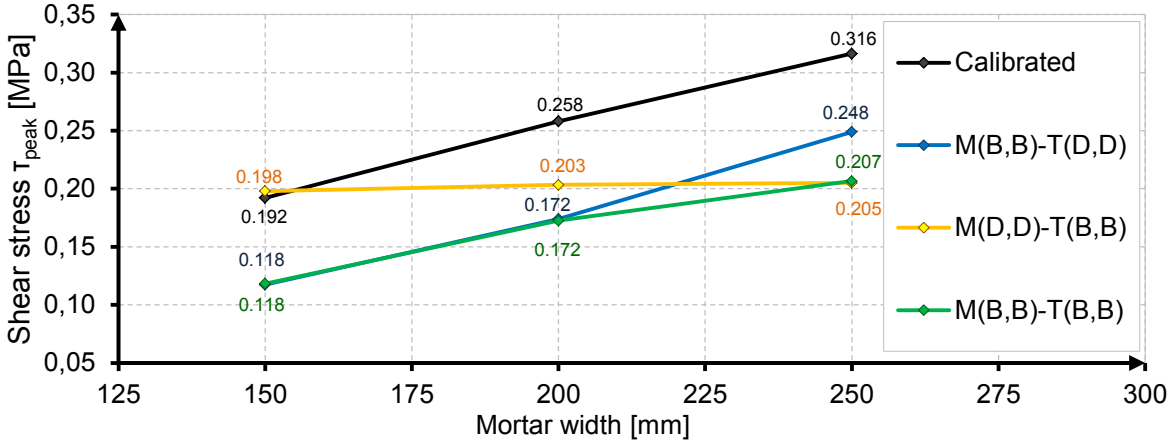

Fig. 9: Shear stress τ_{peak} vs. Mortar width for different values of mortar joint

For the width of 250 mm, the curves M(D,D)- T(B,B) (yellow) and M(B,B)-T(B,B) (green), show similar values of shear peak stress, because the global response is not influenced by the mortar, for lower widths, the mortar failure influences the global response of the wall. In Fig. 10 the crack patterns are reported at the peak. In the case of M(D,D)-T(B,B) the cracking is localized in the brick at the steel load device; only in the case 150 mm cracking was recorded in the mortar joints. For the other cases, cracking mainly involved the mortar.

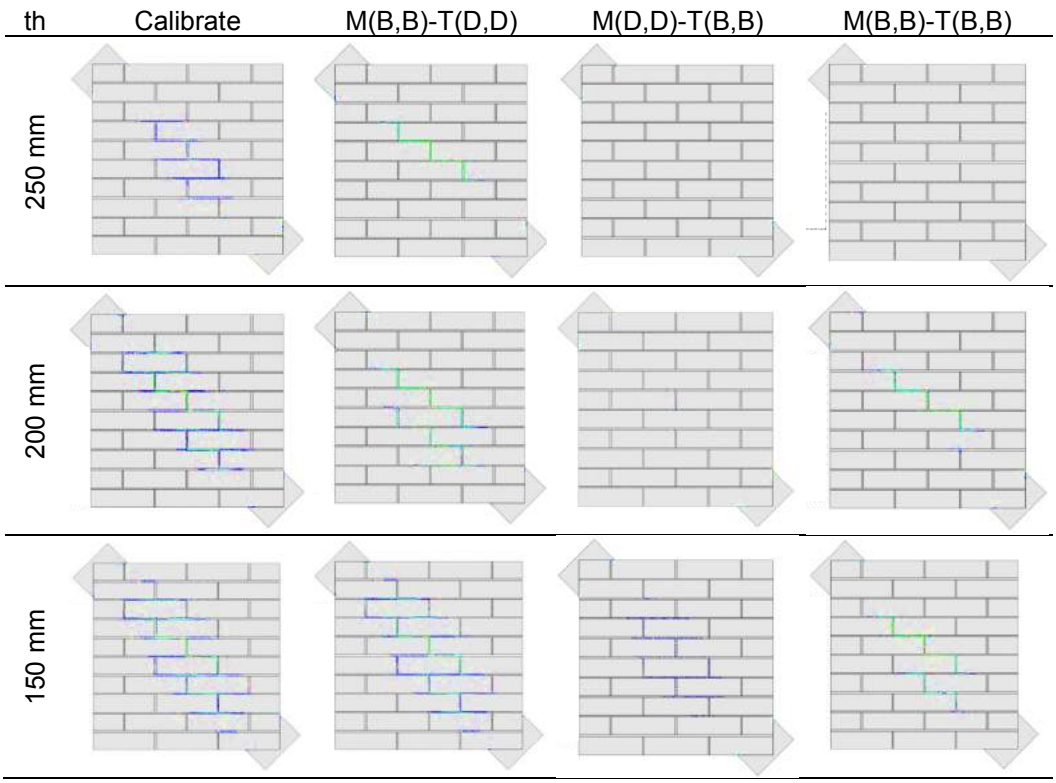

Fig. 10: Numerical peak failure mode for different values of mortar joint width: 250-200-150 mm.

A further analysis has been performed on the dependency of ultimate shear stress to reductions of mortar width and limit material behaviours, as reported in Fig. 11. The values of the M(B,B)- T(D,D) blue curve higher than the calibrated curve are due to the higher ductility of the tuff, indeed the cracks

are localized in the mortar joints (see Fig. 12). Similar value of shear stress was recorder for the case M(D,D)- T(B,B) and M(B,B)- T(B,B) where the global response is mainly related to tuff failure.

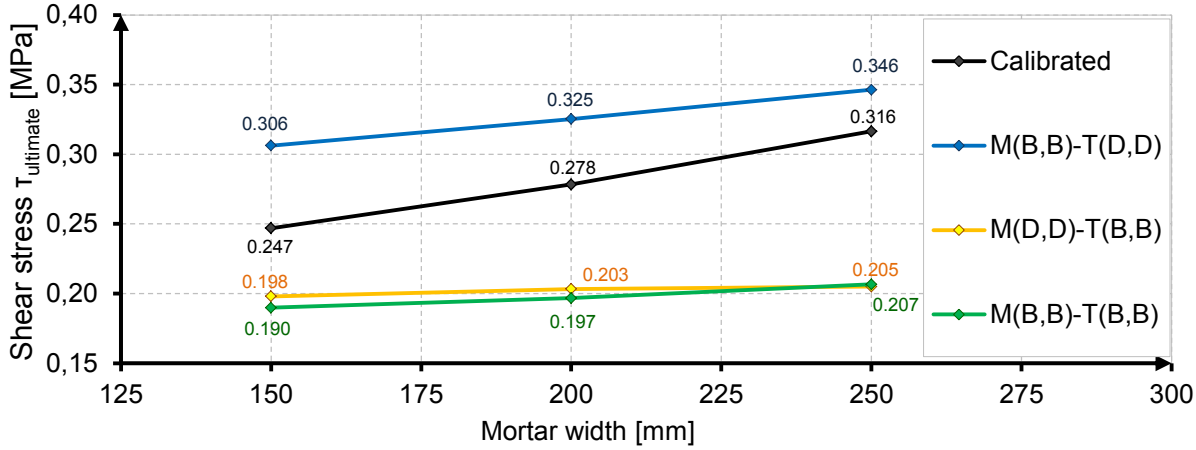

Fig. 11: Shear stress $\tau_{ultimate}$ vs. Mortar width for different values of mortar joint

Only the calibrate curved with 250 mm joints presented cracks both in the mortar and the brick, the other tests have been characterized by the cracking of a single constituent only. The highest shear strain reductions have been recorder for the tests with a brittle behaviour for the tuff; hence global results are mainly affected by the tuff degradation.

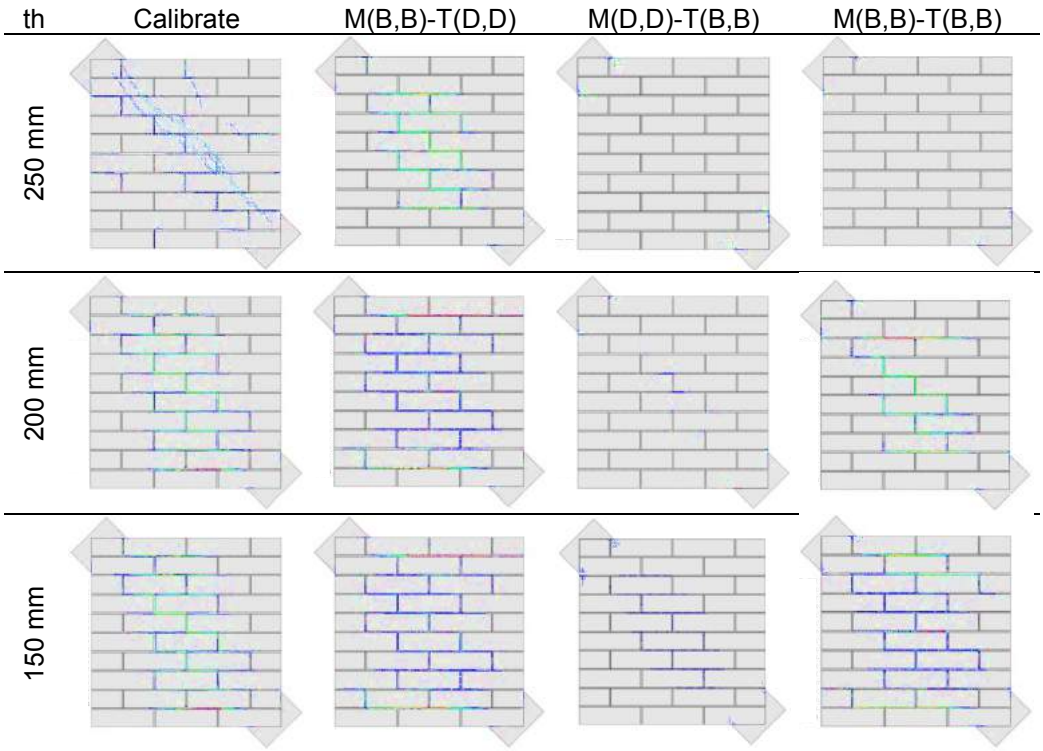

Fig. 12: Numerical ultimate step failure mode for different values of mortar joint width: 250-200-150 mm.

3. Conclusions

The numerical analyses based on an experimentally calibrated FEM allowed to investigate the influence of the degradation of the constituents of the masonry on the global response of the walls.
In particular the degradation involved both the surficial degradation simulated by means of mortar width reduction and the mechanical degradation simulated by means of limit behaviours for constituents (brittle and ductile, to emphasize extreme conditions).
The reduction of mortar width yields usually to:

- Reduction of (peak and ultimate) shear strength;
- Increase of deformability (i.e. shear strain).

The embrittlement of mortar yields usually to:

- Significant decrease of peak shear stress;

- Small increase of deformability (i.e. shear strain);
- Small increase of ultimate shear stress.

The embrittlement of tuff brick yields usually to:

- Significant decrease of (peak and ultimate) shear stress;
- Significant decrease of deformability (i.e. shear strain).

The embrittlement of both constituents usually represents a balance depending to the width of the mortar, if the width reduces the failure switches from tuff to mortar hence the behaviour is dominated by the failure of that constituent. If the mortar width is 250mm, the failure is dominated by the tuff and the shear stress/strain curve tends to overlap to the yellow one (i.e. M(D,D)- T(B,B)), while if the mortar width reduces, the failure is dominated by the mortar and the curve tends to overlap to the blue one (i.e. M(B,B)- T(D,D)).

Future development of this study includes the increase of combinations of limit behaviours and the reduction of the width of the bricks too.

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Structural survey for the seismic vulnerability mitigation

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Abstract
The survey is an important investigative tool of monuments and plays an essential role in the conservation of architectural heritage.
An accurate knowledge of geometry and construction techniques of a building through structural survey forms the basis for seismic vulnerability evaluation and therefore of the consolidation project.
The paper presents the case study of Sant'Antonio Abate church in Rieti, designed by Jacopo Barozzi da Vignola in 1570 and built on a pre-existence after the architect's death in 1573.
A 3D laser-scanner survey integrated with a digital photogrammetry app allowed to reconstruct the geometry of the church, highlighting the structural behavior of macro-elements that compose it. The study of archival documents together with the empirical analysis of the church brought into evidence construction technology and techniques allowing to distinguishing between the current status from that previous restoration works, which took place in 1989-90 and in 1994-95.
Analysis of mechanisms that could affect different macro-elements, verifications carried out using linear kinematics analysis and a critical study of the construction technology made it possible to evaluate the seismic vulnerability of the church. This meticulous knowledge path based on the structural survey led to the development of a project that, according to the principle of minimum intervention, was only limited to necessary works for seismic vulnerability mitigation.

Keywords: Architectural heritage, structural survey, seismic vulnerability, conservation.

1. Introduction
The architectural survey, intended as an operation of knowledge of formal and structural values of the building and its graphic transcription, forms the premise of the investigation about the monument and its historical-critical analysis. For a complete reading of the building, the geometric-dimensional understanding of the monument is accompanied by the need to investigate the historic building from the technical-construction point of view. From here stems the importance of the structural survey, which, using also the information contained in archival documents, allows depicting and evaluating the factory's construction equipment in all its components. The deep knowledge of the geometry and technical features of the building is the basis of the seismic vulnerability evaluation of the architectural heritage. Furthermore the survey, representing an important investigative tool of monuments, plays an essential role in the conservation of architectural heritage.
The restoration project, in fact, is inevitably linked to the pre-existence, which if properly investigated in the historical-critical terms, drives the action in all its aspects.
Therefore, it is understandable that the need for the survey appears unavoidable in the field of the protection and preservation of historical and artistic heritage. Only a thorough knowledge as much as possible of the monument, based on the architectural survey, provides the necessary awareness that, in accordance with the principle of minimum intervention, allows limiting the restoration project to the only necessary works.

Mario Centofanti is author of the "introduction" section and he played a research coordination role.

Fig. 1: Sant'Antonio Abate in Rieti. Aerial view, façade and the interior

2. Case study: the Church of Sant'Antonio Abate by Vignola

Sant'Antonio Abate is a single nave church with side chapels, a barrel vault with lunettes and without a transept. The church, designed by Jacopo Barozzi da Vignola, reflects the cultural context of the Counter-Reformation.

The Church of Sant'Antonio Abate belongs to the ex-Civil Hospital in Rieti, which already existed in the first half of the fourteenth century. In the fifteenth century, a chapel was built and then it was transformed into a small church. In 1570, a bigger church was commissioned to Jacopo Barozzi da Vignola (1507-1573). The work began in 1588, after the death of Vignola. The church was consecrated in 1620, but the upper part of the façade remained unfinished. In 1899 the hospital was expanded incorporating the church. The top floor of a new building, the so-called Severi hall, was built over the chapels on the left side of the church. In 1989-1990, the church was partially consolidated. The work concerned the roof, walls and vaults of the nave and side chapel along via Tancredi.

In 1994-1995 works had also been carried out on Severi Hall and vaults of the chapels supporting the building were reinforced.

The Church, compared with *Regola* of Vignola*,* has different proportions between internal and external orders. The internal Tuscan order and the proportions of the pillars and columns correspond to the precepts of the *Regola.* The module is equal to half the length of the pilasters, then the distance between the top of the arch and the architrave is one module and the height of the top of the arch from the ground is 13 modules. For the façade, Vignola applied the "*Rule*" in a much less observant manner: in order to relate the proportions of the façade to the size of the pilasters, the pedestal base has be included in its height. The module so measured is 1.5 times the width of the pilaster.

3. The integrated digital survey

The survey campaign was carried out using a laser scanner integrated with a digital photogrammetry application. In order to obtain a point resolution as homogeneous as possible, eight stations inside the church were established as follow: one in each chapel, one in the center and one in the entrance.

The entire ex-hospital was surveyed through 13 scansions: eight for the external facades of the hospital and the main and side elevations of the church; five inside the hospital, including the apse of the church incorporated in the complex.

On the base of the numerical points model, a 3D model was generated by extruding and interpolating the profiles obtained by cutting the points cloud.

In this way, the geometrical characteristics of the church have been recognized and represented.

Fig. 2: Three-dimensional models: numerical point cloud and surface models (survey and modelling carried out by Pamela Maiezza and Maria Laura Rossi)

3.1. Structural survey

In order to get a complete survey that included all the aspect of the church, a critical reconstruction of the technological system was also created by integrating archival documents data into the geometrical survey. Of particular use for this aim were diagnostic tests and photos of restoration works, which allowed to distinguishing between the current status from that previous restoration works which took place in 1989-90 and in 1994-95.

The foundation structures of Sant'Antonio Abate church are developed according to a terraces evolution, with subsequent and/or contemporary fills with resulting materials.

The foundation masonry, which continues below the ground level for 5 m, is free from degradation conditions. The pilasters of the chapels have a brick cladding and sponge stones nucleus, except for the first pilaster on the left of the entrance, entirely composed of sponge stone.

The barrel vault with lunettes above the single nave is characterized by stiffening arches and masonry buttresses. The arc of the main elevation is one of the vault stiffening arcs that becomes visible in the facade. The side chapels are topped with barrel vaults made of bricks laid on edge; the first and the third chapel on the side of the Ex Hospital have a spheroidal lunette.

All the vaults, after the works of 1989-90 and 1994-95, have a reinforced concrete vaulted structure, 10 cm thick.

Before the 1989-90 work, the nave roof was made of wooden trusses that were also supported by brick walls as additional aids. The king post presented wedges for the housing of the struts while a bracket, nailed on it, passed around the bottom chord. An additional bracket stared king post and struts. Trusts out of the plane provided an intermediate support for the ridge beams.

Purlins and joists held roof covering made of brick flat tiles and bent tiles. The same roof covering was placed on purlins (15x15 cm in section) and on rafters measuring 25 x 25 cm, above the side chapels.

The restoration works dismantled the original cover and replaced it by metal trusses with compressed web members, composed of L-coupled sections with in the middle uprights anchor plates.

The purlins are constituted by steel H-beams and, between one and the other, there are large hollow bricks with above the concrete filling; there are then a waterproofing bitumen layer, a concrete stratum and roof tiles.

The walls were connected together by means of a top reinforced concrete spandrel beam, fixed to the underlying masonry through the Φ 16 rods injected into the wall.

During the restoration work, the masonry of the arches separating the nave from the side chapels was strengthened with reinforced injections of cement mortar. Furthermore, the inspections show four irons outgoing by pilasters, which represent hinging to anchor the chapels walls and pillars.

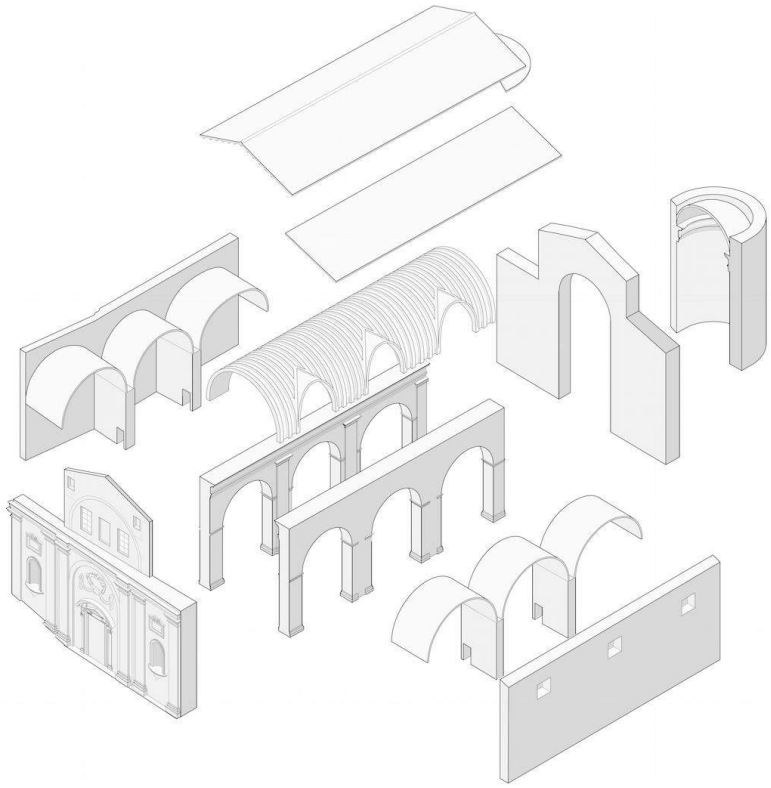

Fig. 3: Macro-elements of Sant'Antonio Abate church.

4. Seismic vulnerability evaluation

4.1. Analysis of possible mechanisms of macro-elements

The seismic vulnerability was evaluated trough an analysis of mechanisms that could affect different macro-elements and a critical study of the construction technology.
The Church of Sant'Antonio Abate was subdivided into six macro-elements, namely six parts of the fabric characterized by a structural response predominantly autonomous.
For each macro-element, the possible kinematics were analysed according with *Linee guida per la valutazione e riduzione del rischio sismico del patrimonio culturale.*
The seismic defenses, that can counteract the activation of the mechanism, and vulnerability indicators -such as pushing elements- which can increase the propensity to damage, were identified and estimated by assigning a score.
For a complete reading of the structural behavior of the Sant'Antonio Abate church, in addition to the macro-elements, the building so-called Severi hall was also taken into account, since it rests in part over the vaults of the left side chapels.
The medium-low value of the calculated vulnerability index led to infer that the church does not present high risks of mechanisms activation.
Deformations and the crack pattern were analyzed. The laser-scanner survey facilitated the deformations study through a visualization mode of the point cloud called "elevation map"; it, assigning a different color to the points according to the level curves, shows the displacements of the masonry from a vertical reference plane.
There were no deformations and damages caused by the macro-elements kinematics. The superficial lesions are mostly due to the degradation of the masonry itself, so the damage index calculation was overlooked. Since there was only a suspected lesion between the apse vault and the triumphal arch, a overturning verification was carried out using the linear kinematics analysis. This audit was conducted in two distinct states: one considering the presence of the spandrel beam and another ignoring it. The verification highlighted the need for a summit enchainment and that the reinforced concrete spandrel beam fulfills this function.

4.2. Critical analysis of the construction technology

In order to evaluate the seismic vulnerability of the church of Sant'Antonio Abate, in addition to Kinematics study, it was also important to analyze critically construction technology, in particular with reference to the restoration work of 1989-90 and 1994-95. For each intervention, we have identified the features, the potential criticality and the possibility or not to remove them.
The reinforced concrete vaulted structure, 10 cm thick, leads to a seismic masses increase and a compression state reduction, that at worst could cause the structure relaxation and the consequent bricks detachment. Furthermore, because of thermal coefficient difference, there may be the detachment between the two materials –brick and concrete- due to thermal excursion.

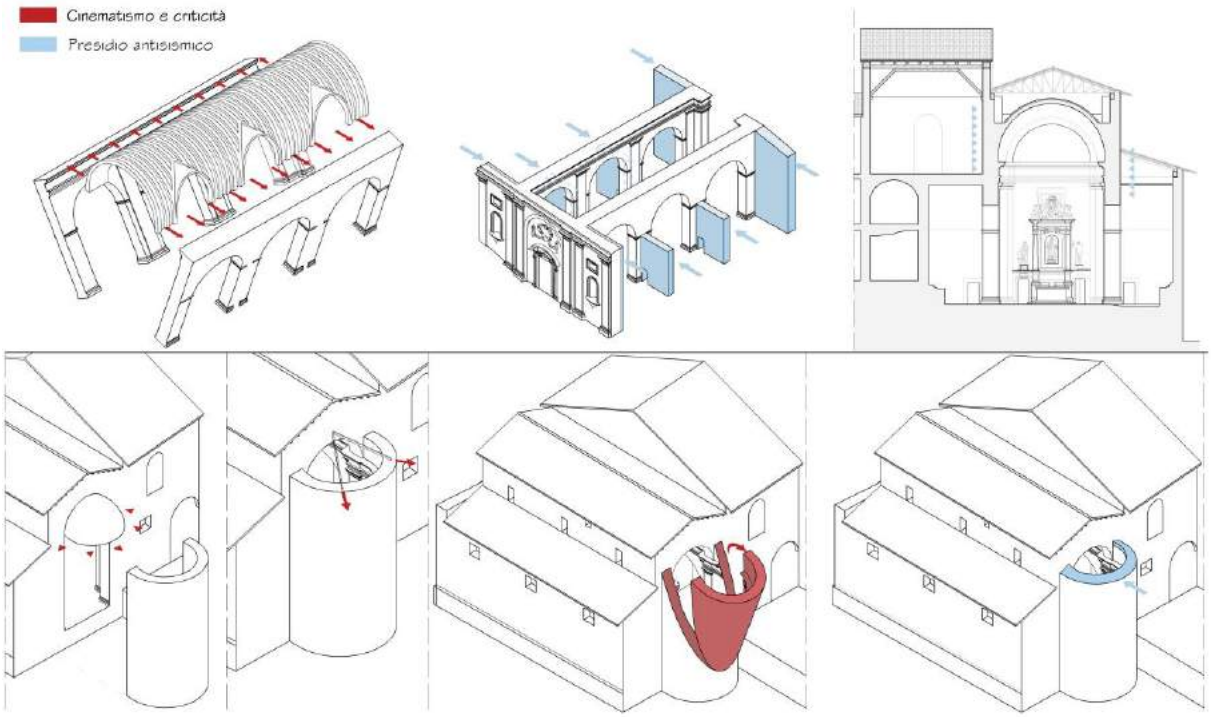

Fig. 4: Macro-elements method: vulnerability indicators and seismic defenses of the nave and apse overturning

Fig. 5: Barrel vault of the single nave before consolidation works

The reinforced perforations made on arches and pilaster may cause the materials disintegration and nullify the action of adhesion, because of different thermal coefficients. Therefore, this intervention reveals a dubious effectiveness in sewing cracks and masonry facing.
The nave spandrel beam, running horizontally on the longitudinal walls and obliquely on the gable, maintains its own section 35x50 cm, so if in the facade it spans the entire wall thickness, on the opposite side it affects less than half of the wall section. Thus, except for the façade, the spandrel beam involves only a part of the wall thickness leaving the remaining completely indifferent; the masonry below the spandrel beam can be thought plasticized while the remaining part is not exploited.
The reinforced concrete spandrel beam, light for the walls by the greater thickness, proves to be heavy and thus hard for the facade; therefore it can be considered a vulnerability factor. Furthermore, the anchor rods length of the spandrel beam is excessive (from 1.7 m upward) because, to be able to engage the stonework over a meter in depth, the steel bar should have an infinite stiffness.
The construction technologies analysis led to the conclusion that the restoration work, as well as disrespectful of the historic and artistic values of the church, constitute structural vulnerabilities.
However, because of their irreversibility, anything could be done to remove the highlighted criticalities, except for the reinforced spandrel beam.

5. Seismic vulnerability mitigation.

In compliance with the principle of minimum intervention, which suggests sticking always to the strict necessary, the project proposal aims to conciliate the historic-artistic values of the church with the seismic vulnerability mitigation.
Because of the analysis results (medium-low index of seismic vulnerability; constructive technologies criticalities unavoidable if not for the concrete spandrel beam), it was proposed to intervene only on the covers, eliminating the current curb with all its problems.
The project of seismic vulnerability mitigation provides for reinforced masonry spandrel beam that proves to be more compatible with the traditional masonry construction, while maintaining high efficiency in carrying out the required static functions.
This type of spandrel beam is distinguished from those in reinforced concrete in the construction and

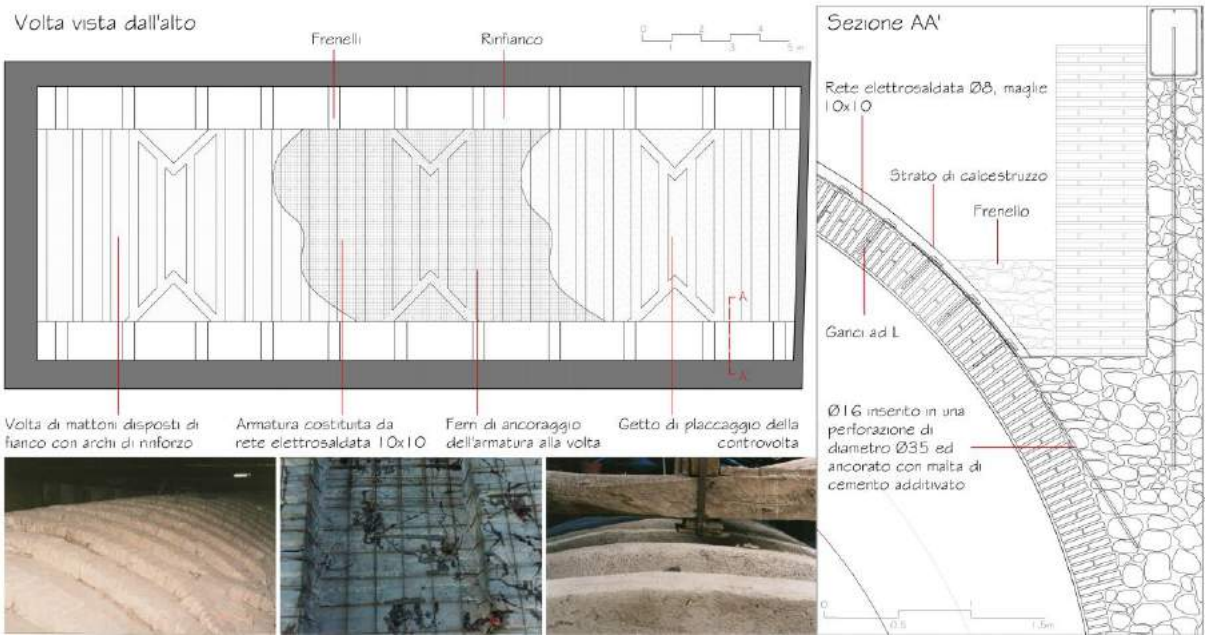

Fig. 6: The restoration of the vault

then in the operating principle. It contains the same rebar as required by the rules but it is implemented in layers and not through a concrete casting; this allows to reduce the shear strength between a row and the other making the structural element more flexible. The assembly of bricks varies depending on the masonry thickness. The bricks are placed so as to leave space for bars. The regular step of bricks alternately arranged, leaves the voids suitable for the positioning of the connecting brackets that enclose the metal cage. The toothing with adjoining masonry is guaranteed through bricks positioned transversely that occasionally replace a longitudinal brick.
Since cover has been removed for changing the spandrel beam, it was decided to complete the operation with the substitution of steel trusses with wooden trusses, more respectful of the historical-formal values of the church. For single nave, the project provides for wooden trusses anchored to the summit spandrel beam through a steel cuff fastened with four anchor rods. The secondary roof framework is constituted by purlins that support the rafters above which a layer of clay tiles is provided, as it was in the old roof. In correspondence of the purlins, a row of tiles is replaced by a wooden beam that acts as a connection of the joists and against the sliding of the tiles mantle. To avoid the risk of planimetric deformations, it was decided to stiffen the pitch through braces consisting of metal plates arranged in a cross. Wooden rafters, anchored to the reinforced masonry spandrel beam by means of steel cuffs, support the roof covering of the apse. In order to limit the thickness of the cover, the purlins are connected at the side of the struts, thus recovering the height of the same; the connection is made through a metal bracket placed. For the side chapels the project envisages the wooden half trusses, resting on the spandrel beam through wired cuffs. The half trusses is anchored to the masonry through a wooden vertical element of connection between the strut and chain, fixed through the horizontal bars.
The conclusive step of the project has been the comparison of criticalities and seismic defenses, existing or planned in the project. The purpose was to ensure that all identified vulnerabilities were properly neutralized, except for the critical situations arising out of irreversible interventions.

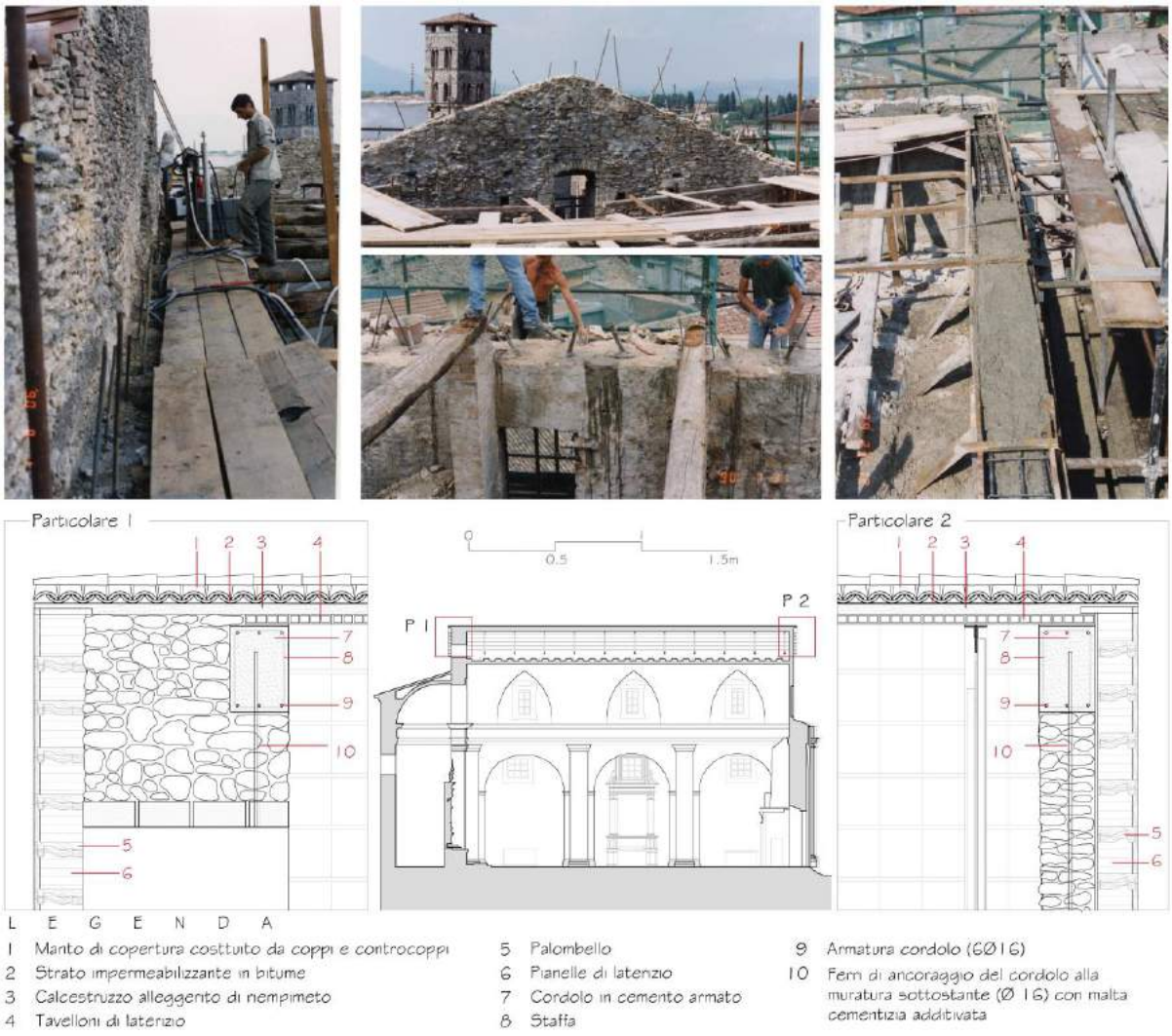

Fig. 7: Photos and sections of the present nave spandrel beam

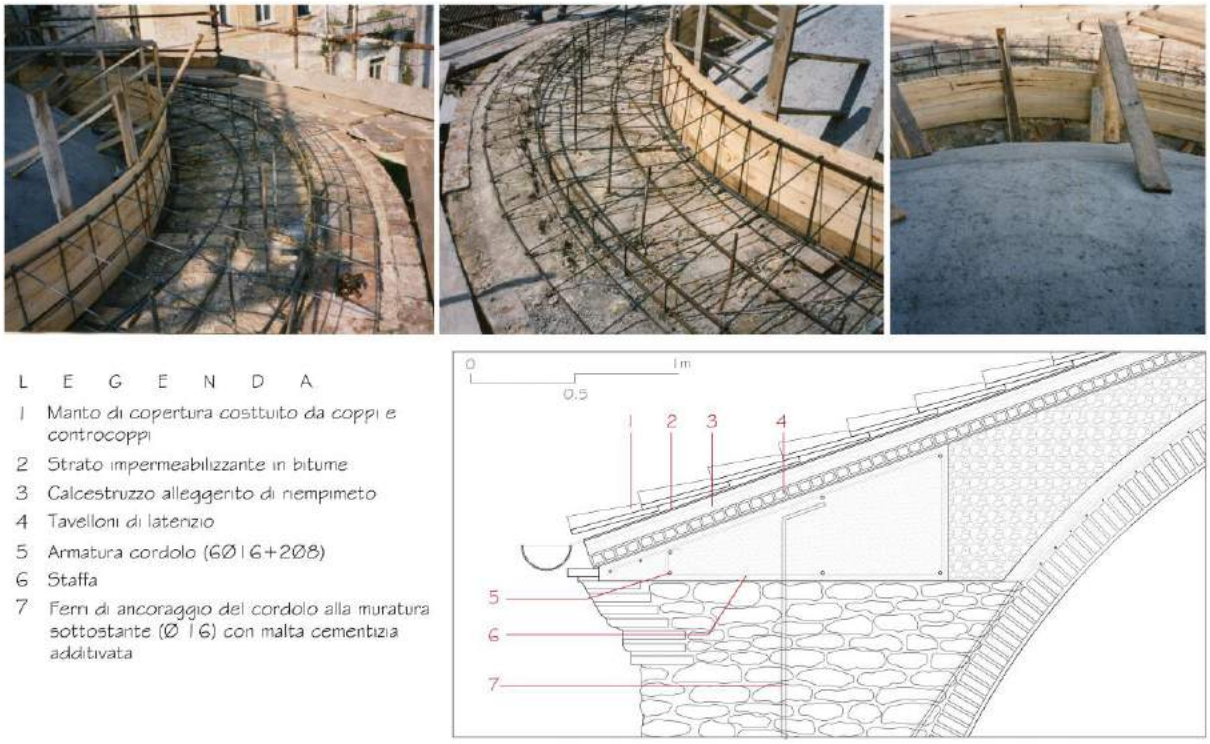

Fig. 8 : Photos and sections of the present apse spandrel beam

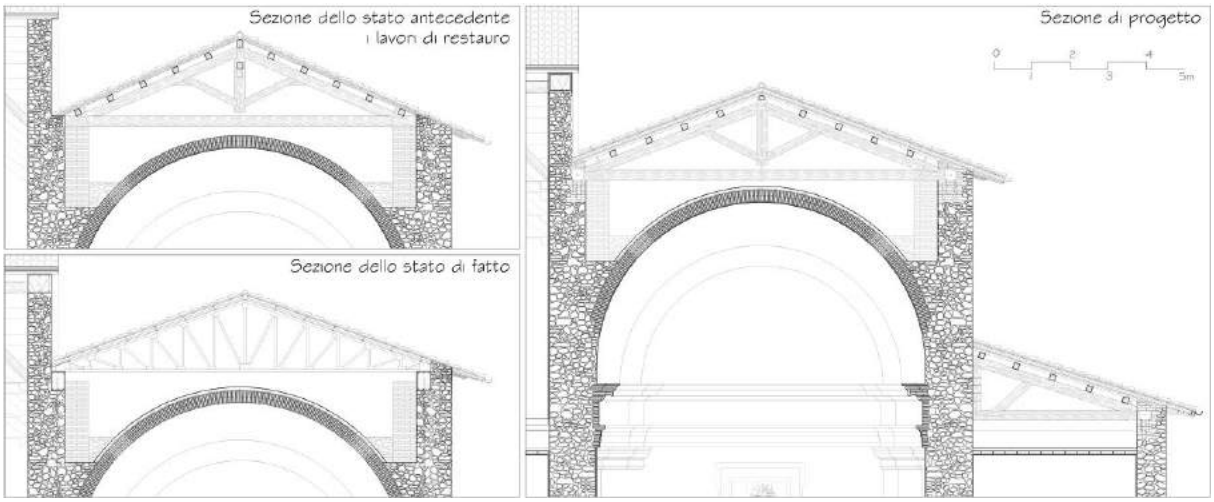

Fig. 9: Comparing sections: status previous restoration works, current status, project proposal

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The recovery of the Italian industrial heritage: the case of the Solvay Silos by Pier Luigi Nervi in San Vincenzo (Tuscany)

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Abstract
The Solvay Silos in San Vincenzo (Tuscany), built between 1928 and 1936 and designed by Pier Luigi Nervi and the Ceretti□Tanfani Company, belongs to that multitude of huge industrial structures which, originally built in the early 20th century at the edges of a city, after the 2nd World War was overwhelmed by the uncontrolled urban expansion, losing its use and becoming incompatible with the urban tissue.
This paper aims to present the results of a project proposal for the sustainable recovery of the silos. The project primarily focused on the architectural survey of the structure and on the reconstruction of its historical events. The analysis followed at a territorial scale, in order to understand the dynamics that could make the silos recovery an important opportunity for the community of San Vincenzo. The success of the intervention strongly depends on the level of integration with the city and on its capability of creating new touristic, cultural, economic and social opportunities. The project therefore proposes a sustainable regeneration of the structure for community services: spaces for co-working, cultural activities and for the promotion of the local food products. For this purpose, a feasibility study was developed considering gradual recovery interventions with both public and private financing in a business plan covering a period of 27 years.

Keywords: Solvay Silos, Pier Luigi Nervi, industrial archaeology, transformation, project financing

1. Introduction
The Solvay Silos in San Vincenzo (Tuscany), surrounded by the Tyrrhenian railway line and the ancient Via Aurelia and only 200 meters far from the sea, has represented an important sign of the industrial development of the territory until 2008, when its activity ended. Nevertheless, for its huge dimension and its strategical position, the silos still represents one of the main elements in the urban tissue (fig. 1).
As an important example of industrial archaeology, for its conservation it's necessary to find new compatible functions, going beyond the logic of a mere preservation bond [2]. In many cases, in fact, several public and private organizations have shown interest for this kind of structures, which may represent a real opportunity for the socio-economic development of a community [5]. Something more than degradation or even demolition can be imagined for many of these industrial structures. Great dimensions, good accessibility, modular plan and serial structures, flexible spatial distribution and

great adjacent free areas, make in fact great part of the ancient industrial heritage easily modifiable for many possible reuses.
After some first example of restauration, prevalently oriented to the mere conservation or to the realization of public or exhibition spaces, in the last 20 years all over the Europe - including Italy - we can see a trend reversal, with several interventions of reuse of ancient industrial structures for 'minor' functions, as artisan or service activities [1]. In this perspective, this papers aims to show the main features and the methodological approach used for the definition of a sustainable reuse project of the Solvay Silos for new productive and socio cultural activities.
The project primarily focused on the historical analysis of the Silos and its context, based on the study of the main bibliographic and archive sources, most of them found in the archive of the Solvay Company in Rosignano. The architectural survey of the structure was therefore developed on the base of the original project drawings. The analysis followed at a territorial scale, in order to understand which sustainable reuse could be imagined for the silos. The recovery project was therefore verified in its feasibility by mean of a project financing in a business plan covering a period of 27 years.

Fig. 1: Areal map of San Vincenzo. In evidence, the Solvay Silos and its neighbourhoods.

2. The historical analysis

The northern part of the Maremma territory is very rich in mineral resources. We are in fact on the edge of the metalliferous hills, where mining activities have been practiced as far back as the Etruscan Age.
In the early 20th century, the Solvay Company started to search in this area the necessary raw materials - salt and limestone - and the geomorphological features for the production of soda.
The first Italian Solvay plant - with its industrial village - was realized therefore in 1913 in the territory of Rosignano Marittimo. The industrial production required the supply of limestone, found in the site of Acquabona, close to Rosignano. After few years, these quarries were exhausted; so in 1929, it was necessary to open new quarries on the San Carlo hill in the territory of San Vincenzo. The opening of the quarries provided the construction of a small industrial village.
In the same years, between 1926 and 1927, the project for the transportation of the extracted material from the quarry to the Tyrrhenian railway line – and therefore to the Solvay plant by train - was defined. Two alternative hypotheses were proposed: the construction of a railway branch up to the point of unloading, or the construction of a cableway, which could continuously transport the limestone by means of trolleys. The second solution was preferred, as it was more economic and it allowed a faster transport cycle. The cableway, four and half kilometres long, was realized in 1928 by the Ceretti Tanfani Company, together with three operative stations: two terminal stations for the limestone loading and unloading, and an intermediary one for the cableway support and traction.
The unloading station, commonly known as Solvay Silos, represents the final part of this system of transportation. In the Solvay Silos, placed near the San Vincenzo railway station, limestone was loaded on the "white trains" (so called for the whiteness of the limestone), which by a special railway junction led into the Tyrrhenian railway line and finally reached the Solvay chemical laboratories in Rosignano, 34 kilometres far from San Vincenzo.
The silos, since its original conformation, is constituted by two structures, which are independent but at the same time connected to each other: a reinforced concrete hopper for the limestone collection and a steel superstructure used for the transit of the cableway trolleys and their emptying into the

hopper. The design of the two structures was entrusted to two of the most important building companies at the time: the *Società per costruzioni Ing. Nervi & Nebbiosi*, which designed the hopper, and the *Società Anonima Ceretti & Tanfani*, specialized in industrial steel structures (fig. 2).
The steel structure, designed for the silos as for the loading and the intermediate stations, is defined by a series of portals, connected by steel trusses which support the cableway trolleys. The Silos has a T shape plan, with the longitudinal body placed parallel to the Tyrrhenian railway line, and the transverse arm aligned in direction of the cableway.

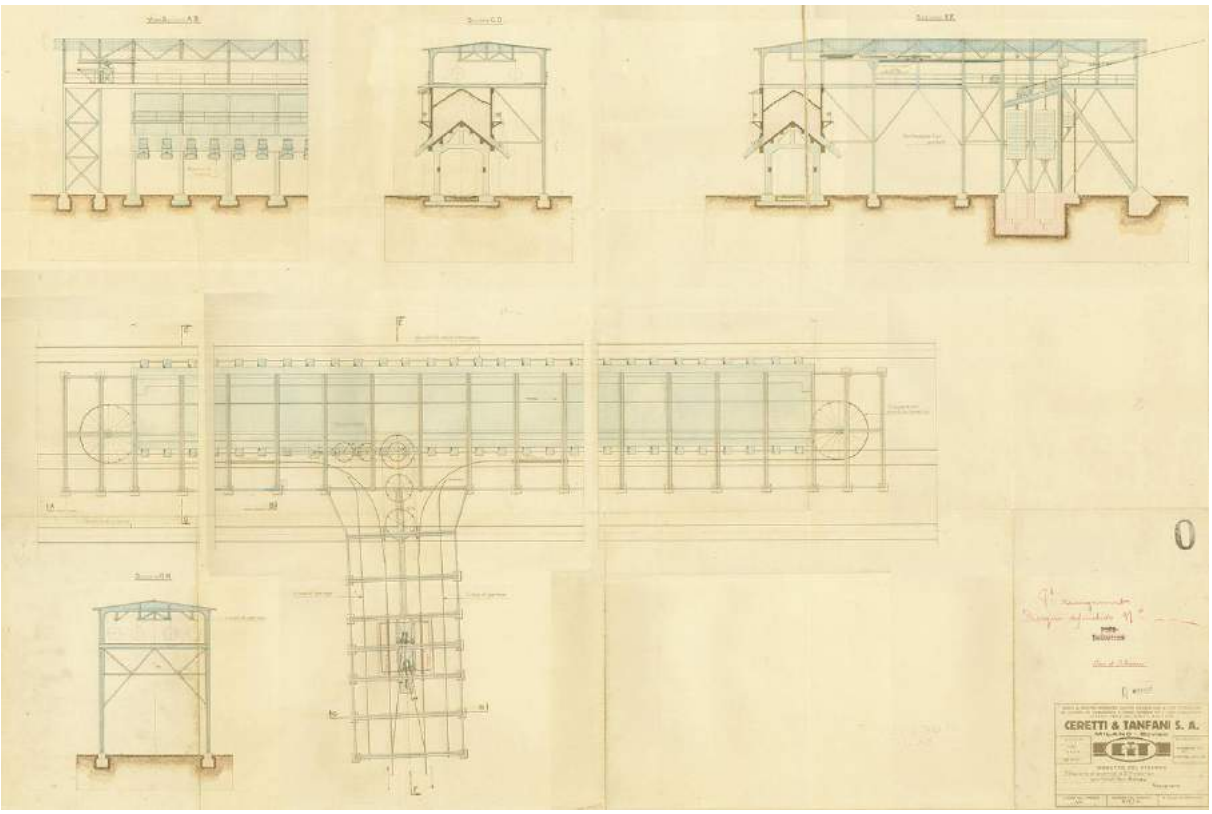

Fig. 2: Preliminary project of the Solvay Silos by Ceretti□Tanfani (Historical Archive of Rosignano Solvay).

The project for the reinforced concrete hopper, designed by Nervi □ Nebbiosi, was completed in 1928 (fig. 3). The structure, 120 meters long, was modelled for supporting heavy weights and at the same time for reducing its resistant sections. The Silos was inaugurated in August 1929 (fig. 4).

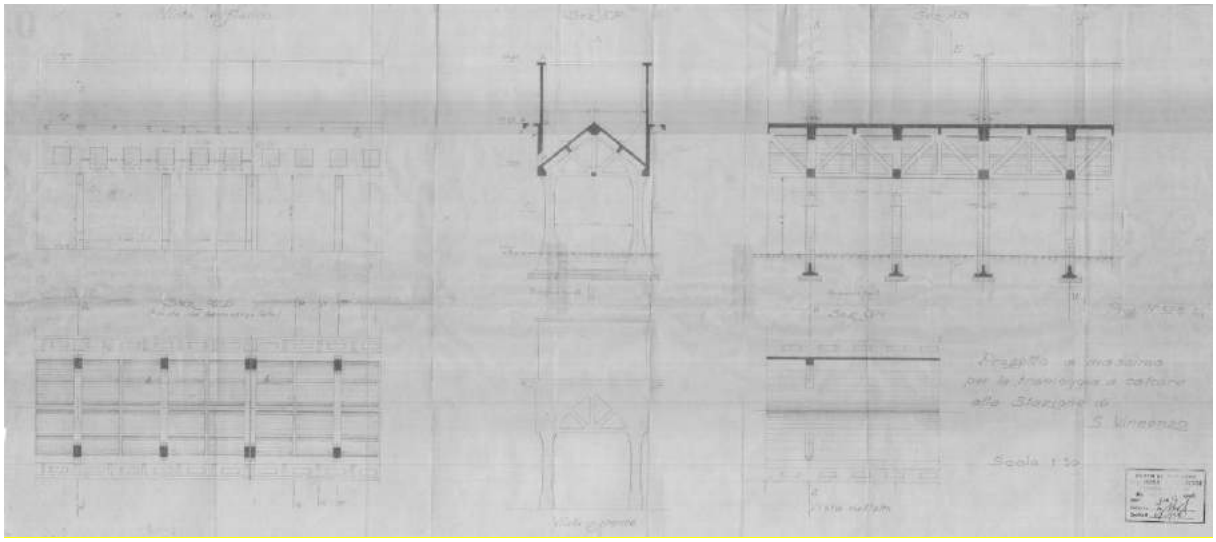

Fig. 3: Definitive project of the Silos by Nervi □ Nebbiosi (Historical Archive of Rosignano Solvay).

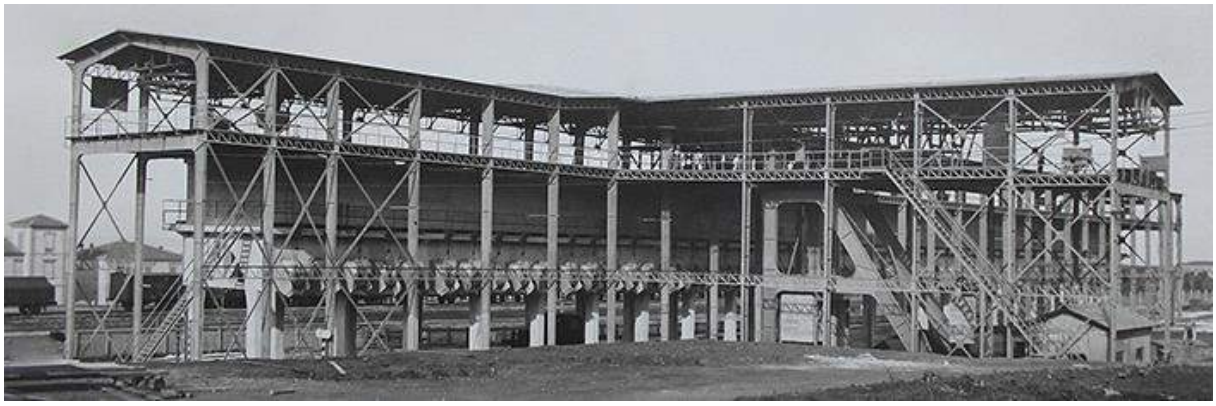

Fig. 4: Historical photo of the Solvay Silos in the 1930's (Historical Archive of Rosignano Solvay).

In 1935, the necessity of increasing the exploitation of the San Carlo quarries required the extension of the unloading station. The project was entrusted to the new society founded by Pier Luigi Nervi in 1932: the *Società anonima Ingg. Nervi and Bartoli.* The new structure was totally conceived in reinforced concrete.
The 60 meters long extension was located at the northern head of the original structure. The realization of this structure within the existing one, required the dismantling of the steel components of the northern extremity and their subsequent reassembly at the new northern head. For this structure, Nervi used the technology for reinforced concrete that he had patented in 1917. The structure was completed at the end of 1936 and tested in May 1938.
During its nearly 70 years of incessant activity, the silos was subjected to little maintenance works. In the 1990's, new interventions for limiting the dispersion of dust in the air and for the global soundproofing of the plant, determined the modification of the structure formal characters and the concealing of the plastic forms designed by Nervi.
In 2003, the *Accordo di Programma San Carlo* □□□□, a new agreement between the Solvay Company and the local government bodies - the Municipality of San Vincenzo, the Region of Tuscany, the Province of Pisa – defined the reorganization of the infrastructures for the limestone transportation from the San Carlo quarries to the railway station (in particular the construction of a new loading station near the quarry and a new railway between the quarry and the San Vincenzo railway station), with the consequent closure of the cableway system with its stations in 2008 [4].
After the closure and the consequent dismantling of its roof and curtain panels, the Solvay Silos now appears as it was originally conceived, with its skeleton exposed to the weather and to a slow and inevitable degradation (fig. 5).

Fig. 5: The Solvay Silos nowadays.

3. The architectural survey

The architectural survey of the Solvay Silos consisted in the verification of its present state with regard to the original project drawings (fig. 6). As we said, the silos is composed by three complementary

parts: the reinforced concrete hopper, designed by Nervi Nebbiosi in 1928; the steel superstructure designed by Ceretti Tanfani in 1928; and the reinforced concrete extension, designed by Nervi Bartoli in 1936, which units both the functions of hopper and coverage.

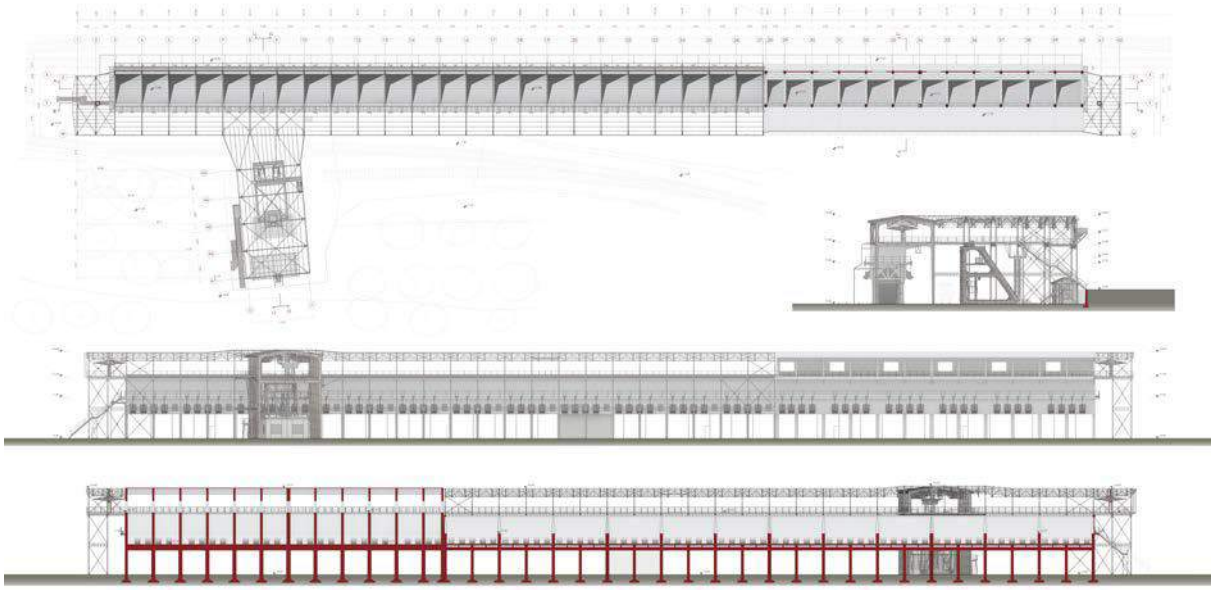

Fig. 6: Extract of the architectural survey drawings. Original scale 1:200 (drawings by L. Bianchi).

The limestone hopper consists in a long reinforced concrete tank on pillars, with 52x65 cm wide sections. The hopper represents the most important structure from a historical and architectural point of view. The structure, 120.60 meters long and 11.00 meters high, is composed by four modules, separated each other by flat expansion joints; the module, 30.15 meters long and 5.90 meters large, is made up of six spans (fig. 7).

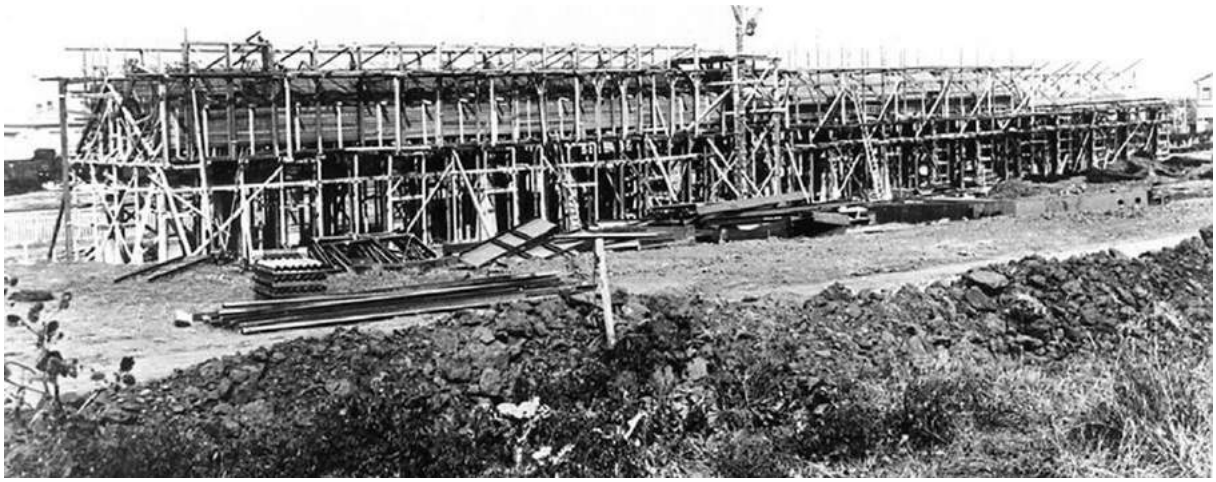

Fig. 7: The hopper under construction in 1928 (Historical Archive of Rosignano Solvay).

The steel structure made by Ceretti Tanfani is leaned on the hopper for its great part. The structure is longitudinally divided into 24 spans; each span is 5.025 meters long, except for the two terminal ones, which are 3.50 meters long. The whole structure – 134.60 meters long, 11.85 meters large and 16.00 meters high - consists therefore in a reticular structure which, with slim resistant sections and limited amount of constructive elements, has large distances between the supports (fig. 8).
The new reinforced concrete structure, designed by Nervi Bartoli in 1935, consists of 2 contiguous blocks; each block is 30 meters long and composed by 6 frames. The hopper has a flat basic floor, made by a ribbed slab with a series of rectangular beams. At the upper level and at the coverage one,

the structure has two big projections – 4 meters long for the upper level and 5 meters long for the coverage – supported by variable-section beams (fig. 9).

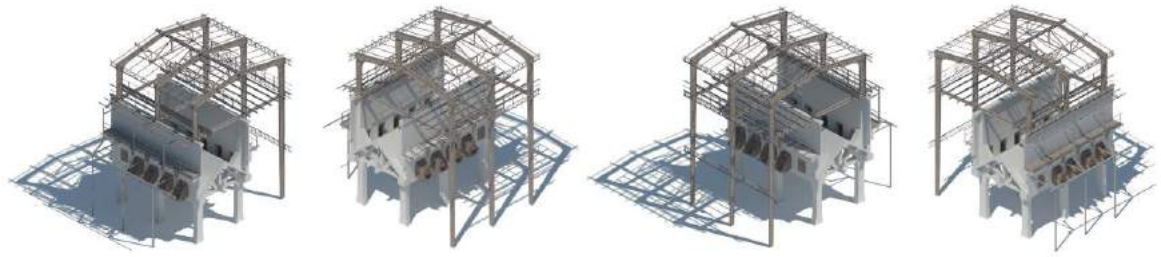

Fig. 8: 3D model of the base module of the original structure (drawing by L. Bianchi).

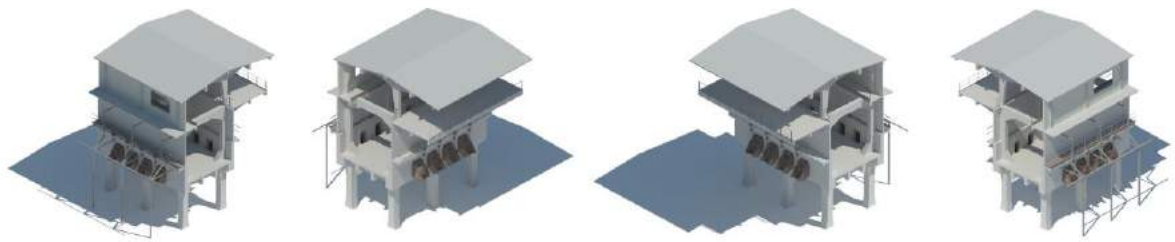

Fig. 9: 3D model of the base module of the reinforced concrete extension designed by Nervi Bartoli in 1935 (drawing by L. Bianchi).

4. The recovery project

The recovery project for the silos proposes its reuse for community services and aims to realize some good synergies, able to trigger forms of reciprocal valorization between 'contents' and 'containers'. The following guidelines have been defined for the development of the project:

- to recognize the documentary value of the structure in order to preserve its essential characters;
- to define a new layout for the spatial and functional relations;
- to insert new functions, preserving the constructive and typological characters of the building.

The aim is to promote the functional recovery using neutrality, lightness, fluidity and transparency, in order to preserve the structural and formal integrity of the building, and at the same time to use a contemporary and recognizable language for the new insertions.

The first step consists of course in the restoration of the existing structures, with the contextual removal of some incongruous or marginal elements. The project therefore provides the insertion of new modular surfaces and volumes, using a drywall construction system. The main character of the intervention is the functional versatility with which new elements are managed, thus avoiding both the spatial-distributional problems and those deriving from the new technical system. The whole project has been designed as a sort of *mechano*, made by elements which can be mantled and dismantled depending on the real needs. On the other hand, in order to respect the existing geometrical and spatial proportions of the structure, the project has been developed with the insertion of easily recognizable box-shaped elements, with opaque or transparent surfaces, made by polycarbonate, glass, aluminium or wood (figg. 10, 11).

At the ground floor, the new functions are hosted in wooden additional volumes, inserted between the hopper pillars. At the first level, great open spaces are carved out in the hopper huge volume, accessible thanks to the recovery of the existing promenade along the hopper and the insertion of new suspended walkways for the transversal connection. The upper floor maintains its original open conformation, with the only addiction of some modules, shaped and placed according to the existing structure. All the new activities, defined on the base of the results of an analysis carried out at a territorial and urban scale, can be divided in three functional macro-categories: the "Culture-Hub", the "Food-Hub" and the "Work-Hub". All the hub activities are identified by one of the three primary colours: red, yellow and blue.

The Culture-Hub includes a bookshop and artisan and multimedia workshops at the ground level; inside the hopper, a new structure, in steel and glass, contains exhibition spaces, leaving the huge concrete container visible. The upper floor hosts an eco-museum, with reception, game rooms and spaces for temporary exhibitions. The Food-Hub, instead, is characterized by the presence of a

lounge-bar at the ground floor, a food and wine cluster at the first floor; the cluster is composed by 6 stands, designed as wooden boxes, placed at the centre of the space between the existing trusses and beams. The Work-Hub is made at the ground floor by combinable wooden modules for *start-up* activities; at the hopper level, the hub provides a multifunctional hall with a small auditorium, connected with the upper level dedicated to co-working activities.
Four new functional towers, in steel and polycarbonate, are built within the existing structure. Each tower contains a staircase, an elevator and technical compartments, and is flanked by a prefabricated wooden module for the toilets. On the roof, clad in aluminium panels, there are a photovoltaic system and two wind turbines placed at the heads of the structure.
All around, the new industrial park is conceived as a complementary element of the Silos, with a new system of cycle-pedestrian paths, parking areas and a new pedestrian bridge over the railway line coming from San Carlo. A new pedestrian underpass connects the Silos with its park to the city centre of San Vincenzo.

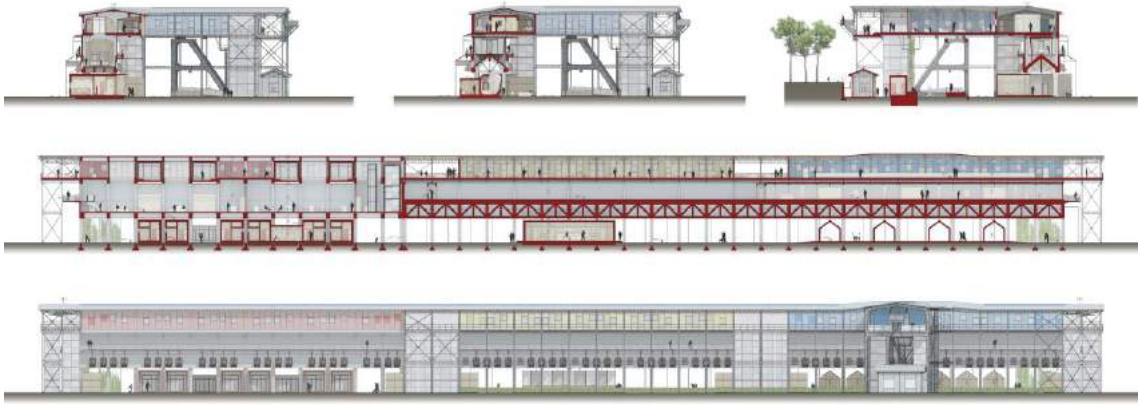

Fig. 1□: Project drawings. Original scale 1:200 (drawing by L. Bianchi).

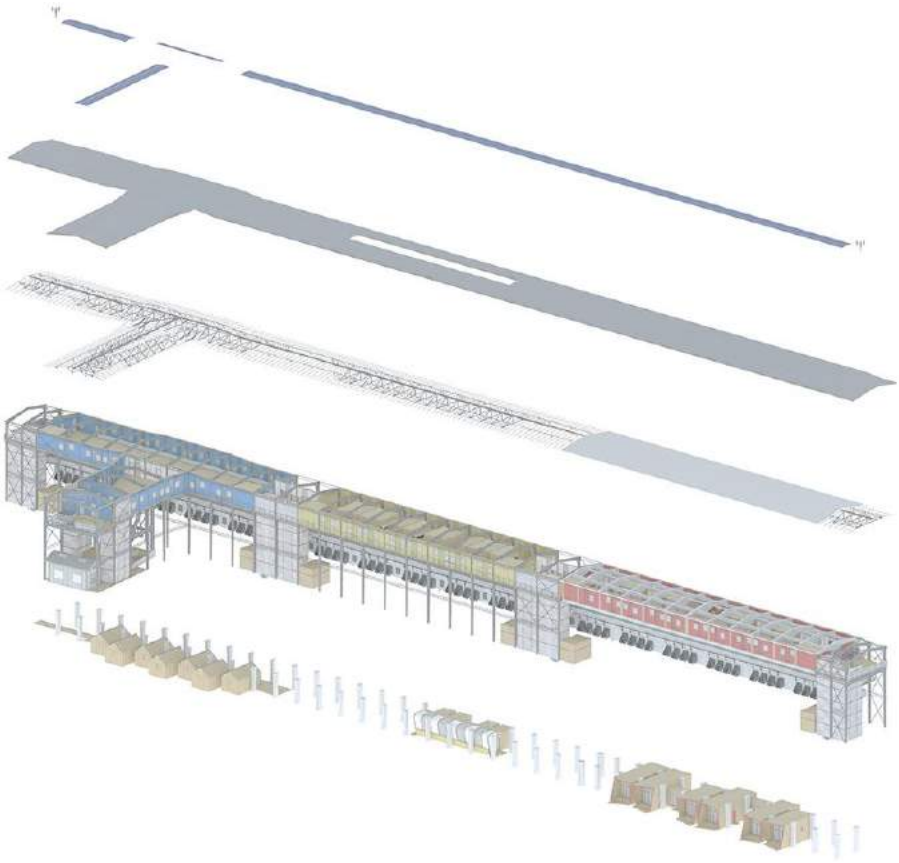

Fig. 11: Exploded axonometric of the renewed Silos (drawing by L. Bianchi).

5. Business Plan

The project proposal is supported by a feasibility study, based on the estimation of the costs of construction, maintenance and management, using a parametric metric calculation. The aim is to demonstrate the feasibility of the project in relation to its ability of producing incomes over time and consequently paying the initial investment [3].

The study is therefore made up of the analysis both of the project, aimed at identifying the global recovery costs, and of the revenues and expenditures generated by the project (cash flow).

A business plan has been consequently developed in order to consider the overall costs (construction, operative, and maintenance costs) and the potentially achievable revenues in the hypothesis of a life cycle of 25 years. In particular, the feasibility study is based on a project financing plan covering a period of 27 years, in which cash flows are defined, and on a plan of investments for the verification of the best economic and financial balance of the works in their whole.

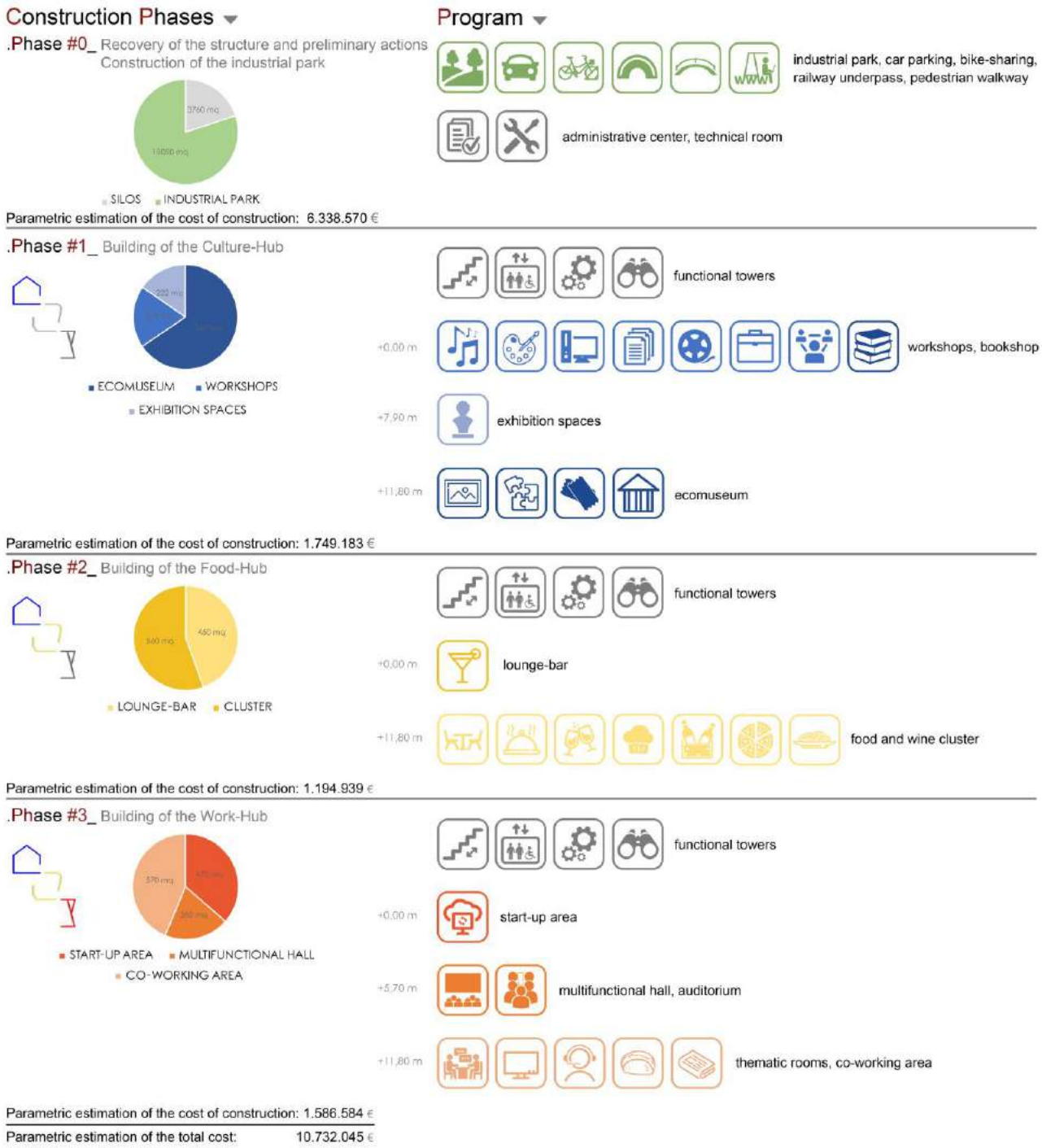

Fig. 12: Phases of interventions.

Some problems for the financial coverage of this kind of interventions, generally derives from the negative trend of the cash flows in the first years (during the promotion, the design and the realization phases), while the positive trend is generally registered in the phases of management and economic exploitation. The promotion and the realization of the interventions so require a great initial investment; for these reasons, the project realization is planned in a step-by-step logic, so as to actuate the reuse in a progressive manner. Therefore, the feasibility study has been carried out taking into account various scenarios related to different temporal choices for the realization of the Hubs.
On the base of the results of the feasibility study, we identify the following phases (fig. 12):
- Phase 0_ recovery of the structure and creation of the industrial park;
- Phase 1_ creation of the Culture-Hub (3rd year);
- Phase 2_ creation of the Food-Hub (5th year);
- Phase 3_ creation of the Work-Hub (7th year).

The recourse to no-refundable grants may represent also a solution for this apparently insurmountable technical-financial constraint. Considering a business plan with public-private partnership and mixed investment, we can reach the balance between costs and revenues after 16 years, and over-6 million profits after 25 years (fig. 13).

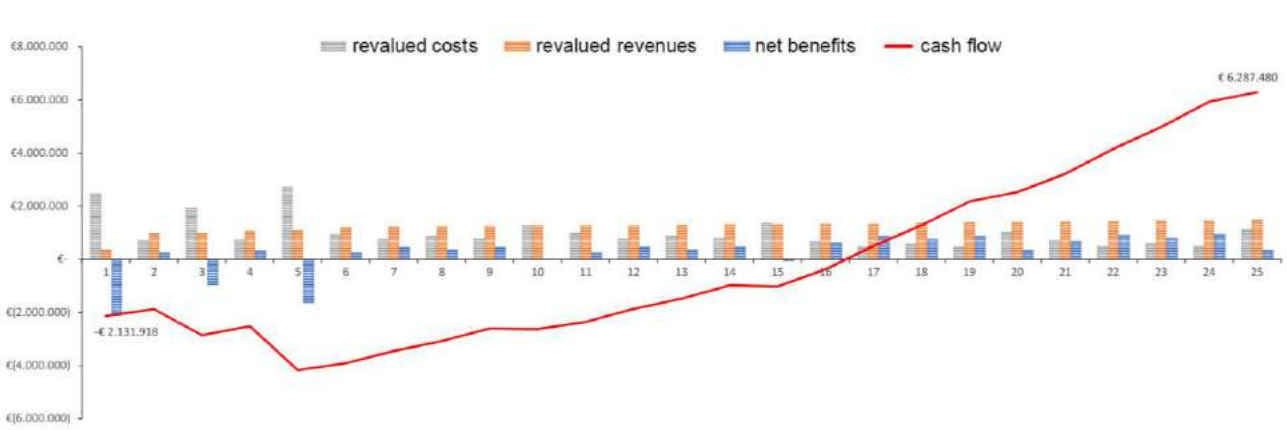

Fig. 13: Business Plan.

The transfer for free of the property of the Silos and its area from the Solvay Company to the Municipality of San Vincenzo, is also a necessary precondition.
We estimate a period of two years for: the acquisition of the area and the publication of the notice by the city administration, the creation of a Project Company to which the construction and the management of the works are given in concession, the development of the final and executive projects, the carrying-out of the technical and bureaucratic procedures, and the restoration of the original structure. Therefore, the construction of the first Hub will start at the 3rd year, and the completion of the works will be at the end of the 7th year (fig. 14).
At the end of the concession period at the 27th year, the Project Company will be dissolved and the Silos will become full property of the City Administration.

6. Conclusions

The aim of this paper is to show and prove that the recovery and valorisation of this kind of huge industrial buildings, is possible and sustainable. As regard the project, the introduction of new recognizable elements and surfaces, has been considered from the beginning as the best choice for reusing the structure and at the same time respecting its historical value.
The solution proposed for the Solvay Silos in San Vincenzo can therefore define a sustainable intervention strategy, both from an environmental and economic point of view, for the regeneration of other examples of industrial archaeology in Italy and abroad.

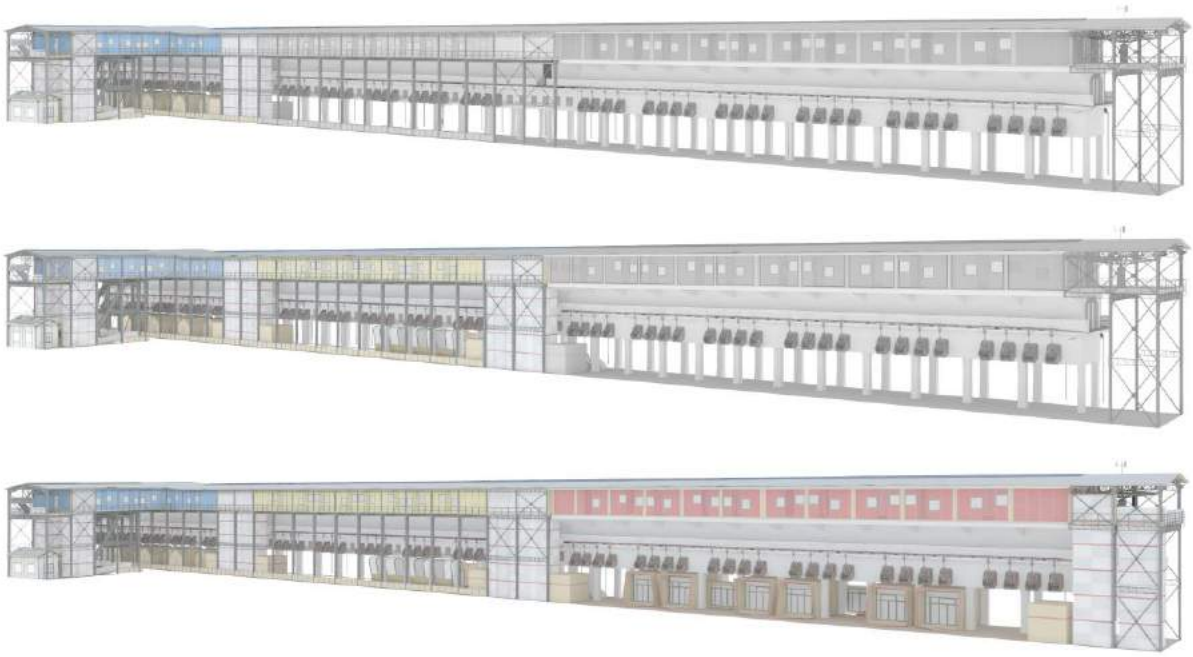

Fig. 14: Phases of construction of the Hub.

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Villages at that age of the agrarian reform: the Schisina Village in Francavilla di Sicilia

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Abstract
The villages made during the agrarian reform in Sicily representing a local defined territorially and determined by historical events.
Identify them, drawing them and analyze their the existing, is founding moment of a study full of surprises and expressive potential.
Visiting these realities, reduced to a state of ruin, often never inhabited or used, it is impossible to separate the architectural phenomenon by historical and economic contexts that generated them.
The villages Schisina comprises a complex of seven sets of suburbs built in 1950.
The whole has been designed to accommodate a family of peasants, who had to be given a small plot of land of land with which to realize up their own business profitable.
At that time, the lack of electricity and drinking water discouraged farmers to move there. Since then, only few people know about the ruins of these buildings without life.
They are now in a unique mountain ridge overlooking the Ionian Sea in the inland province of Messina. Italian director Michelangelo Antonioni was so impressed by the charm and history that lay behind the villages who decided to shoot a scene in the film *L'Avventura*.
The idea of a project to restoration and reusing for tourism and training (temporary atelier for workshops of artists and structures for receiving for tourists and sports) is a kind of ransom of the place, able to exorcise the demons of the devastation of the territory by humans.

Keywords: Rural Villages, Surveying, Analysis, Restoration, Cultural landscapes Projects

1. The Rural Villages: a phenomenon analysis
Village, is located near Francavilla di Sicilia in Messina Province. It is a built up area of seven villages placed side by side and built by the Sicilian regional authorities in 1950.
They are named: Schisina, Borgo San Giovanni, Bucceri-Monastero, Pietra Pizzuta, Malfitana, Piano Torre, Morfia. The design of this rural complex is consistent with the Agrarian Reform Plan of Sicilian regional authorities launched in the '20s.
In those years in Sicily, during the Fascist era was established the "Institution for Agrarian Reform (Eras), a public body which coordinated the expropriation system of large estates and then assign them to the farmers that they would request.
The assignee, once acquired housing, could have buy it with a subsidized rent and expanded in time.
The project carried out lasted just 10 years[1]. Already in 1960 the Schisina villages were abandoned for depopulation. Those places were immediately abandoned.
The villages never saw the work of farmers. The houses were looted and then vandalized by man, and then consumed by the relentless action of nature. Nowadays the site is still reachable despite the rough road. Some house is used as a shelter for animals and often the villages are used for simulated fighting games.

1.2 The abandonment of Schisina Village

At that time the farmers were very reluctant to move to Schisina villages because of the total absence of services. The farmers of the place immediately realized that this project was very lacking. Thus ending the strange story of a project that would have wanted to give something to the agricultural land and its farmers. Today, they are abandoned villages also in the memory of the close Villages administrations. Nevertheless, the unique charm of the villages realized, nowadays they do imagine the recovery opportunities to a new life, in accordance with principles and assumptions completely different from those for which they were built.

The Italian director Michelangelo Antonioni was so impressed by the special charm of the place and history who he was behind the villages who decided to shoot a scene from the film *L'Avventura*, in 1960[2]. After him, even Roberto Rossellini in 1967, has devoted some shot to SchisIna dealing with the subject of the ghost villages, in the documentary *Idea of an island*[3].

The distinctiveness of these architectures today is a challenge for the relationship between man and environment.

Fig. 1: Schisina village: photo of site.

The hypothesis of a project to recover and reuse for tourism and educational purposes (temporary atelier for workshops of artists or reception facilities for tourists and athletes) is a kind of redemption of the place; a redemption able to exorcise the demons of the devastation of the territory by man.

In the study conducted about two years ago and recently concluded, we have analyzed the state of affairs of what yet we read of the distinctive characteristics of the seven villages.

Once the analysis starts, the survey of the ruins and an overall assessment of Schisìna, have been found all the potentialities that today could give a reason for its rebirth. However, it is necessary to call into question the original assumptions which determined the initial project and subsequent abandonment.

According to an idea of Sustainable Tourism and Culture could revive an interesting site in view of accommodation used for workshops related to art and other performing activities, which could have some success, as well as an attractive economic return for the neighboring communities.

In more than 60 years since the operation's failure, rather than investigate the various political responsibilities, it is more useful to find a new and sustainable destination for these possible resources. In this key, in 2011 it seems that the municipality of Francavilla di Sicilia, current possessor of the villages, took into account a revaluation project of this portion of the Peloritani mountain chain.

1.3. From estate to the Agricultural Reform

Fascism had aimed for a social policy of development of country activities, and already adopted in 1923 Consolidated law on soil remediation that favored the growth of productivity of the great (R.D.L. n. 2110, 1925), in order to promote the development consortiums of remediation, hydrogeological investigations and provide technical and financial assistance to the settlers.

In this first phase of interventions on the Sicilian agricultural world were, among other things, the projects launched for the construction of farm houses and villages at the service of workers. On January 2, 1940 was promulgated the law n.1 with which it established the Institution of Colonization of Sicilian Estate, managed by the Ministry of Agriculture, which absorbed the competencies and goals of Vittorio Emanuele III Institute in the transformation of the productive agricultural system. The Institution could go directly to the acquisition of the land and their subsequent assignmentin small farms.

The initiatives launced allowed the construction of seven service villages, more than two thousand five hundred houses for the farm workers, the farm tracks of aqueducts.

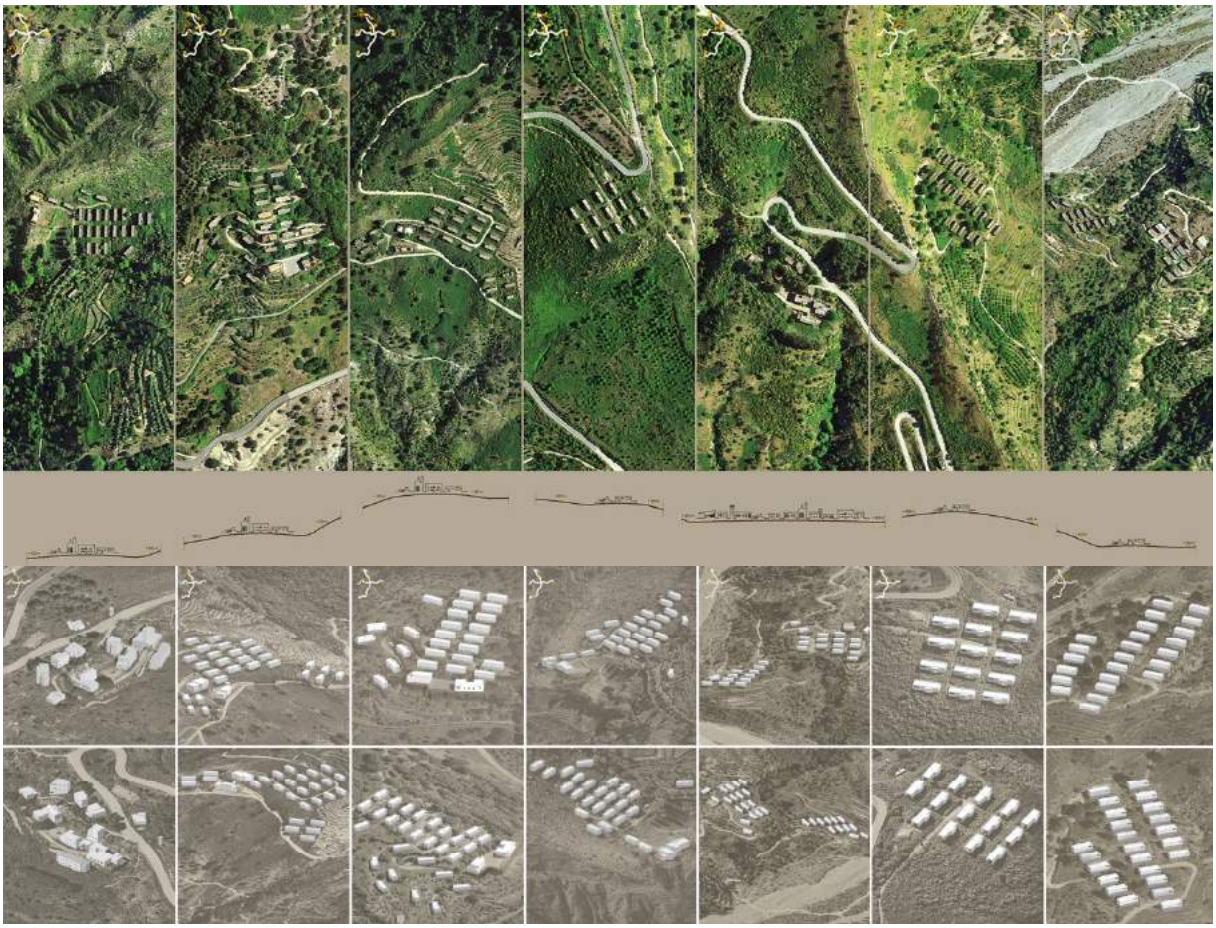

Fig. 2: Aerial photo of the seven village; section of area; 3D models. In sequence: Schisina, Morfia, Piano Torre, San Giovanni, Bucceri-Monastero, Pietra Pizzuta.

Total economic dependency from public intervention, that it took charge of all costs of operating and management, quickly connected the villages to a destiny of welfarism, and to the will of the political rather than the impulse of the settlers and the actual usefulness, as it historically has always happened in the foundation and expansion of population centers, born by spontaneous aggregation.

After the establishment of the Sicilian region authority and the passage of legislative powers in the field Agricultural to the Regional Assembly, on December 27, 1950 was passed regional Law: n. 104 "Agrarian Reform" who transformed the E.C.L.S. in Institution for Agrarian Reform in Sicily.

On April 5, 1954, with Regional Law nr. 9, it was decided to build other rural villages, offering farmers housing and other services.

1.4. The project of the Rural Villages as a paradigm of the Fascist towns

The reference image in the rural villages project remains one of the founding cities in Fascist period between the two Wars, as Littoria, Pomezia, Sabaudia, Aprilia and others of the same period.

The rural villages were new towns. They were a sort of simplified zoning where urban functions were represented in a simplified way: the square which is overlooked the public buildings (the church, town hall with city tower, the post office, the public office) the adjacent streets where the shops and services are located (the school, the craftsman's workshop, doctor's surgery, a police station, the veterinarian, the fountain) and the road structure that determines the residential area for extremely simple and reduced accommodation. In some cases, in the most important villages there is the rail station also.

The villages, in fact, consist of simple volumes, made with humble materials, lacking of services or even without comfort. Often the geographical location made it difficult the link with urban centers and the quality of land to farm did not seem to be an opportunity for a livelihood for families that moved to those places.

Fig. 3: Plans and sections of the seven village.

Carlo Emilio Gadda writes in *I nuovi borghi della Sicilia rurale* (The new villages of rural Sicily) for *La Nuova Antologia* (The New Anthology): "*The rural houses, which host farm families gradually recovered to a better job and entered into the estate, find protection into the villages.*

They are constituted in civilized living centers and will have to be invested in all tasks and attributes of the chief town, however, without the disadvantage which is to be avoided: that of a dense population of farmers that throng in the village in little healthcare conditions, extreme poverty, at a distance of kilometer from the place of work. The village of colonization will not host peasants: but only the indispensable artisans (mechanics, tailors, cabinetmakers, bricklayers, shoemakers) and shops of foodstuffs or multipurpose commercial premises, and offices, health posts, schools. The village is to be seen as a displaced small functionalist capital without effort and without heaviness of plebes".

It defines the typology of village, which in the Gadda's description, is composed: "*Arise in each center the church Parish with the home of the parish priest; the school with the homes of the teachers; the podest office in charge for the marital status; the seat of the Fascio and dependent organizations; the Post office, with telegraph and telephone; the station of Carabinieri Reali with housing; the House of health, where will have to live the doctor-surgeon, midwife, a health care provider; an inn with accommodation, a resale of various products; workshops for artisans and their neighborhoods and even: the offices of 'Institution of colonization with the staff house*".

A specific resolution identified eight architects in charge to design the villages, that had to be Sicilians, because being 'born in the Island" they could produce congenial shapes to the nature and Sicilian villages, to its being old and new". The 1940's final balance, the first year of reclamation, it closes to the entry "farm houses" with assets of 2507 built units and 300 houses being completed.

2. Typological characteristics of the architecture, geometric description and references

The code of cultural heritage and landscape (Legislative Decree 22 January 2004 n. 42) has recognized the cultural and historic value of the villages realized in the 40s in Sicily, as testimony of an era[4]. Subsequently, the Regional Department for Cultural Heritage has established the "Regional Charter of places and their identity and memory, section Historical events of the early twentieth century: the villages of Duce "affirming the importance of the protection and enhancement of the villages".

This research is moving in that direction. The creation and evolution of rural villages has led to a fundamental role in the transformation of the Sicilian landscape.

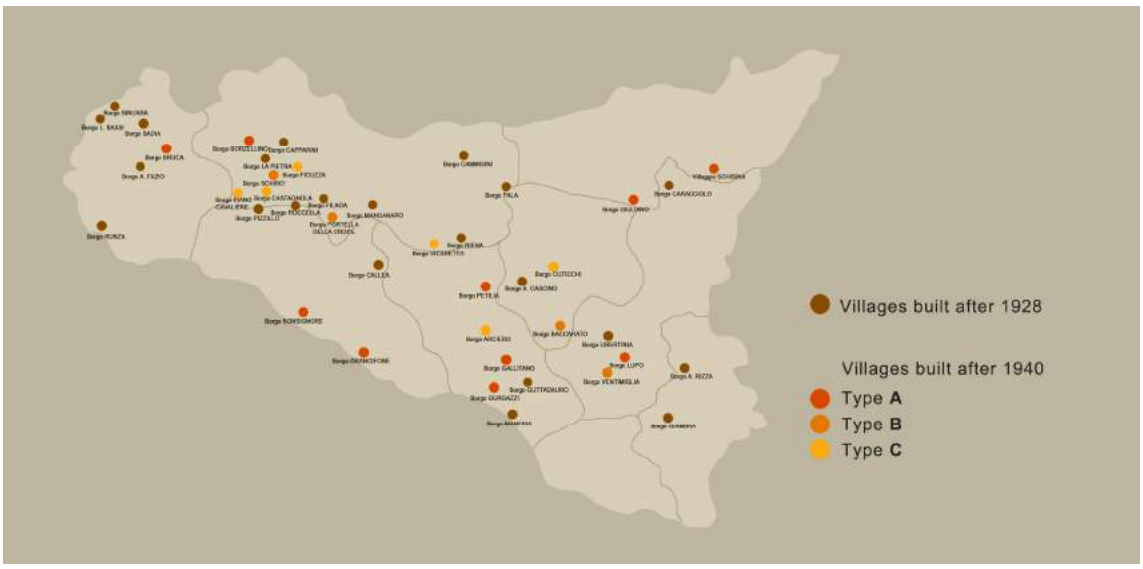

Fig. 4: Sicily map with indication of rural village.

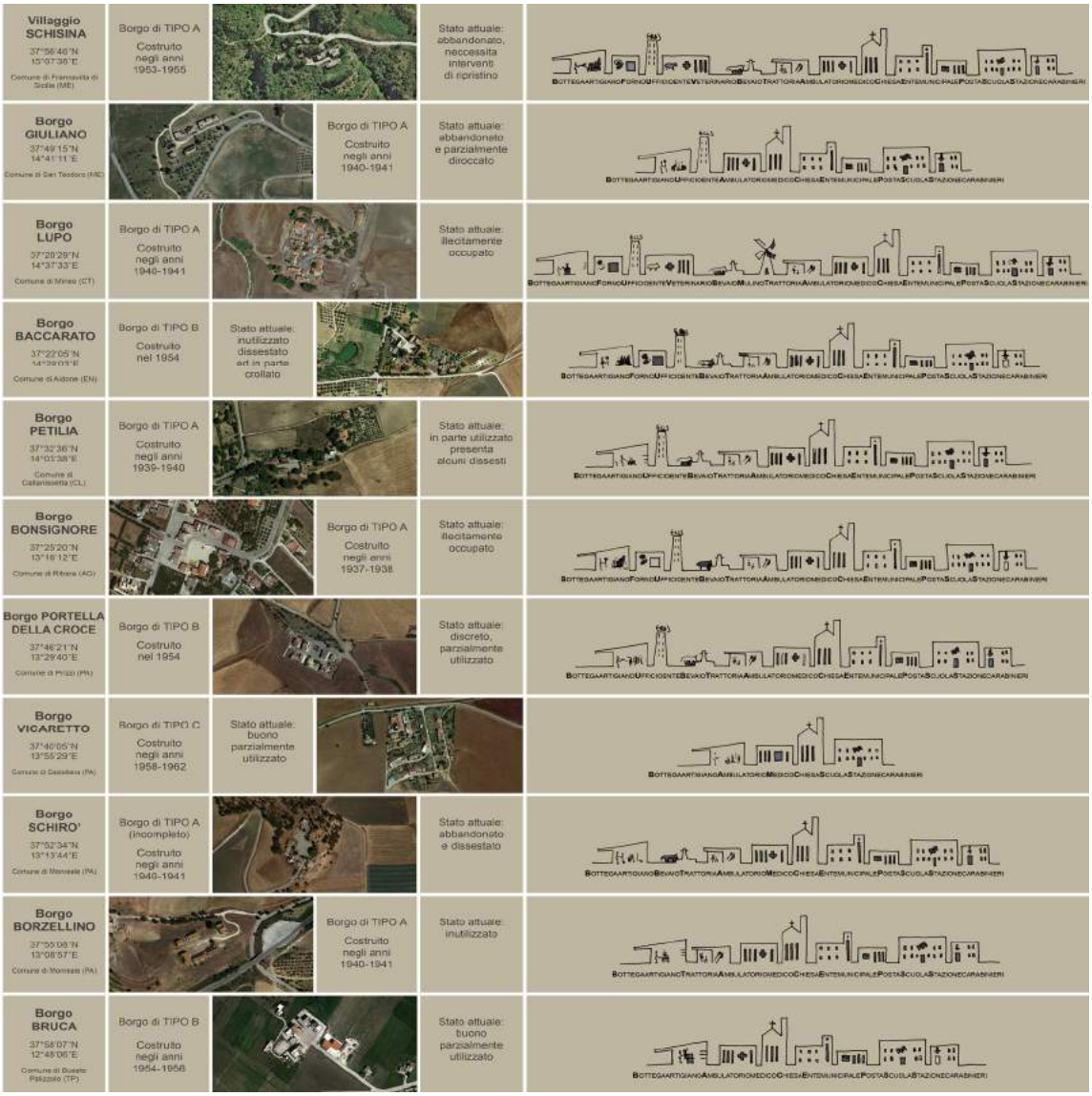

Fig. 5: Villages services schemes.

To understand the current image must not forget one of the most important chapters of his training: the twentieth century.The Sicilian Regional Authority has assumed a leading role both in the choice of the places for the revival of an architectural language capable of giving recognizability to the common inspiration to the period of the Italian Rationalist movement.
The architectural style of Schisina village, despite having been built a few decades later, reflects the aesthetic language of the fascist regime villages. In this research, the analysis starts from the study of the villages, from project charts to the state of affairs.
It was prearrange for each of the seven villages analyzed: the survey of the artifacts, for a sampling of the most representative buildings, and a comparison of the different typologies. The cataloging of the types allows the consultation of documents (source: Agricultural Development Agency) and to identify the morphological characters and typological of the artefacts, as well as to deepen the knowledge of building techniques adopted in order to be able to draft the preliminary guidelines to the choice of techniques and most appropriate intervention methods for recovery[5].
The comparison among the various types was done on the analysis of the functional distribution of spaces, analysis of architectural and building characters and analysis of geometrical and spatial relationships.
The villages have a planimetric layout with orthoganal scheme within which are placed individual residential units. All housing have the same typology of rural house with a rectangular plan: two rooms for residential purposes, the barn and the stable.
Each house is surrounded by an area of pertinence that makes them isolated from each other.
The structure of the buildings consists of bearing masonry, made of sandstone ashlars and pressed bricks with the exception of some structures made of reinforced concrete.
Most of the buildings is based on the same plant-type and has common elements: the presence of arched porticoes and a facing stone plinth which continues at the basement, the theme of the arc in the service buildings is also taken as a decorative motif in correspondence of some openings.
The villages are distinguished into the following types:
Village of type A
1. Church and residence of the parish priest
2. School with accommodation for teachers
3. Nursery with accommodation
4. The municipality with accommodation of the municipal delegate
5. Post office and telegraph office with accommodation postmaster's
6. Carabinieri station with separate accommodation for the graduated
7. Infirmary with accommodation for the doctor, midwife and nurse
8. The Ente office with accommodation
9. Accommodation for those in of the village services (municipal employee, agricultural engineer, municipal messenger, janitor, laborer, guard)
10. Artisan workshops with accommodation (shoemaker, tailor, blacksmith, barber)
11. Tobacco shop and stamps with accommodation and restaurant
12. Veterinary clinic and slaughterhouse
13. Stud farm bovines and equines
14. The mill with accommodation miller, stable and laundry services

Village of type B
1. Church and residence of the the parish priest
2. School with accommodation for teachers
3. The municipality with accommodation of the municipal delegate
4. Post office and telegraph office with accommodation postmaster's
5. Carabinieri station with separate accommodation for the graduated
6. Infirmary with accommodation for the doctor, midwife and nurse
7. Accommodation for those in of the village services (municipal employee, agricultural engineer, municipal messenger, janitor, laborer, guard)
8. Workshops craftsmen, sales and trattoria

Village of type C
1. Church with sacristy
2. School with accommodation for teachers
3. Infirmary with accommodation for the doctor
4. Village Guardian Accomodation

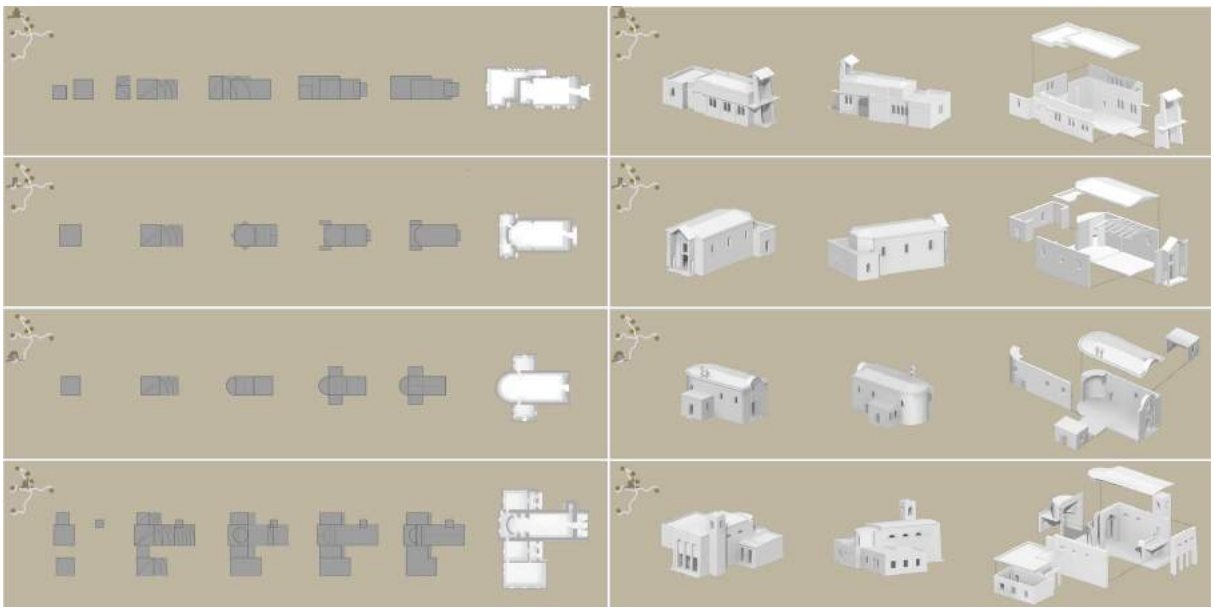

Fig. 6: Geometrical analysis, plans and sections of the seven villages churches.

The C-type villages are dependent on those of type A or B for the completion of the missing services. The service buildings, however, for Schisìna, were never realized, however, they are not clear the events that have prevented the construction. From the documentation, it seems it was carried out a reworking of the original design.The presentation of the new project, however, would have been "... subject to the possibility to discover and pick up the necessary quantities of water for water supply of the village". Possibility that did not materialize ever.
In the film *L'Avventura*, when Monica Vitti, who believes a "graveyard" village, asked why the village is deserted, Gabriele Ferzetti replies with another question: "You have to wonder why they built it."
The two protagonists move away without giving an answer, but the answer is contained in the other movie, the documentary filmed by Roberto Rossellini in 1967.The shots are carried out in Borgo San Giovanni, and the eight-year age difference between the two shoots are apparent for the state of the plaster of the buildings. Also from San Giovanni village is framed suddenly village PianoTorre which appears in the distance, while the voiceover says "an absurd speculation".

3. A project of enhancement of the rural villages.

In Italy the political choices economic and social have led to bad use of the soil resulting in damage to the landscape. In the last sixty years the policy has considered more economical to abandon vast degraded areas rather than using them with new destinations.Urban policy has preferred new construction. Today the re-use solutions are activated almost always thanks to public initiatives or by associations no profit. The reuse of old rural villages is pushed from the world of culture, informal art and niche economies. With these assumptions, shows the need to have cultural programming tools capable of reading the territory in its complexity of its context. We have to elaborate wide-ranging strategies to harnessing the potentials and available resources, by defining "strategic" the role of culture for the regeneration of rural villages.
Rural areas are investing in tourism in order to diversify their economies; the strategy required to ensure growth, employment and sustainable development. The weak and depressed areas, including rural areas have important natural resources, landscape and food that have remained intact thanks to their territorial marginality. The project proposed by this research aims to give value to the extraordinary heritage of the villages, which is likely to go definitively lost.

3.1. The project of a ecovillage

The project consists of the enhancement and re-use of abandoned building context of the seven villages that compose the Schisina village.Today Schisina is in an advanced state of degradation, but it retains a certain charm due to the testimony of his past. Abandoned buildings becomes the hint for creating a space for art and culture and for creating a accommodation facilities of support.The recovering project of the villages gives particular attention to their conservation and retraining through structural interventions upon existing structures, but without losing sight the main aim, namely the social revitalization and the promotion of economic activities, tourist industry, cultural and artistic.

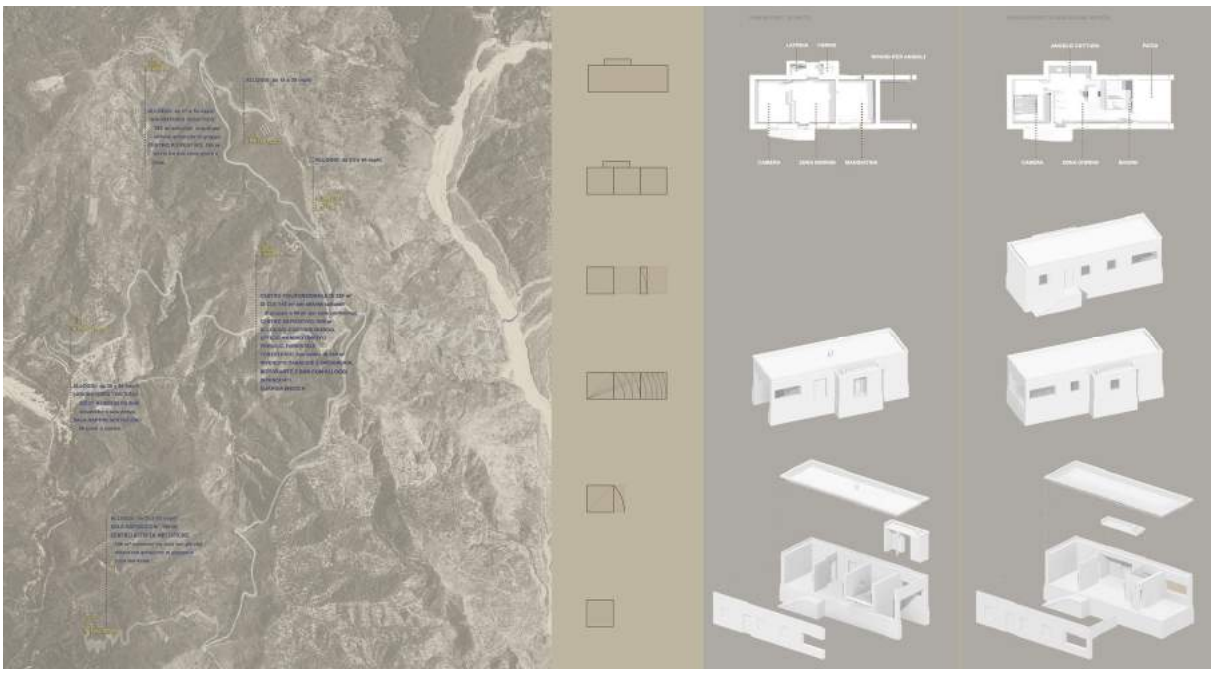

Fig. 7: Master plan of reuse of seven villages.

The recovering project of the villages gives particular attention to their conservation and retraining through structural interventions upon existing structures, but without losing sight the main aim, namely the social revitalization and the promotion of economic activities, tourist industry, cultural and artistic. Architectural program provides the establishment, through the reuse of existing structures, housing, exhibition spaces, educational workshops and conference rooms, spaces of study as well as an polyfunctional accommodation facilities of support.
Specifically have been planned: for Schisina village the realization of a multifunctional center with rooms for cultural activities and exhibition spaces, administrative offices, a medical center, two guest rooms and a restaurant; about San Giovanni the realization of tourist accommodation and a center for educational and artistic activities;

- Schisina village, the construction of a multifunctional center with rooms for cultural activities and exhibition spaces, administrative offices, a medical center, two guest rooms and a restaurant;
- San Giovanni village, the construction of tourist accommodation and a center for educational and artistic activities;
- Piano Torre village, the construction of housing, a theater workshop and a performance hall;
- Morfia village, the construction of a leisure center and an educational workshop;
- Pietra Pizzuta, Amalfi and Bucceri - Monastero villages the construction of accommodation units of various sizes.

The preliminary plan also provide an opportunity to ensure a "low impact settlements" thanks to the exploitation of alternative energy source and ensuring that it remains a low environmental impact over the next few years.The minor rural villages have a role as a witness of a world that is revisited and reinterpreted, can be promoter of a larger project of spatial development where the villages assume an activation role of synergies and creation of favorable situations so as to play roles well more central and not more marginal.

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Notes

[1] The construction of the villages was conducted by Ente for Agrarian Reform in Sicily, the houses were manned by the peasants but only very few were inhabited and only for a very short period. The houses were poorly constructed, not served by the electricity grid, with no hot water.

[2] Michelangelo Antonioni, *L'Avventura,* 1960, with Monica Vitti, Lea Massari, Gabriele Ferzetti.

[3] Roberto Rossellini, *Idea di un'isola*, 1967.

[4] In the fascist period, the rural village is symbolically represented as the fight against large estates called latifundia, which were wide spread phenomenon in Sicily.

[5] The villages become a symbol of state policies, this factor becomes central to the choice of sites and the proposed architectural elements characteristic, that make them distinctive architecturally through Rational inspiration. This capillary territorial diffusion finally makes us deal with some important questions, as to the selection and supply of materials, the relation between villages' national elements and the own local typologies.

Drawing sources of: *"La via dei borghi all'epoca della riforma agraria: Villaggio Schisina a Francavilla di Sicilia".* Degree thesis by Francesco Romano e Giulia Romano, Supervisor Francesca Fatta, Co-supervisors Manuela Bassetta and Andrea Manti. Department of Architecture and Territory, *Mediterranea* University of Reggio Calabria, Italy.

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Effects of Corrosion on Reinforced Concrete Structures

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Abstract
Development of reinforced concrete (RC) structures is quite recent; nonetheless world heritage now includes many RC constructions. Safeguarding the historic value of such structures requires a clear knowledge on predictability of degradation consequences. Among many potential degradation sources, corrosion process of steel bars in RC structures is a structural problem, not simply aesthetical, affecting existing structures and leading to a loss of structural capacity. Because of the volumetric expansion of oxides of steel, the corrosion process, as well as responsible a loss of cross section of reinforcement, leads to concrete cover cracking. The main structural consequences are the reduction of bond between steel and concrete plus the loss of load bearing capacity.
In order to determinate the loss of load bearing capacity due to corrosion, theoretical analyses have been performed in order to evaluate steel and concrete degradation, and compared to available experimental outcomes on columns. Under axial loads the loss of load bearing capacity can be associated to a degree of eccentricity due to concrete cover spalling, yielding to even worse consequences. A further theoretical evaluation has been performed to evaluate the loss of load bearing and shear capacity of beams and slabs.

Keywords: RC structures, corrosion, structural performance, numerical modeling, experimental tests

1. Introduction
Starting from 40's, the concrete has become the main used material for buildings. It was considered a very-long time durable material, but the early appearance of degradation phenomena, has made necessary to introduce the concept of durability and service life of reinforced concrete (RC) structures. Certainly, the major cause of degradation of RC structures is the corrosion of bars, due to carbonation and chloride ion penetration. Even if a lot of studies have been performed, corrosion is still a dangerous type of degradation afflicting RC members and structures, that reduces the service life of RC buildings. Corrosion of bars of RC structures is, hence, a structural and safety problem. The volumetric expansion of corrosion products, in fact, comes with the reduction of steel cross section, concrete cover cracking and loss of main structural capacity [1, 2, 3]. Other structural aspects of corrosion are the reduction of bond between bars and concrete, buckling, eccentricity of vertical loads, reduction of shear capacity and bending moment. Corrosion of steel in concrete is, hence, a serious problem, and needs to be investigated very accurately, both from a point of view of materials science and of its structural effects on buildings. Basing on last consideration, about ten years ago a wide experimental program was started, involving the Department of Structures for Engineering and Architecture and Department of Chemical Engineering, Materials and Production of University of Naples "Federico II", with the scope to investigate structural effects of corrosion in terms of loss of structural capacity due to corrosion of reinforcement in concrete. Aged and non-aged reinforced concrete specimens (some reinforced by using smooth bars and some other by using ribbed bars)

have been tested by performing compression load tests. Results have been used to perform theoretical analyses in order to evaluate corrosion effects, in terms of loss of capacity and ductility, of beams and slabs.

2. Materials and Methods

In order to determinate a possible correlation between the conditions of structural safety and the degradation of structural elements in reinforced concrete, 36 reinforced concrete specimens have been fabricated. They have a square base (side equal to 30 cm) and height of 90 cm and they have been aged by imposing an anodic current and a chloride solution of 3.5□ wt. In order to evaluate corrosion effects on “old” structures (Italian code R.D. 2229 del 16/11/1939 [4]) and “recent” structures (Italian code D.M. 05/11/1971 [5]), 18 specimens have been reinforced by using smooth bars and the others by using ribbed bars. All specimens have been reinforced by using 8 longitudinal bars of diameter equal to 14 mm and stirrups of diameter 10 mm. Figure 1 shows the geometry of specimens. It has been used a cement Portland II/B.LL.32.5R with a water/cement ratio equal to 0.45 and a concrete cover equal to 3 cm. The S3-class of workability has been evaluated according to EN 12350-2 [6] and the average cubic compressive strength was equal to 33 N/mm^2. Bars and stirrups have been tested by performing tensile tests, and all of them were verified according to their-period code. After the curing period, 3 specimens have been aged by using chloride solution 3.5□ wt and an imposed current.

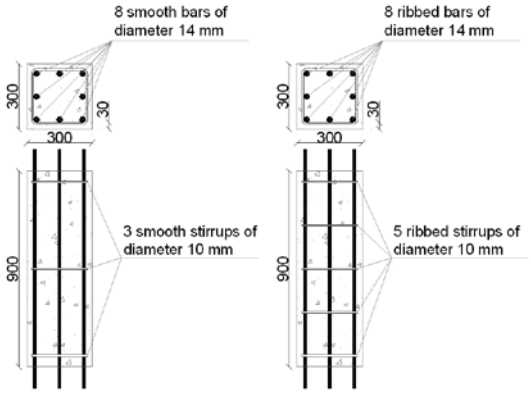

Figure 1. Construction details of specimens.

3. Experimental test procedure

In order to evaluate the degradation process, ultrasonic wave rate (SON) and rebound (REB) tests [7] and corrosion potential mapping have been performed on reinforcement bars and on concrete, respectively. In fact, by coupling SONREB method with corrosion potential mapping it is possible to localize degraded areas of the specimens and it becomes a good tool in order to extend and deepen the study of the degradation. The first one has been evaluated according to the scheme represented in figure 2a, for specimens reinforced by smooth bars, and Figure 2b for specimens reinforced by ribbed bars. In order to investigate concrete degradation, it has been applied the SONREB method. It allows to determine concrete properties and to individuate segregated areas and cracks.

Six values of corrosion potential has been registered along every corroded bar. The corrosion potential has been evaluated in respect to a $Cu/CuSO_4$ counter electrode. It allows to localize where corrosion process is in progress, and how fast it is evolving. Corrosion potential values in the range +100 e −200 mV (vs $Cu/CuSO_4$), represent passivity region of the metal (no corrosion), while if they are lower than −350 mV (vs $Cu/CuSO_4$), the metal is corroding.

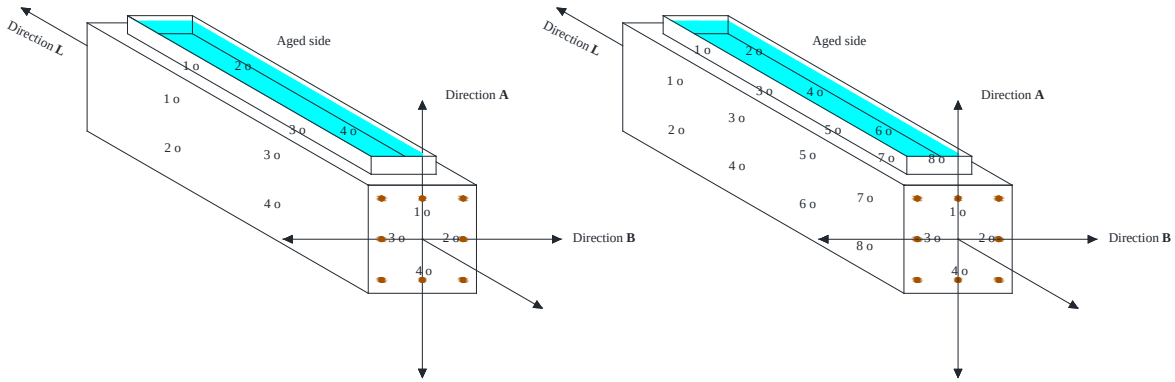

Figure 2: Ultrasonic wave rate measurement locations for specimens with smooth and ribbed bars.

4. Non destructive test results

Figures 3a and 3b represent the development of ultrasonic wave values vs time for specimens reinforced by using smooth and ribbed bars, respectively. It can be noticed that during the first 120 days, the ultrasonic wave rate is not decreasing, while it starts to decrease when cracks start to form. The values of corrosion rate and corrosion potential (Figures 4a and 4b, respectively) confirm that corrosion process is developing faster after 120 days of ageing, leading to concrete cover cracks due to volumetric expansion of oxides. In fact, values of corrosion rate increases until 100 μm/year. Figure 5 shows as, after 160 days of ageing, cracks are clearly visible on specimens' surface. By coupling ultrasonic wave rate trend with corrosion rate evolution, it can be noticed that as the former decreases (when ultrasonic waves go towards a crack, the rate is slower then they go towards the concrete), the latter increases. Furthermore, it is very interesting to notice that the upper side of the specimen (the side from which aggressive agents enter into the concrete) has a degradation process faster than the lower side. Definitively, it possible to recognize three different layers: the top layer, in contact with aggressive agents, very damaged (concrete cover), a bottom layer, not yet involved in degradation process (measurement points 2, 4, 6 and 8) and an intermediate layer (measurement points 1, 3, 5 and 7). Figures 5a and 5b show the surface of specimens and the corrosion potential mapping. Overlapping the corrosion mapping to the images of specimen surface it is possible to notice that cracks appear in correspondence with dark represented zone (E_{corr} -350 mV) of corrosion potential mapping and consequently in correspondence to high corrosion rate.

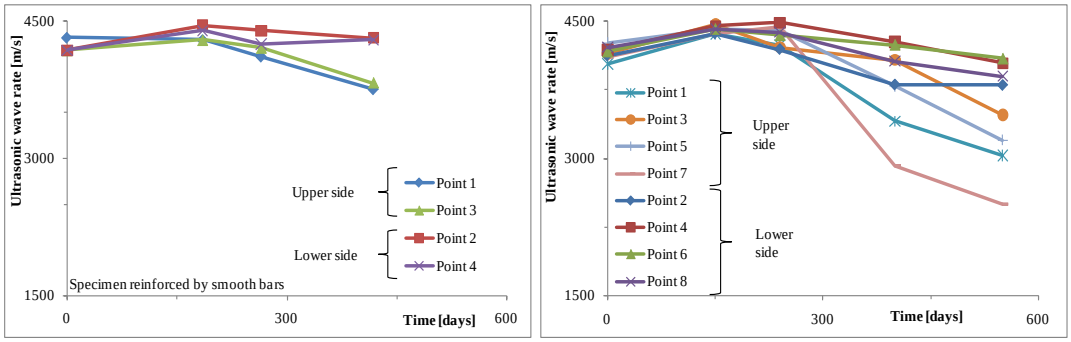

Figure 3: ultrasonic wave rate with time.

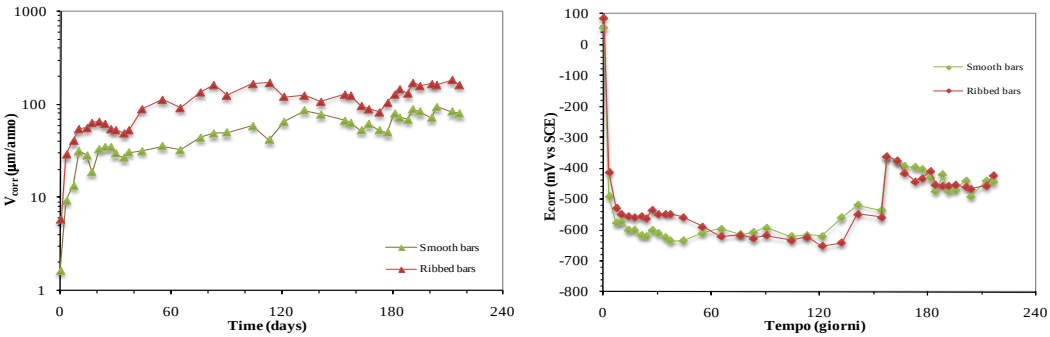

Figure 4: corrosion rate and corrosion potential with time.

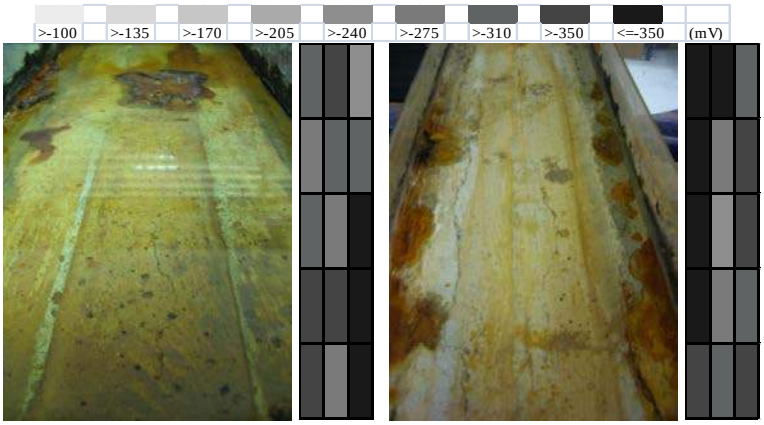

Figure 5: damaged surfaces of specimens after 160 days of ageing for specimen reinforced by a) smooth bars and b) ribbed bars, and corrosion potential mapping.

From a structural point of view, the crack shape and the rate of corrosion suggest that the concrete cover is completely not resistant, and thus there is a reduction of concrete section and an eccentricity of vertical loads.

5. Destructive tests

In order to evaluate the loss of axial load capacity due to the loss of section of concrete because of concrete cover spalling, axial load tests have been performed by using a hydraulic machine "Mohr □ Federhoff", able to generate a maximum compressive axial load of 5,000 kN. In order to insure the uniformity of axial load and the orthogonality between specimen and applied load, specimens' sides have been leveled by using an appropriate material. In order to know the shortening, and, thus, evaluate the deformation, three linear variable differential transformers (LVDT) have been positioned as shown in figure 6. Previously, destructive tests have been performed on non aged specimens. It was registered an average ultimate axial load equal to 4,250 kN (47.2 N/mm^2) and a shortening of 2.54 mm (2.82□). Figure 7 shows the stress-strain diagram. The ultimate axial load of aged specimens reinforced by using smooth bars was 3,200 kN (35.56 N/mm^2) with a shortening of 2.52 mm (2.79□), while the ultimate axial load of aged specimens reinforced by using ribbed bars was 3,100 kN (34.44 N/mm^2) with a shortening of 2.59 mm (2.87□). Both the values of ultimate axial load and shortening are comparable to each other; hence, it is possible to say that there are no differences on compressive behavior due to the kind of the bar and that the corrosion process degraded the specimens in the same way. Ultimate axial load of aged specimens is about 25□ less than the ultimate axial load of non aged specimens. The bar capacity was very low compared to that offered by concrete, so the loss in compression capacity is mainly due to the loss of concrete section due to concrete cover cracking. Figure 8 shows the curvature around horizontal (Φx) and vertical (Φy) axes both in case of smooth (Figures 8a and 8b) and ribbed (Figures 8c and 8d) bars. It is possible to notice that rotation is higher in direction of corroded side of specimens than the other direction due to the different resistance offered by cracked and uncracked concrete cover. In order to have a theoretical evaluation of loss of structural capacity due to corrosion, some structural simulations have been performed by using output results from non destructive tests. Figures 9 show the development of structural capacity of specimen reinforced by using smooth bars (Figure 9a) and specimens reinforced by using ribbed bars (Figure 9b) related to percentage of bar cross section loss, both in the case of cross section of concrete equal to (30x30) cm^2 and (30x27) cm^2, accounting for the loss of concrete cover. Considering smooth bars (Figure 9a), it is possible to notice that the experimental curve (EXP) has an intermediate behavior in respect to theoretical models (30x30 cm^2 and 30x27 cm^2), conversely, considering ribbed bars (Figure b), the experimental curve (EXP) is lower than the theoretical curve even in case of (30x27 cm^2). These different behaviors could depend on the different bond condition generated by smooth or ribbed bars with concrete. Loss of bending moment and variation of ductility, related to time, has been evaluated for structural members affected by corrosion.

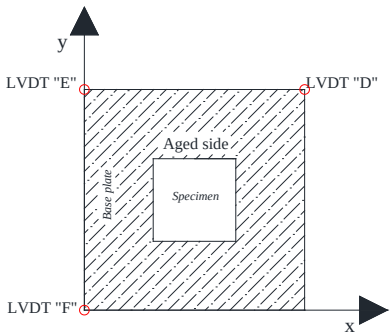

Figure 6: Specimen and LVDT position: plane view.

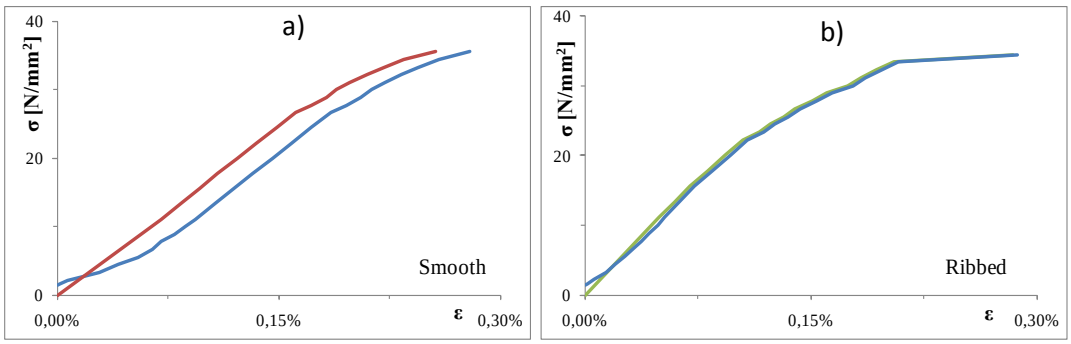

Figure 7: Stress-strain plot of specimens reinforced by using a) Smooth bars, b) Ribbed bars.

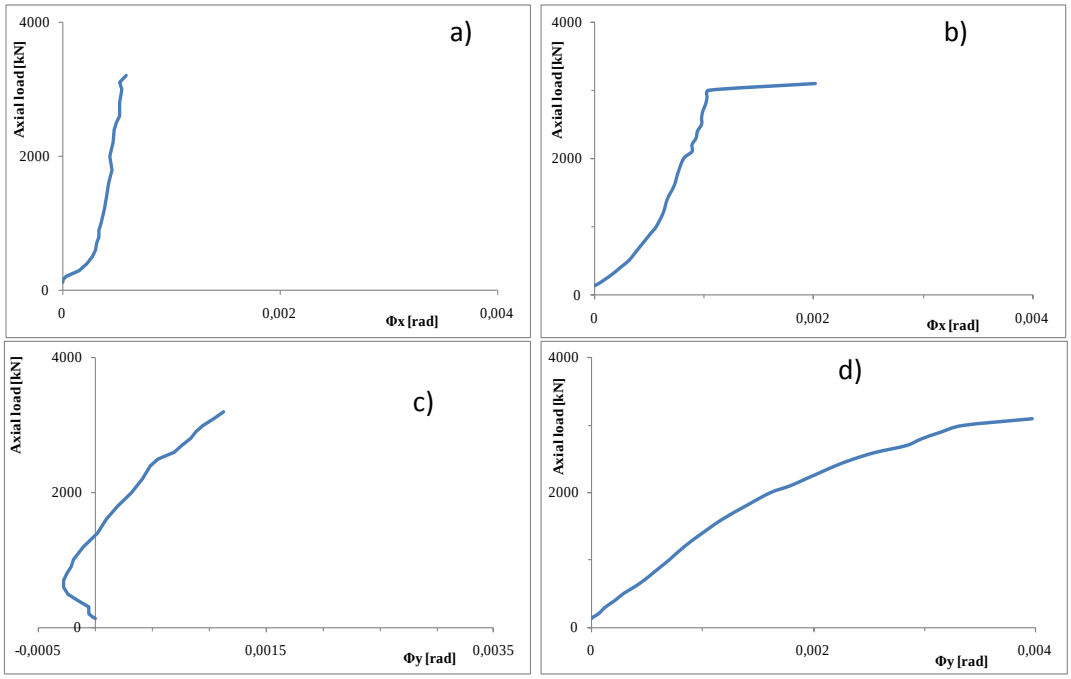

Figure 8: rotation around horizontal axis, x (a and b) and vertical axis, y (c and d) for specimens reinforced by smooth bars (a and c) and ribbed bars (b and d).

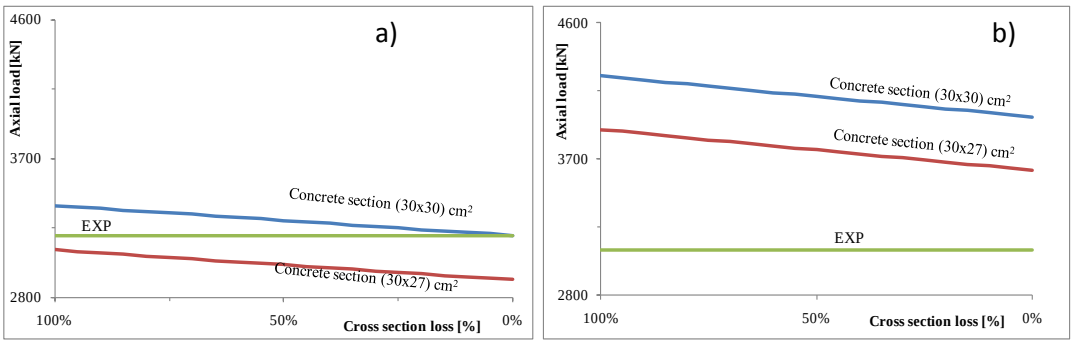

Figure 9: Axial load design capacity of specimens reinforced by a) smooth bars and b) ribbed bars, for full section, section after spalling and experimental calculation.

6. Loss of bending moment and ductility for structural elements

The main scope of present paper is the evaluation of variation of load bearing capacity of structural elements according to Italian Building code [8], in order to provide a useful tool to designers of restoration of existing structures affected by corrosion problems.

6.1 Beams

A beam with dimensions (50x70) cm^2 has been considered, with three different values of concrete cover, namely (10, 35 and 50 mm) and two load conditions: in the formed cracked concrete cover is in tension, while in the latter it is in compression. Figures 10 show the variations of bending moment and curvature ductility, related to cross section loss of bars, in case of corroded bars positioned in the tension side of the beam. It can be noticed that increasing the corrosion penetration, bending moment decreases by 22.2□, 21.9□ and 21.6□, in case of concrete covers equal to 15, 30 and 50 mm, respectively. The loss of bar cross section leading to spalling has been calculated according to [3] and it is equal to 0.6 mm. Ductility increases when bar cross section decreases, because concrete cover is not considered as effective in concrete cross section. Similarly to figure 10, figures 11 show the variation of bending moment and curvature ductility, related to cross section loss of bars, in case of corroded bars positioned in compression side of the beam. It can be noticed that increasing the corrosion penetration, the loss of bending moment is negligible, but the loss of concrete cover generates a critical decrease of bending moment, proportionally related to concrete cover thickness. Conversely, ductility presents a decreasing trend and the loss of concrete cover generates a sudden increase of ductility in the range of 56□ (concrete cover equal to 15 mm) to 169□ (concrete cover equal to 50 mm). Considering concrete sections under bending moment, shear forces are very relevant to be considered. As known, a shear failure can be very brittle and with very severe

consequences on the structure. Referring to corrosion penetrations previously considered, figures 12 show the development of shear capacity (according to Italian Building Code) related to corrosion penetration, in cases of concrete covers equal to 15 mm and 35 mm. In the case of cotgϑ (where ϑ is shear crack inclination) lower than 1, the shear capacity is limited by concrete, being the value of design shear capacity, V_{Rd}, defined as the minimum value between stirrups and concrete contribution. So, in this case, the reduction of shear capacity is directly linked to concrete cover spalling and its thickness. In the case of cotgϑ higher than 2.5, the shear capacity is limited by steel reinforcement.

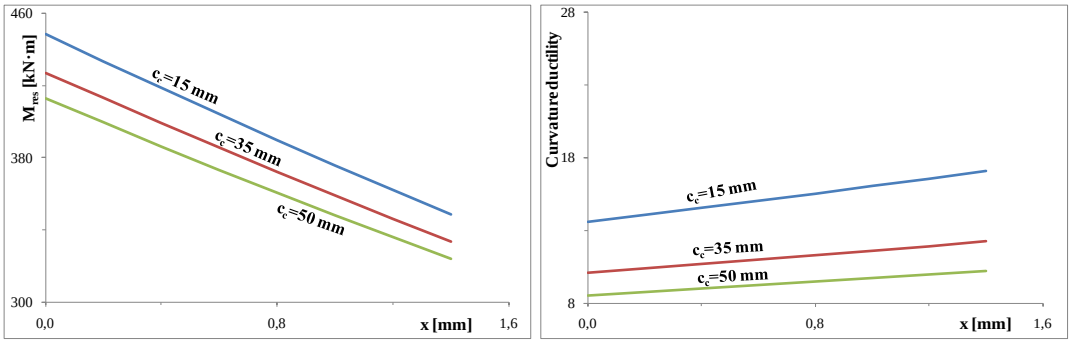

Figure 10: variation of bending moment (a) and curvature ductility (b) related to corrosion penetration, x, in case of aged bars in tension.

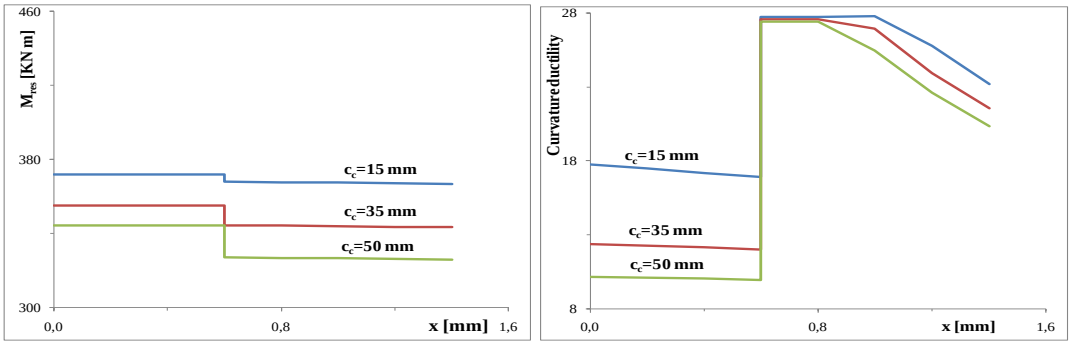

Figure 11 variation of bending moment (a) and curvature ductility (b) related to corrosion penetration, x, in case of aged bars in compression.

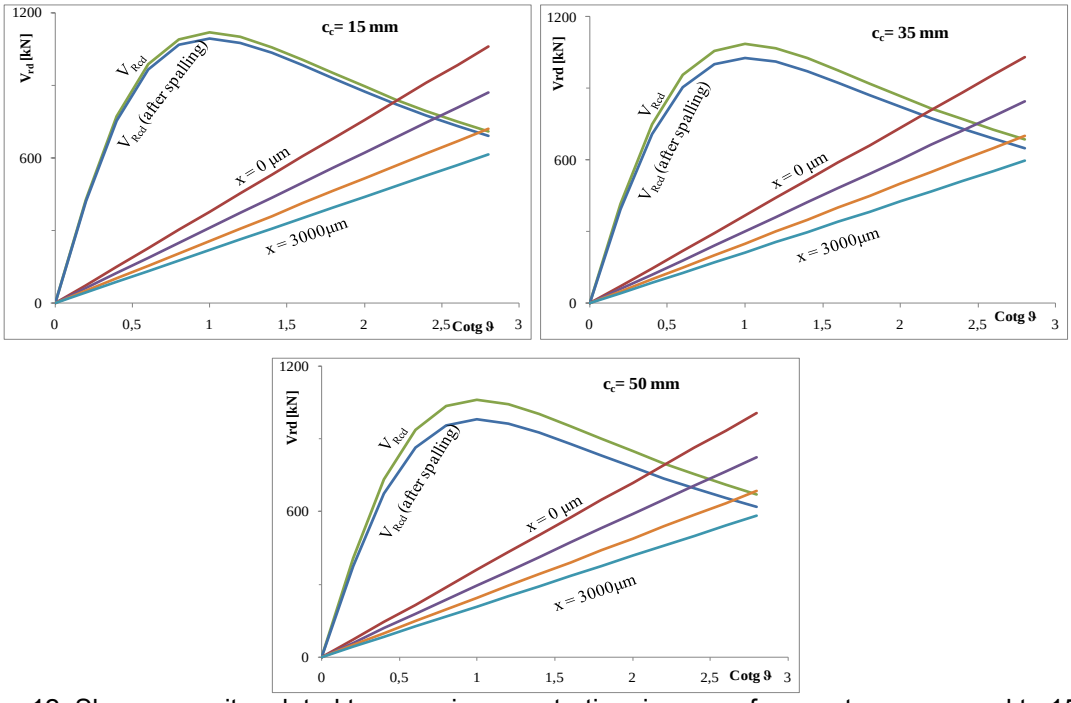

Figure 12: Shear capacity related to corrosion penetration, in case pf concrete cover equal to 15, 35 and 50 mm.

6.2 Slabs

A similar parametric analysis has been performed considering a slab of overall thickness 25 cm, and solid topping of 5 cm, and two joists of height equal to 20 cm, reinforced by 2 bars of diameter 12 mm. In this case, two values of concrete cover have been considered: 15 cm and 25 cm, lower than the values considered in the case of beams because of the lower height of the slab. The value of concrete cover cracking leading to spalling has been calculated according to [9] and it is equal to 0.501 mm and 0.509 mm for concrete cover equal to 15 mm and 25 mm, respectively. Figures 13 and 14 show the moment capacity, M_{res}, (a) and ductility (b), related to loss of cross section bar, in case of tension or compression, respectively. It is possible to notice that in the former case, (corroded bars in tension) as corrosion penetration increases, the bending capacity (Figure 13a) and the ductility, μ, decrease. The trend of the ductility is linearly increasing and presents a higher slope for higher values of concrete cover (Figure 13 b). In the case of corroded bars in compression (Figures 14), the loss of moment capacity, M_{res}, is negligible (Figure 14a), but the concrete cover spalling leads to a clear capacity drop because of the loss of cross section of concrete due to cover spalling. The ductility decreases as corrosion penetration increases, but it suddenly increases when spalling occurs (Figure 14b). In order to evaluate the shear capacity of slabs, joists of higher width have been considered (B equal to 20 cm, 60 cm and 100 cm, respectively).
Figures 15 shows the shear capacity related to corrosion penetration. In the case of corroded bars in tension, the shear capacity of slabs decreases of about 7.4□ as corrosion penetration increases (Figure 15a), while, in the case of corroded bars in compression, it decreases of 10.00□ and 11.8□ for concrete cover equal to 15 mm and 25 m, respectively (Figure 15b). The spalling generates a decreasing of shear capacity in case of corroded bars in compression due to the reduction of effective depth (this does not occur if concrete cover is in tension).

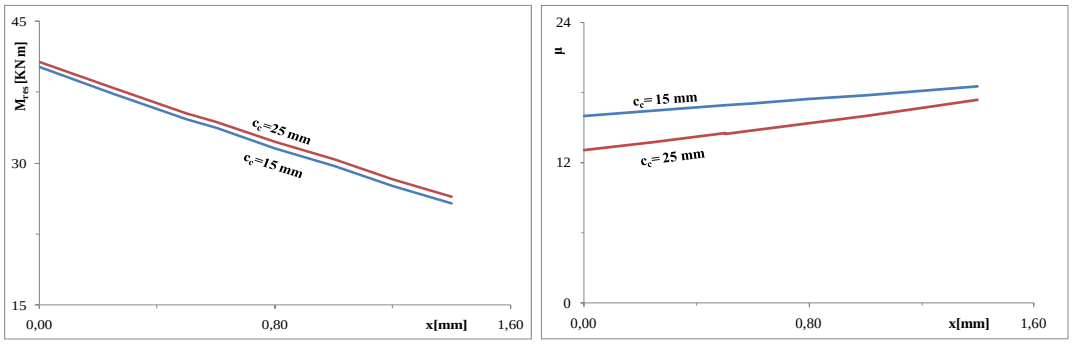

Figure 13: variation of bending capacity, M_{res}, (a) and ductility (b) related to corrosion penetration, x, in case of aged bars in tension.

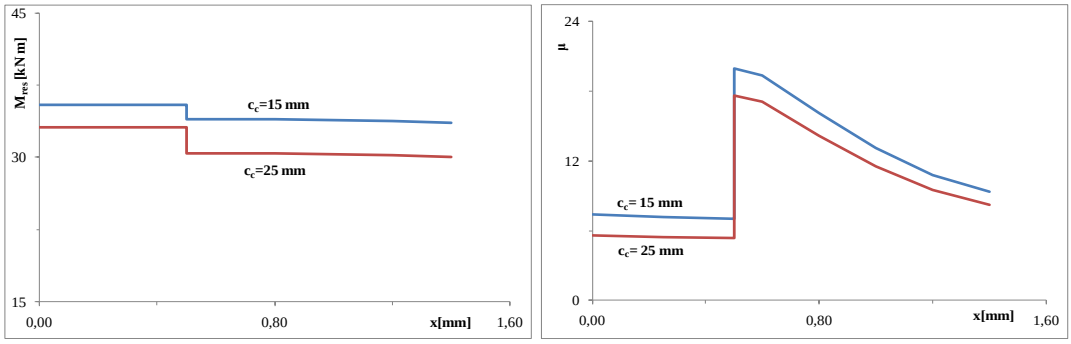

Figure 14: variation of bending capacity, M_{res}, (a) and ductility (b) related to corrosion penetration, x, in case of aged bars in compression.

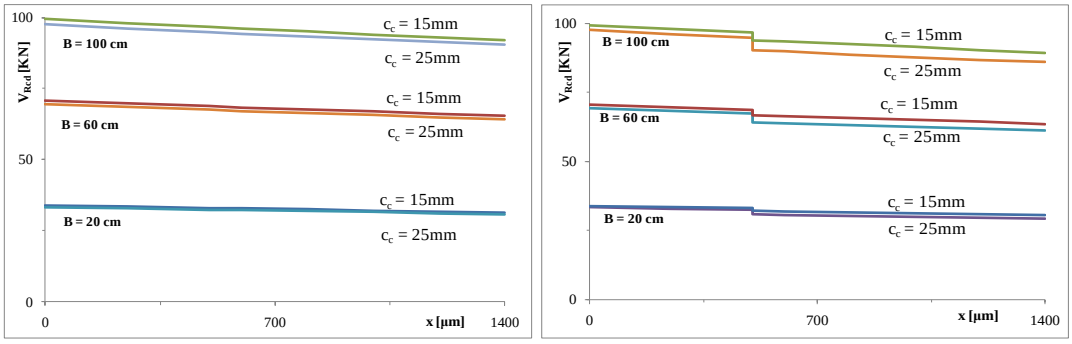

Figure 15: Shear capacity related to corrosion penetration in case of aged bars (a) in tension and (b) in compression.

7. Conclusions

Corrosion of reinforcement bars represents the main source of degradation for reinforced concrete structures. It yields to the reduction of cross section of steel bars, loss of bond, concrete cover cracking and spalling, leading to reductions of safety and structural capacity of buildings. Parametric and experimental analyses have been performed in order to evaluate the variation of structural capacity of structural elements reinforced by smooth or ribbed bars, affected by corrosion. Axial load tests have been performed and results show that the kind of reinforcement have a negligible effect on ultimate axial load capacity, even if both of them show a similar decrease of ultimate axial load capacity of about 25□ in respect to not corroded specimens. The induced corrosion process yielded to a severe degradation of concrete, with appearance of wide cracks on concrete cover surface. These cracks produce a rotation of the structural element during the axial load test, in the direction of corroded side of the specimen. Parametrical analyses on beams and slabs show that both for the former and the latter, the bending moment capacity decreases as corrosion penetration increases. This effect is more evident in the case of corroded reinforcement in tension than in the case of compression. Even if, in the case of corroded bars in compression, the decrease of moment capacity, M_{res}, is negligible because of the low contribution of bars in compression, the loss of moment capacity, M_{res}, becomes severe when cracks appear on concrete cover because of the reduction of concrete section. Considering the beams, the shear capacity at low values of cotgϑ, is dependent on bars. It presents a negligible decrease as corrosion penetration increases; while, when the value of cotgϑ is about 2.5, initially, the shear capacity is depended on concrete section, but when the corrosion generates a loss of cross section area higher than 10□, the shear capacity is transferred to the reinforcement. Considering the slabs, the variation of cross section of steel, generates a negligible reduction of capacity, but experimental tests underlined that corrosion process as well as the bars, also influences the concrete behavior. High values of concrete cover thickness provide two kinds of benefit to reinforced concrete structures: a delay of initiation of corrosion process and less percentage of loss of structural capacity.

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Overland routes through Egypt: transit points, cities and geographical projects

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Abstract
If the adoption of Islam in Africa was largely a result of trade networks, it should be added that Egypt has always held a key position in this geographical scene as an overland route. The Nile/Red Sea Corridor as a physical feature is possessing a degree of cultural homogeneity expressed in urban context. While much scholarly work has been devoted to "cultural encounters" in the Mediterranean ports, much remains to be said about Upper Egypt and the Red Sea, at the heart of the Islamic world, where cities were and still ports for pilgrimage and trading cross via the Red Sea to Arabia.
Non-Muslim ships were allowed to stop only at Quseir harbour, connected by a caravan route to the Nile that was the way to travel northwards and reach the river ports. After Napoleon Expedition (1798), in Mohamed Ali's rule a number of large-scale geographical project (fairy route and several proposals of Canal construction) were undertaken to establish the "overland route" across the Delta. In particular, we shall focus on a number of cities (Alexandria, Cairo, Suez, Quseir), trying to identify the correspondences between transit point along the trade routes and the related urban structure.
This topic lies in the possible effects of the New Canal de Suez Project on the cities' present status and the economic trade connection. Based on previous and on-going research (note S. Boca, M. Al Gammal), our contribution aims at clarifying how the geography of settlement in Egypt is deeply linked to the trade networks mentioned above and transit points.

Keywords: Urban context, Canal de Suez, Mediterranean/Red Sea trade routes, The Nile corridor, Overland route.

1. Egypt as key position in the geographical scene - an Overland Route
The centrality of Egypt's position within the Old World, located at the crossroads of traffic streams that have constantly connected Europe, Africa and Asia, has facilitated for over five thousand years (from the earliest dynasties up to modern Arab Republic Egyptian) a leading role in the political and economic landscape of the Mediterranean area. The geographical features of Egyptian territory were decisive in economic, social and historical affairs. The Nile and the Sea and the Desert dominate the landscape and simultaneously provide growth factors and limits to expansion.

The importance of Egypt's location since the time of Alexander the Great in the fourth century BC, were his armies discovered different civilizations, African, Egyptian, Mediterranean Sea and Persian. Hence shows the idea of the world, and thus the importance of the Arab region as a bridge between the East and the West, confirmed this importance in classical times (roman- Greek) when the ancient trade was active along certain routes penetrate the territory of Iraq and Egypt. With the Arab conquest of Egypt in 642 AD, the Arab region began to occupy a place in the Egyptian economy, because of the breadth of the Transit Trade between the East Asia-Europe and the West, so that Egypt turned to "linkage" of the ancient world, or the mediator way between the densest two regions in the world productive and populous. The Arab Near East region has turned into a great commercial corridor with two main wings which one of them is Egypt.

With the discovery of the Route of Cape of Good Hope, Transit Trade movement decayed in Egypt and caused the deviation their economic conditions especially with the Ottomans' occupation to Egypt. The combination of incidents knockdown the Red Sea trade that barely get rid of the effects and didn't return back to its former prosperity, from the beginning of the 19th century and in 1869 when the Suez

Canal was root out. The Suez Canal had a positive effect of improving European – Asian trading mainly serving the economy of western nations but on the local level though it had relatively a negative effect of the traditional trading routes (Agriculture and Industry in the Delta and along the Nile valley till upper Egypt) that were established for decades and centuries in Egypt. After the Nationalization of Suez Canal in 1956 the economic revenues returned back to Egypt which boosted the Economic status of Egypt but didn't compensate completely the loss of the old trading routes and the hierarchy of the Cities that had a strategic position in the old economic system. The new opening of Suez Canal influenced the establishment of new settlements and industries along the path of the canal.

2.The Grids of the Egyptian Urban Structure

In order to study the evolution of the trading ports we have to study first the old different trading rotes and their reflection on the urban structure of Egypt and especially the case study ports mentioned in the abstract. From analyzing the trading routes in map (See fig. 1) through different decades in Egypt. two systems of Grid were concluded. First system is Vertical with three main corridors of Geographical Routes of Egypt and the other system is Horizontal which is presented in the horizontal routing system connecting them. The vertical corridors are presented in The Nile / Mediterranean corridor, The Nile Desert Corridor and The Nile/Red Sea corridor and the points of the cross cutting horizontal grid are presented in the position of the River and Sea ports which are heritage milestones. The Suez Canal had an effect on the urban presence of these cities and the formation of new settlements towards North East of Egypt.

2.1 The Nile Mediterranean Corridor Delta

When we speak about the Nile/ Mediterranean (Delta), it is important to mention that the only crossing of goods stood at the edge of the delta was made up of the ancient caravan routes, all attested to the boundary between the delta and the desert. As for the routes from Libya, the Wadi al-Natrun valley have great importance which boasts the presence of several monasteries, likely place for rest and refreshment of travelers till now.

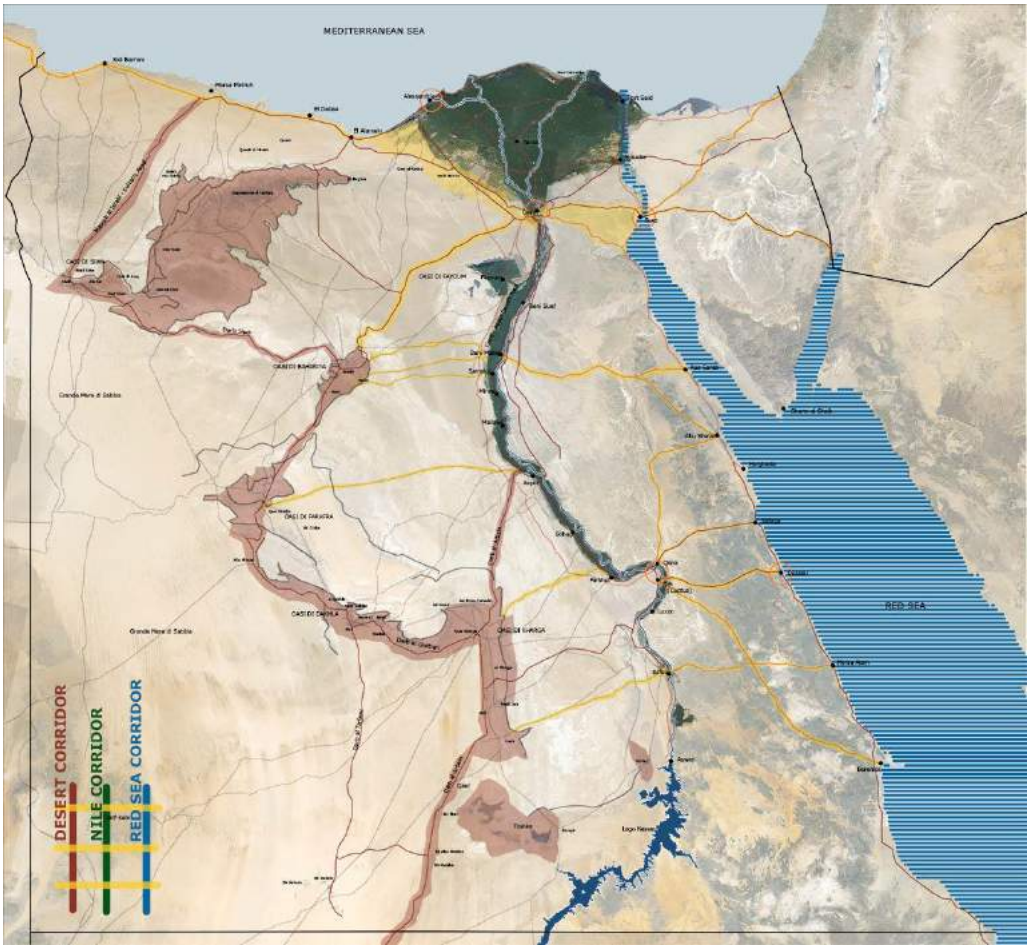

Fig. 1: The Map of the Vertical and Horizontal Grid of Three Main Corridors and Cross Cutting Routes,

Since the time of the Greeks, commercial and cultural exchanges on Mediterranean were very Important. Egypt has always been an important crossroads of trade between Europe, Africa and India. In the Middle Ages Egypt, especially the Delta, was facing on the Mediterranean with three city-port: Alexandria, the most important, Rosetta and Damietta. They held the Role of sorting goods by caravan routes to the north and central Africa and to the Middle East too. In the 19th century the route of the isthmus was very different and more complex than the current one. The goods were unloaded in the port of Alexandria before being re-boarded on the Nile, which would lead them in Cairo, the first stop for some of the goods, and to the southern markets. After passing Cairo they continued their journey along the Nile, the most important infrastructure for the Egyptian trade, up to Asyut and Qift. Due to the intensification of relations with India which led to the study of a new route for isthmus that could be useful, but for whom. There was a discussion on which route were more convenient, as for one route which was passing through Delta, the heart of Egypt, was preferable more than a direct route through the Gulf of Suez, through which Europeans can have much more advantages. Instead of this, there had been several proposals for the new layout of the Isthmus (See fig 3), until the Ferdinando de Lesseps and Engineer Luigi Negrelli took the decision of constructing the Suez Canal project.

Another shifting geographical route that affected the trading movement in the Delta and afterwards in Upper Egypt was the Railways' system. At the beginning of 19th century the British forces started to pressure Mohamad Ali to convince him with initiating a Rail way system. The first railway line was built by Britain in order to serve only their international trade and interest as a colonizing nation therefore they weren't concerned about the economy of the Delta. In fact, after opening the railway from Alexandria to Cairo (1855), the first railway in the Ottoman Empire as well as Africa and the Middle East, followed by an extension from Cairo to Suez (1858); the Britain closed the Cairo - Suez railway and the Delta area was neglected after the opening of Canal el Suez in (1869), the shortest route between Europe and Asia.

Although the above mentioned fact about the Delta, the only first railway built by the Britain was in some perspective beneficial to the Egyptian economy as the Egyptian government built a Railway network based on it. This helped on boosting the Egyptian economy and strengthening the relationship between the main trading and industrial centers presented in the provinces of the Delta with the international ports, Alexandria and Damietta and Ismailia, at that time and also to connect these provinces with each other. There was another network presented in the "Light Line" of Railway connecting the small towns of agriculture areas and small market areas. Railway opening was not limited to lower Egypt and by (1867), the building of the Upper Egypt railway started. It was pushed further south and opened at different stages until it reached Asyut in 1874. Before railways water (Nile) was the main stream of Economic transition route along these areas, so as we see the Railway system presented a revolutionary economic route network between the different parts of Delta from Alexandria to Damietta to Cairo and from Cairo to upper Egypt and participated in uprising the urban status of the Delta cities. (See Fig 2)

2.2 The Nile Desert Corridor

The desert had not been always a desert. There was plenty of rainfall and people could establish villages around rivers and lakes and live as hunters and farmers. When the climate condition changed, the water ways dried up, people immigrated to the Nile valley abundant this land.

Fig. 2: 1910, L.WIENER, "Chemis de Fer d'Egypte"

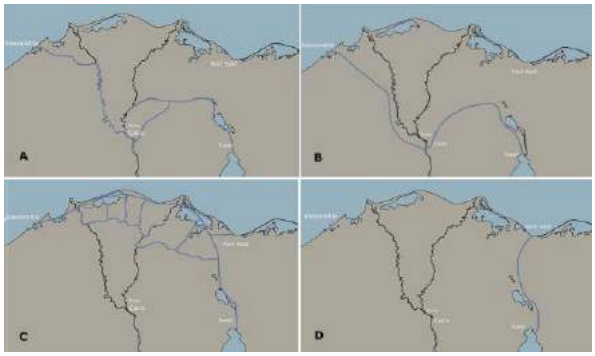

Fig. 3: Several Proposals of the New Isthmus (A)Project by Lepere, (B)Project by Talabot (C)Project by Barrault, (D)Project by Linant Mougel

In each depression there may be dozens of such places: some had become towns, others are used only as day station by Farmers, Traders and Travelers. Identifying seven major depressions in the Western desert of Egypt: Qattara, Kharga, Dakhla, Frafra, Baharya, Siwa, Fayoum and minor depressions including Kurkur, Wadi Rayyan, Wadi Natrun and Qara. We can read for the first time about Baharya and Kharga in the writing of Starbo (63B.C – 24-A. D) who narrates that the oases dotted the Western desert "like the spots on a leopard" and presents geographical pictures and descriptions to illustrate such concept.

In prosperity in the Nile valley its control reached into the Oases. In hard times, the Oases were left to fend for themselves, and were often invaded and influenced by the west in the direction of Libya. We know most about Kharga in Roman times, when all Oases enjoyed their greatest prosperity and was well protected by Romans. The soldier and Bedouin in their hire also patrolled the various desert tracks leading in and out of Kharga. In Christian era, all one has to do is look at the grand cemetery of Bagawat to see that Oases was Christian, where there were churches and hermitages everywhere. Christianity stuck around longer in the Oases than it did in the

Nile valley. When Islam came from the west via Libya, during the Mamluk era, Oases had fallen under the direct control of the central government in Cairo. Soldiers were sent to garrison the towns and fortress, and emigrated to the Oases along with their families. During Mohammed Ali's era, doors were opened to Oases. A number of scientists answered his call of fore-exploration. The Oases had been left to their own devices for a long time, therefore he brought them back under the Egyptian control, and then requested explorers to find out just what was in the desert. Obviously in all the above mentioned era they understood the power and the vitality of affairs and goods served through the Desert

However, there are a number of great North South routes leading from northern routes leading from northern coast of Africa through deserts to Bilad al Sudan. The future of some nations was depended by the ability to keep these routes opened and working Darb Al Arbain or the Forty Day's road is the main caravan track linking Darfur to Asyut in the Nile valley through 1721 kilometers. With the colonization of North Africa by European s all the caravan routes declined and further more they chose other way, often by sea, and eliminated the middlemen: the desert tribes that controlled the trade. In fact, in addition to Nomads, the people lived in the above seven mentioned depressions. Tracking and tracing were from the essential manners of the desert residents. They good tracker knew who, what, when, where, and even why.

2.3 The Nile□Red Sea Corridor

The Egyptian Nile's major maritime interface, through the Eastern Desert, was with the Red sea. The Nile / Red sea corridor, and East Africa. Each of these is characterized by certain physical features and possesses a degree of cultural, homogeneity expressed either in terms of Language, ethnic composition, or historical ties.

Fig. 4: Different Desert Routes, "*The □estern of Desert Eg□pt"*

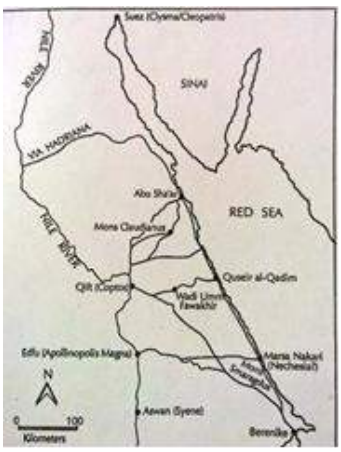

Fig. 5: Old Settlements and Routes on the RedSea "*Trading □ Travellers in Red Sea"*

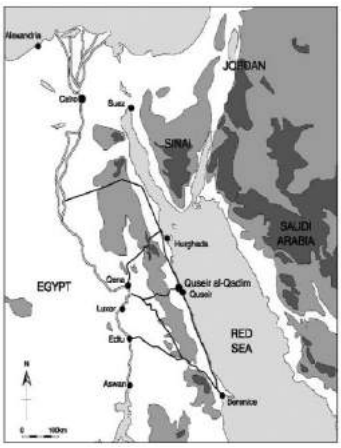

Fig. 6: Nile□Red Sea Corridor and Present Settlements along the corridor, "*Consumption, Trade and Innovation"*

However, this division is not obscure the fact that there was a large volume of inter-regional trade and also a significant amount of trade with the Non-Muslim world, particularly in pagan Africa, medieval Europe, China and India. Physically, North Africa may be defined as that part Africa between the Mediterranean and the Atlas Mountains, the trade network of North Africa continues the pattern established when the region was under Roman rule, with trans- Saharan caravan routes connecting to the West Africa and Sea routes linking it into a wider Mediterranean network.

The Nile/Red Sea corridor links Egypt and the Mediterranean with sub-Saharan Africa, Arabia and the Indian Ocean. The trade networks of this area are of great antiquity and precede the advent of Islam by many centuries. One frequently used trade route involved transporting goods by boat up the Nile and then transferring them with camel caravans, which would cross the desert to one of the Red sea ports from where they could have shipped elsewhere. The Gulf of Suez, part of the Red Sea corridor, was the base travel and commerce between Europe, Africa and Asia, where from the lower part of the Nile valley the goods came from the Alexandria till Cairo to Suez to be transported.

The coming of Islam had major implications for the economy and trade of this region. In the first place, the institution of the Hajj meant that thousands of African pilgrims would annually cross via the Red sea to Arabia. In addition, the increased importance of Mecca and Medina meant that there was an increased demand for food and other commodities in the Hijaz, which could be supplied from Egypt and other parts of Africa. Egypt found itself at the political center, where trade with and through Egypt across the Mediterranean and Red Seas formed an integral part of medieval intercontinental trade. In early Islamic era, it was only during the seventh and eight centuries that the Nile network was connected directly to the Red Sea, by the way of the Canal of the Faithful. When the Canal of the commander of the Faithful did not exist, journeys between the Nile and the Red Sea could only be made by land, the quickest and logistically, the easiest route was between Cairo / Fustat and Suez/al-Qulzum, at the northern extreme of what we know today as the Gulf of Suez. Distances through the Eastern Desert between the Nile of Upper Egypt and ports farther down the Red sea coast were, of course considerably longer than between Cairo and al-Qulzum. The chief of these ports during the medieval period was Qusier. The Former occupied the site of ancient Myous Hormos, today Quseir al-Qadim, and was active in during the Fatimid, Ayyubid, Mamluk and early Ottoman periods.

There were two interacting systems of trade at work in the Red- Sea during the Ottoman period:
First, The Mediterranean-Indian Ocean axis, bringing goods and metals from the west, in return for spices, cloth and other luxury goods from the east. Second, extensive regional trade and pilgrimage between and along the Arabian – African shores. Qusier's place with in this system was primarily within the secondary, regional system, redistributing the Agricultural wealth of Nile valley to agriculturally less productive areas such as Hejaz. Its role in the trade of eastern goods such as spices, cloth and incense was very much circumscribed by customs regulations which required all trade in such goods to pass through Suez

However, the planning strategies of merchants and travelers were, of course intertwined with commercial life on the river. Timing was all in the profitable conduct of trade and the delivery of goods into key markets such as Cairo and Alexandria. However, the commercial network of the Nile was not a closed system: it interacted with the commercial activities of the Mediterranean basin on the one hand, and the Red sea and wider Indian Ocean on the other.

3.The Horizontal Grids: The relationship between the River Ports and Sea Ports along the vertical grid

3.1 Alexandria, Canal Port and Cairo Bulaq

The urban area of the harbor is to witness and recognizable symbol of the passage in the cities of the isthmus route, of the changes and the rebirth occurred in Alexandria since the rise to power of Mohamed Ali.

Mohamed's Ali first "big project" was the re-founding of Alexandria before as the city-garrison, then as a store and a capital bridging European interests. The re-establishment of the city-port was made possible by two big project: the opening of a channel derived from the Nile, Rosetta branch, and an urban planning based on European models that were used at that time.

Alexandria flourished thanks to the rise of commercial activities and magnetized people from everywhere, rich Turkish- Egyptian merchants, Jews, Greeks, Italians, and around the Mediterranean basin, thus giving it the title of multicultural metropolis. The port was the transfer point and the place of

governing multiple uses of water. Channel Mahmodya, (Pascal Coste, 1818-1821) facilitated the connections with the Egyptian hinterland, allowing to concentrate in Alexandria all the agricultural production of the country. The channel made it possible to shorten the duration of the trip along the isthmus transit from Alexandria to Suez, part of the itinerary of the long course to India.

The development of Canal Port started in the middle of 19th century, with a regular grid and quarters were divided by type of the product, right where the first settlements and warehouses were already present along the canal. Timber and tobacco for Import and first ever cotton for export were the main products stored there. Just for the sale and trade of the rich cotton, in one of the blocks, along the main axis directly connected and set according to the grid of the new “European quarter” of Alexandria, we find the cotton exchange. This road, just as happens in other blocks, was named like the product stored there. Since this is a fundamental point within the urban structure even in the construction of Alexandria-Cairo railway line the station, dedicated to the goods at that time, were located at the same point but on the opposite side of the Mahmodya Canal: there weren’t a better place than here to gather the following activities: loading and landing, storage and departure either by the of the two major infrastructure (the Canal or Railway) at the same point. Subsequently, it was also necessary the transport of people, that is why the line was divided and taken inside the “Cairo station” in the city. There wasn’t a coincidence that this new station was in the position in the head of one of the historically axis, Moharrem Bey, that connected the new center and the Canal. Due to the importance that the channel covered at that time, in the head-node on the bank were built important social buildings for the city: a theater, the “Regina Margherita Hospital” and the “Moharrem Bey” Mosque. (See Fig. 8)

The channel besides being, until the opening of the railway, the main communication infrastructure for Cairo was considered one of the luxury residential areas and a pleasant dining and pedestrian venue. For this reason, along its banks it was built important palaces such as Moharrem Bey palace, Said Pasha palace (1859), Halim Pasha palace (1863) and Antoniadis Palace, related to the richest sophisticated families, and a botanical garden.

The river-sea ports of Alexandria and Bulaq continued to have a fundamental role, and in them the commercial life was vivid: the goods were sorted, boarded, there were important markets and warehouses. The goods then continued their journey along the caravan route that put in direct connection Cairo to Suez.

3.2 Suez□Cairo and □useir□□us, Copts

From the map alone one would have thought that Suez, or somewhere close by, would have been the major port in the northern Red sea throughout centuries. But it is not so; the place now known as Suez and in antiquity as Arsinoe and Clysma / Qulzum has played a relatively minor role in the Red sea trade. The location of Qulzum was established according to the place where the water coming from the Nile to flow into the Red Sea that we dug at the beginning by pharaohs.

Amro Ibn Elass rebuilt the canal after the Islamic takeover of Egypt linking the Nile to the Red Sea creating a new supply line from Fustat (Cairo). It was used for shipping grain to Arabia and to transport the pilgrimages to the Holy Land. The canal was stopped up in 767 AD by the Abbasid caliph El-Mansur to cut off supplies to insurgents located in the Delta and to starve out rebels in Medina. This was before closing the Canal in the Abbassed period. Also one of the well-known routes was the Hajj route, it was the Egyptian route that pilgrims from coming from Morocco or Spain used to take. It started from north east of Cairo till Suez then to Sinai till Arabia.

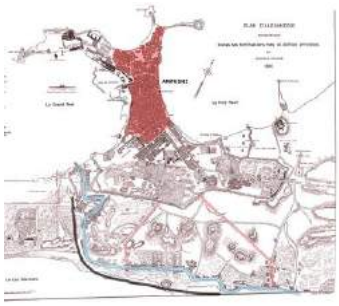

Fig. 7: Old settlement □ Urban structure, *“Plan D’Alexandrie, Muller 1855”*

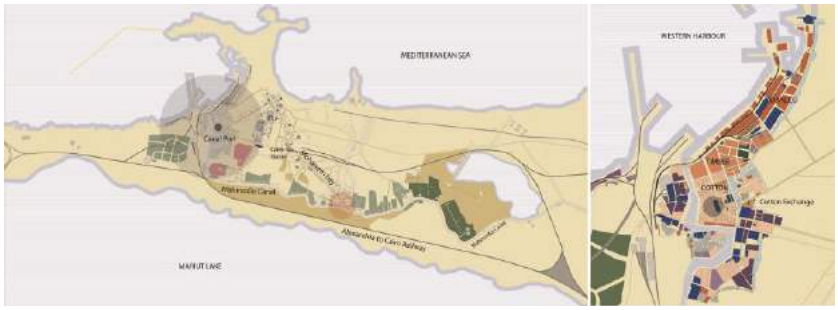

Fig. 8: Alexandria during the 19th Century-Urban Morphology and Canal Port District. *“Silvia Boca”*

It was the most famous land route, and the sea route was from Cairo till Qus then to Qusier which was well known by the pilgrimage trips and a transit point for transferring the goods till Mecca and Madinah in Arabia beside the Pepper and Spices trading from India and Silk trading from China.

However, it seems that Qusier had ceased to be a major player in international commerce before the opening of Suez Canal. An overland access from Quseir to the Nile was through Hamamat, its corresponding Nile port was Qus and Coptis, on the Dendara bend. Though in the past it was terminus of an ancient caravan route from the Nile to the Red Sea, and the place where routes from Coptos and Quseir joined before passing to Berenice. Arabic geographical sources often describe Qusier as the "Port of Qus. Quseir was used by merchants to land cargoes of spices bound for Fustat via Qus. Ports serving the Nile valley exhibit a notable south wards, south sea ports were as Qusier Al Qadim (Limen/Albus Portus (White Harbor) - Myos Hormos and Berenkie and added to them Safaga Quseir.

4.Evolution of the Trading Points□Ports □Sea and River□as Heritage Milestones and transition point of Geographical scene

4.1 Alexandria

The Greeks always knew that Egypt could count on a huge potential in natural and human resources. In 332 BC Alexander the Great occupied the entire region and on the Delta of the Nile founded a new city: Alexandria. Alexandria was not based, as usually happened, for military reasons, but for commercial reasons: this is the real reason and the real power, even today, of the city. In the period of its greatest splendor, in the third century BC, Alexandria became the main port of the eastern Mediterranean: it was able to accommodate the largest merchant
and commercial ships of the time. Alexandria made a fortune for two main reasons: on one hand with the export of Egyptian agricultural products, the other by maritime trade to the Middle East. So it was that Alexandria soon became the largest Greek city in the world and then the most important of the Hellenistic world. During the Ottoman period The rest of the Historical evolution related to the urban transformation was mentioned above in subsection 5.1.

Alexandria didn't lose its position as a sea port but it lost its internal importance as a transit point of goods along the Delta, rather the towns along the post canal declined. The reason behind such declination opening Suez Canal. The change of the trading route which affected the urban expansion and the economic region that surrounded to serve each town, especially the quarter around the canal inside Alexandria. For example, there were villas and then factories established during the flourishment of Port canal and Mahmoudya canal. which were slowly abundant until it became an urban decay.

4.2 Fustat Cairo □Bulaq:

There were two major ports in Cairo that were mentioned through history, considering Cairo as a fundamental and the major transit point, where all of the routes interconnected. Al Fustat which is the first capital of the Arab conquest, and then comes Bulaq. We can refer to Bulaq, by the end of the 15th century, when it was even able to take over the role as the major commercial port from Masr el-Qadima (Fustat). Starting from the Ottoman period in Egypt (1517) the two major river and sea ports were Bulaq and Alexandria, where they established Al Anfoshy district in Alex and they built "Wekalas", a typical architecture building where Merchants used to sit in during merchandising their goods and store them. We can find the same architecture in the district of Bulaq, this means that this kind of architecture is one of the main characters of urban morphology in transit point cities. See Figure ()

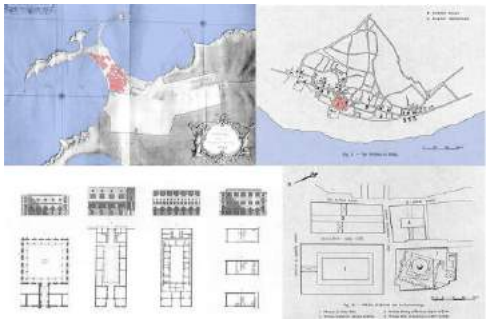

Fig. 9: Wekalas in Aleanderia □ Bolaq, *"C. Pallini, S. Smith1□th IP□S Conference, New Delhi, 11-1□ Dicembre □006"*

Fig. 10: The analysis of Cairo (Fustat/Bulaq/ Al Azbakeya), http://mapsof.net/cairo/cairo-map1847

Tin the second half of the 15th century, they were two major transformations in Cairo taking place in Bulaq and around the Azbakeya lake where Amir Azbak established Al Azbakeya district. In the 19th century it became a place where the upper class and merchants seek to live which means it had palaces and hotels Bulaq continued to be the port where the goods were landing and by its strategic position being close to the river were antiquities can be transferred., therefore they established the first Egyptian Museum in (1835). It isn't a co-incidence, during the 19th century, that Egyptian railway station of Cairo was established between these two major districts of Bulaq and Azbakeya. Considering it as a new transit point in Cairo's urban structure. Subsequently to this transformation the new Cairo was built between the Old Cairo (Fustat and Kaheret el Muez) and the river where Bulaq was located.

4.3 Suez

Though it had a moderate position among the Egyptian cities, during the Arab conquest era the Qulzum was for the first time before the Suez Canal opening to flourish and be the axis of economic relationship between the Mediterranean and the red sea. It had lots of palaces and mosques, which got diminished due to the declination of Qulzum after 767 in the Abasid period where the Nile – Red Sea canal was closed. With closing the canal, people started to immigrate from Qulzum till it became an abundant city. The city was settling in the middle of the desert and it lacked fresh water, the whole city was depending on the convoys or the ships as a source of transporting fresh water to it. The name Suez was first mentioned by the Arab geographers. Even during the Fatimd period, Suez had a very minor role in trading as it had very shallow harbor for ships coming from India, where all merchants went to new ports on the Red sea which are Quseir and Aydab.

However, the development of Suez returns truly to the political and Military circumstances in the Middle east during 12th century where it became a Military harbor. During the Mamluk period, they built Markets and supply points. In the Ottomans' period they built a fortress to protect the supply points and they enhanced the Suez harbor which was used as a shipyard for Ottoman fleets in the Red Sea in the Sixteenth century and continued in use as till 19th century when it became the fastest and safest Hajj (Pilgrimage) sailing and trading port. Throughout much of the Ottoman period, Suez was the main port of departure for Egyptian wheat to the holy land, and the main Official caravan route ran from Cairo via Suez. After the Opening of Suez Canal in the 1869, there was a drastic Urban transformation in the Urban structure of Suez and its' surrounding area which we will mention below.

4.4 □useir

Qusier is a small Egyptian city on the east African Red Sea coast. The present Egyptian town of Qusier is suited on the Red sea coast approximately 500 kilometers south of the port of Suez. Historical records and archeological excavation have shown that over the last two thousand years there have been mooring and harbor facilities at two sites in the vicinity of the town. Indications are that earlier harbor was located ten kilometers north of Qusier, which is now called Qusier El Qadim or Ancient Quseir. Through archeological studies during the Roman occupation, in the 1st century BC. A Vas international network linked the Roman Empire's Mediterranean heartland, and the near east.

Following period of abandonment after the 4th and the 5th century, the site of Qusier alQadim was revived as an international port during the Fatimid period, from the latter half of the 10th century. The Arabs inherited the Roman trade routes but also ventured further to the east establishing contacts with China, Indonesia, and eventually adding East Africa (African Horn). This earliest mention of the name "Quseir" appears in the 13th century under the rule of the Bahri Mamluk till 14th - 15th century.

Fig. 11: Analysis of Qusier, Mosques □Shrines, *"Dalila el Kerdany, Living Museum of Qusier"*

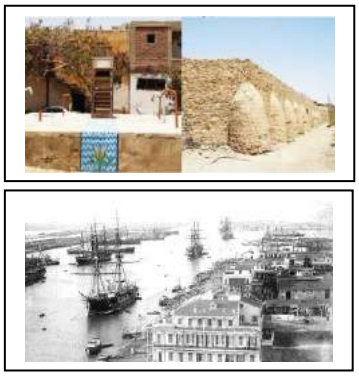

Fig. 12: Pictures of Quseir □ Suez, *"Dalila el Kerdany"*

Fig. 13: Suez Old Map, Qulzum, *"Claudine Piaton, Suez"*

The present town of Qusier apparently, took the role of the Red Sea port for the Upper Egypt. However, it might be assumed that the impetus for developing the new Quseir came with the Ottoman conquest of Egypt in 1517. Evidently “New Qusier” had come into existence by the Ottomans and their strategic expansion into the Red sea in the early 1520s. The Ottomans built a Fortress in order to maintain their strategic military status and their control over the trading routes and pilgrimage.

The fort is generally associated in the minds of modern residents of Qusier with Muhammed Ali, who did much to improve the economic fortunes of the town in the early decades of the nineteenth century. Though the Ottomans took Suez as their main port, Muhammed Ali established Quseir as the main port of departure of subsidies of wheat and other commodities to the Holy cities beside the transfer of Pilgrims which reached 30 thousand a year. The historic mosques of Ottoman Quseir, most of which are likely date from at least the eighteenth century with dedications to sheiks from Somalia, Saudi Arabia, emen, India Morocco and Tirkrur.

Quseir port entered into disuse in the second quarter of the 19th century, after the change of trade routes to Alexandria and the port of Suez, and had been moved further south and transformed to be an industrial facility for phosphate.

5.The Effect of Suez Canal on the Egyptian Settlements

5.1 The Growth of New Settlements Along the Canal and the Flourishment of Cairo

Construction of the canal in 1869 led to the growth of new settlements in what had been, except for Suez, almost uninhabited arid territory. More than 70,000 acres (28,000 hectares) were brought under cultivation, and about 8 percent of the total population was engaged in agriculture, with approximately 10,000 commercial and industrial activities of various sizes. The major urban centers are Port Said, with its east-bank counterpart, Būr Fuʾād; Ismailia (Al-Ismāʿīliyyah), on the north shore of Lake Timsah; and Suez, with its west-bank outport, Būr Tawfīq. Water for irrigation and for domestic and industrial use is supplied by the Nile via the Al-Ismāʿīliyyah Canal.

5.2 The Abandonment of Upper Egypt

After shifting the route of trading from coming through the south Red Sea ports to the South river ports in Upper Egypt till it reaches Cairo (Fustat/Bolaq), and establishing Suez as the main port in the Red Sea, gradually Upper Egypt came into poverty and immigration rates started to increase towards the north especially Cairo. Especially after opening Suez Canal, the vital trading routes became in the North East, where as we mentioned evolved new cities which increased the strategic value of Cairo. Till today Cairo accounts for high rates of internal migration from Upper Egypt. This internal migration is labor migration from an area that is considered to be underdeveloped, poor, and more traditionally religious. Upper Egyptians are often motivated to emigrate to Cairo because of the presence of family members and networking, possibilities to get a government position, etc. There is also a group of migrants that see their move to Cairo as a transitory step before emigrating to Gulf countries.

6.The New Suez Canal Foreseeing Effect on the Egyptian Settlements:

Nowadays, witnessed the opening of the New Canal Suez, the project can have advantages such as supporting the Suez Canal Area Development Project and should enhance the Egyptian national economy and turn Egypt into an international logistics center. Also one of the project’s objectives is to create job opportunities for young people living at the Canal area, Sinai and neighboring governorates; and creating new urban societies – settlements as well. Also undergoing a change in its internal map by creation of new governorates – specifically creating for all Upper Egypt governorates an arm/outlet to the Red Sea. Therefore, government declared the intention to form three new governorates and redefinition of the current borders of governorates, especially the Red Sea Governorate. This approach is aimed to improve the investment opportunities in each governorate, and to initiate strong national development projects. The disadvantages of New Canal Suez can be presented in the same effects of the Old canal which was the reason behind shifting the geographic importance from the Delta and the southern cities of the Red sea to the Northern eastern were we find Cairo, Suez and cities of the canal leading to the increase of poverty in the southern part of Egypt.

7. Conclusion

According to the above study, we conclude that the main Heritage area in each city is influenced by two main factors: the passage of the trading routes, the policies of each historical period and economical factors of each period. It is important to realize that we have to consider Heritage not only historic buildings but rather the context and territory that represents the role of the city in different periods along centuries.

Fig. 14: New Canal Suez □Development plan, *"Canal Suez Investment Conference"*

Fig. 15: Alexandria view from the Delta-the Resources, Silvia Boca, 2013, *"La regione agricola di Behera e il suo attestamento ad Alessandria."*

We can consider Heritage buildings, infrastructures and Landscape (rural and urban areas, structures and morphology). We have to be able to recognize them in each case study although they are different and influenced by different factors in each case study. The above figure is an example of how we can study (by comparing different references, documentation and maps), recognize and then show the resources through mapping down the heritage territories which are existing nowadays. (See Fig.15). And the study could be the beginning step for each researcher that based on it he/she should decide which strategy to use regarding Heritage in each city.

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THE RE-USE OF WINDMILLS WITHIN THE SCOPE OF SUSTAINABILITY AND INTERIOR DESIGN

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Abstract
Windmills are one of the most important local architectural structures which use wind energy, from the past to present. Windmills were constructed generally to grind cereals and seeds, lift water and run saws. Windmills may fall under the scope of industrial heritage with these aspects. In this study the windmills which located in Mediterranean countries such as Turkey, Greece and Spain have been included. Also In this study, the historical development, the architectural design process and the interior design setup of windmills are examined. The re-uses of windmills in different functions were mentioned on re-use of existing structures within the scope of a basic act of sustainability.

Keywords: Re-use, Windmills, Sustainability, Interior Design, Industrial Heritage

1. Introduction
The rapid advances in the technological and economical fields which came one after the other, had leaded up to many unfavorable results. The unconscious use of technology in order to raise the quality of life has caused the sources that have vital importance for survival of mankind such as air, water and soil to pollute, extinction of various animal and plant species, global warming as an effect of greenhouse gases, climate change and degradation of ecological balance. The notion of sustainability has been put forward when this situation was recognized and application methods have been started to be researched.

According to the WCED (World Commission on Environment and Development) *"Sustainable development is development that meets the needs of the present without compromising the abilit of future generations to meet their own needs (Our Common Future, Brundtland Report, 1987)."* The use of renewable energy sources such as wind, solar in urban planning and architectural design has been mentioned strongly in several conferences such as the Stockholm Conference on the Human Environment (Stockholm, Sweden), the Earth Summit (The United Nations Conference on Environment and Development, 1992, Rio de Janeiro, Brazil) and the Habitat II, The United Nations Conference on Human Settlements (Istanbul, Turkey, 1996).

The use of renewable energy sources is one of the main factor in designing sustainable environments, buildings and spaces. Wind energy is a clean energy source which can be used in several parts of an ecological and a sustainable building. Wind energy is a converted form of solar energy. Differences in temperature and pressure that are arisen because the sun does not heat lands, seas and atmosphere equally generate currents of air. Wind is the movement of air flowing from areas with high pressure through those of low pressure, relative to the surface of the earth [1].

The use of wind energy is believed to begin in the Middle East around 2800 BC. Wind energy has been used for irrigation purposes during the reign of the Babylonian King Hammurabi in Mesopotamia around 1700 BC, also have been used in China during the same period [2]. In addition, the wind

power was also used for sailing on marine transportation. The first sailing boats, are believed to be used in the Ancient Era by the Egyptians or Phoenicians. Until the invention of steam ships, sailing boats have played an important role in the intercontinental transport and trade [3].

2. The History of Windmills

The first examples of mill, date back to Neolithic Period (9000–5600 BC) in which the people started to engage in agriculture and adapted to sedentary life. People have begun to obtain flour by grinding cereal grains (wheat, barley, corn, rye) between two stones and by developing this process they have had the first hand-mills. People have begun to live in a common area and have begun to engage in agriculture. This common life has revealed the need of "division of labor". As a result of this requirement, it can be said that the milling has arisen as a branch of profession and several mills have been constructed. Initially, slaves or animals such as horse, donkey, mule and camel turned the grinding stones. In time, the water was used to turn the grinding stones, and then the wind power was used. Thus, the windmills were started to be constructed. These windmills can be regarded as the forerunners of today's wind farms.

A windmill is a gear wheel machine which harnesses the energy of wind to produce energy. Usually windmills were used to grind cereals and seeds, lift water, run saws. In addition, the windmills have been used to weave fabric and rush in Islamic countries, also have been used to pump water in Netherlands to separate the land from the sea. Although the modern windmills (wind turbines) are still important power supplies in developing countries, the wind turbines have decreased their roles in industrially developed countries. Many windmills which are dated to early periods and that can be considered as industrial heritage lost their architectural features and are idle today. However, some of them are still structurally in a good shape.

Windmills are presumed to be constructed for the first time 3000 years ago near Alexandria. The first windmills constructed by Turks for the first time in 640 A.D have been introduced to Europe during the Crusades [5]. The first use of windmills by Turks and Persians began in the 7th century while the usage of windmills in England, France and in Netherlands began in the 12th century [3]. The first windmill mentioned in written documents was constructed in 644 A.D. in Seistan at the border of Persia and Afghanistan. Windmills were used to irrigate rice fields around 750 – 850 A.D. in China. The vertical-axis windmills that have been used on East were enhanced in the West and horizontal-axis windmills were produced [5]. One of the most scenic and successful applications of wind power is the extensive use of water pumping machines on the Island of Crete. Here, hundreds of sail-rotor windmills pump water for crops and livestock.

3. The Structural Features of Windmills

When we examine the structural developments of windmills, we see that the structure of windmills was formed according to the requirements. We can examine the horizontal-axis windmills in four main groups such as post mill, smock mill, tower mill and American fan-type windmill (Halladay windmill). As the main theme of this sudy, the tower mills which are located in the Mediterranean region, will be mentioned.

Post mills are so named because of the large upright post on which the mill's main structure (the "body" or "buck") is balanced. By mounting the body this way, the mill is able to rotate to face the (variable) wind direction [6]. The body contains all the milling machinery. The first post mills were of the sunken type where the post was buried in an earth mound to support it. Later a wooden support was developed called the trestle. This was often covered over or surrounded by a roundhouse to protect the trestle from the weather and to provide storage space. This type of windmill was the most common in Europe until the 19th century when more powerful tower and smock mills replaced them. In a ***hollow-post mill*** the post on which the body is mounted is hollowed out, to accommodate the drive shaft. In this way it is possible to drive machinery below or outside the body while still being able to rotate the body into the wind. Hollow-post mills driving scoop wheels were used in the Netherlands to drain wetlands from the 14th century onwards [7].

Smock mills are a fundamental improvement over the post mill design. Instead of rotating the whole body of the mill to face the mill, the smock mill design consists of a fixed wooden body, holding the milling machinery, together with a rotatable cap, which holds just the roof, the sails, the windshaft and the brake wheel. By rotating just the mill cap, the body of the mill can be made much larger than in a post mill, and hence able to house more pairs of stones, and more ancillary machinery. In addition, the body can be made arbitrarily high, the extra height allowing the sails to catch more wind. Smock mill

bodies are theoretically roughly circular, though the use of straight timber means that most are actually eight sided. Other numbers of sides occur, including in England examples of six through to twelve sides. In addition there are a number of small smock mills throughout the world which have square bodies [6].

As early as 1390, the Dutch set out to refine the ***tower mill*** design, which had appeared somewhat earlier along the Mediterranean Sea. The Dutch essentially affixed the standard post mill to the top of a multi-story tower, with separate floors devoted to grinding grain, removing chaff, storing grain, and (on the bottom) living quarters for the wind smith and his family [8]. Tower mills take the smock mill design even further, by replacing the wooden body with a brick or stone built tower. Since the necessity of having straight sides (due to straight timber) is removed, true circular bodies are the common arrangement. However straight sided structures do occur, and even towers that start off with straight sides at the base, but change to a circular plan part way up. By using brick or stone for the body, tower mills can be built even larger and taller than smock mills, and by being a more durable building material, the mills are more weatherproof, and more fireproof [6].

As indicated, the main theme of this study is the tower mills which are located in the Mediterranean region. In this regard, the building survey one of the windmills which is located in Kızlan Village near Datça (Figure 1) was conveyed. Datça is village which is located in the Mediterranean coast of Turkey.

> *"The windmills of Datça are c□lindrical tower-li□e structures, with thic□ stone walls. The outer diameter of the tower wall which is built of rubble stone is 6.00 meters and its height is □.7□ meters. The windmills of Dat□a have three floors. The heights of the floors are □.10 meters, □.□□ meters and 1.□0 meters, respectivel□. There is an arched entrance door on the first floor and its width is □0 centimeters and its height is 1.□0 meters – at the highest point –. On the third floor there are two windows which are placed opposite to each other and the□ measure are 90□6□ centimeters.*
>
> *There is a stone staircase which is ad□acent to the inner face of the wall rising from the right of the entrance door. Its width is 60 centimeters and it has 17 stairs. □ou can reach the first floor on the ninth stair to and the second floor on the eighteenth stair. The depth of the tower's base is as near as 50 centimeters. There is a furnace (fireplace), a cabinet, one or two alcoves and an empt□ area having a diameter of □.□□ meters on the first floor. This area is also the sleeping □uarter of the miller.*

Fig. 1: Six windmills were arranged in a row near the village of Kızlan, 5-6 km to Datça. The building survey was used for the windmill third from the left. (Photograph: İskan Kazak) [1]

> *□ indows and door openings have been □ept to minimum and are located on the west or east sides, in the lee of the prevailing winds. This serves two purposes: avoiding interference with the wind and the air currents created b□ the turning vanes, and enabling the structure to withstand the strain and vibrations when the windmill is operating. Overall, the features of the structure reveal that their designers had considerable □nowledge of static. The interior fi□tures of the windmill and the mechanism are made entirel□ of wood. The mechanism*

*is simple and functional. The construction techni□ue reflects the □nowledge and e□perience gleaned over centuries **[1]**."*

When we examine the interior space of this windmill, we can see that the interior space was designed with the concept of minimalism thus, sometimes obstructs the movements of the miller. The staircase, the window and door openings and the cylindrical shape of the windmill were formed because of the function of the windmill. The ground floor is a narrow area however it rises up vertically. Most of the windmills are deserted; however some of them are used negatively such as storage, hayloft or barn.

4. The Re-use of Windmills

The windmills are mostly located in the villages of Alaçatı, Bodrum and Datça in Turkey. There are 80 windmills, as the oldest one is 400 years old, located in the village of Bodrum. One of these windmills restored and refunctioned as Windmill Museum □**Figure 2**□. Some of the windmills are refunctioned as restaurants in the village of Alaçatı. There are approximately 19 windmills in the village of Datça. The most known of them are located in the village of Kızlan in Datça. As also seen on Figure 1, one of windmills was restored as a house and the other as a restaurant and both of them are in use today. Some of these windmills were still in use until 1972.

The windmill and the church which is located on the Island of Cunda, was restored by the Museum and Cultural Foundation of Rahmi M. Koç and is still in use with the name of *"Sevim and Necdet Kent Library"* since 2007 □**Figure 3**□. Windmills are sustainable structures which are made from local material using traditional methods. Within the scope of reuse of windmill, windmills that are currently available wre restored and are used as museum, library, restaurant and residence. Another approach is the reuse of windmills proper to their own functions. Within this scope, a windmill in Yalıkavak was restored by the collaboration of Municipality of Bodrum Yalıkavak and Kocaeli University and began to product flour. Similarly, the Little Salkeld watermill was restored in Cumbria in North of England. It is a traditional 18th century corn mill, using the power of water to produce organic flour, corn and muesli. There are trips round the mill. There are also baking and cooking courses, a mill shop selling the products of the mill, and a tea-room serving coffee, wholefood lunches, afternoon tea with watermill breads, scones, cakes, biscuits, tarts, pies, and quiches**.**

Fig. 2: The Windmill Museum, □alıkavak / Bodrum / Turkey □**9**□

Fig. 3: Sevim and Necdet Kent Library, Cunda Island / Ayvalık / Turkey 10

Fig. 4: The Folklore Museum “Bonis Windmill”, Mykonos Upper Chora / Cyclades Islands/ Greece 11

Fig. 5: The windmills are used as residence, Dodecanese / Leros / Greece [12]

Mykonos was situated on a major trade route. The grain produced needed to be refined and compacted for the sea transport. Combined with the winds that blow on Mykonos, the windmills were born. The Mykonos windmills are iconic feature of the Greek Island of the Mykonos. Today the mills are no longer used for grinding. They are still important for the historical heritage they carry. Some of them have been restored and now used as museums (i.e. Bonis mill) while others as dwellings. The Windmill of Geronymos is still preserved remarkably. It operated up to the 1960's and its mechanism is still preserved. The windmill is now privately owned [13]. Boni's mill [**Figure 4**] which is a part of Mykonos Folklore Museum, still maintains its original interior and exterior form. Inside you will see where the workers used to weigh the sacks of flour, the storage room and the grinding machine. Each year, on the second Sunday of September the harvest celebration takes places here and crowds gather to step on the grapes at the old wine press and celebrate the custom. [14].

The windmills in Spain are tourist attraction centers that are preserved and enhanced to serve as living museums. The tower mills in Spain never provided a living space as in some European windmills. There was an area where grain would be bagged and loaded and perhaps a small space beneath to stable mules. Then the next level housed the millstones and the upper floors the machinery and a gallery for the storage of linen vane cloths and other essentials, the whole accessed by a spiral staircase. Every Spanish mill was given a name. In the northeast province of *Ciudad Real* some thirty mills sit on the Hill of La Paz. ***The Sardinero*** contains some original 17th century machinery, ***The Culebro*** and ***The Lizard*** are house museums, ***The Pylon*** preserves the history of wine, ***The Burleta*** and ***The Infant*** also have original machinery, still grinding grain so that visitors may observe the operation of a working mill and ***The Poyatos*** serves as the Office of Tourism [15].

Fig. 6: Traditional windmill of Don Quixote, Consuegra / La Mancha / Spain [16]

5. Conclusion

Windmills are one of the most important local architectural structures which use wind energy, come from the past to today and played an important role in the daily life of the rural people. People used windmills to grind cereals and seeds, lift water, run saws. The windmills are also sustainable structures which are made from local material using traditional methods. Windmills are one of the representatives of the industrial heritage as well as. Windmills need to be preserved within the scope of industrial heritage and this heritage needs to be transferred to the future generations. Within the scope of this preservation, their surveys have to be documented, re-use proposals have to be developed and conservation problems have to be documented. For this reason and a commission has to be established between Mediterranean countries and this commission should follow the studies. Windmills should be preserved with their original features and their reuse potentials should be examined. It would be better to re-use well constructed windmills for cultural events or in its original function. The idle windmills may be included in the nature walking. The aim of this research is to take the initiative of these studies.

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Historic Garden – possibilities of its revitalisation and interpretation

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Abstract
The main objective of the paper is the presentation of some examples of the interpretation of the historical garden in Kremnica, a small town in Central Slovakia. The garden is a part of the Educational centre for visualisation and communication of The Academy of Fine Arts and Design in Bratislava. Our approach is focused on present use of this historical garden underlining its added value by using it directly for the educational activities in fine arts and design. This will results in a new dimension of its functionality and of course bring a new dimension to the interpretation of the garden as the place for the art. It seems to be very difficult to combine the educational requirements with the preservation of the historical site and all of its qualities. The paper also present results from the intensive student´s workshop which was organised in this garden to tried found new approaches to its usage.

Keywords: historical garden, educational facility, interpretation.

1. Introduction and the overview of the issues
This interesting example of a historic garden interpretation is a result of an assignment of a landscaping and architecture study of the historic garden on the premisses of the Communication and Visualisation Learning Centre of the Academy of Fine Arts in Kremnica. The unusual combination of teaching art subjects on the premises on the historic garden makes this assignment highly specific while creating a new dimension of functionality and revitalisation of the garden.
The garden, together with the Communication and Visualisation Learning Centre of the Academy of Fine Arts in Kremnica, is situated directly on the slope beneath the walls of the town castle in Kremnica. The shape of the garden is irregular, copying the shape of the contours. Its limits are defined by the castle wall in the East, a corridor leading to the castle in the South, a historically looking metal fence in the West and the building of the Learning Centre in the North. The overall size of the premisses is 1740 m^2 and the garden covers the area of 1200 m^2.
In October 2014 the garden held an intensive workshop attended by students and teachers from the Institute of Landscaping and Garden Architecture at the Faculty of Architecture of the Slovak Technical University in Bratislava. This workshop aimed to look for ways of revitalisating the garden while maintaining its historical character on one hand and providing space for the activities of the Communication and Visualisation Learning Centre on the other.
The objective of the report is to present the results of research suggesting 3 possibilities of reconstruction of the garden with emphais on maintaining the historical aspect.

2. Methodology and research methods
The methodological processes consisted of several steps:
1. Historical research focused on acquiring data about the house and the garden from town archives, e.g. historical maps, vistas and post cards.

2. Field survey focused on determining the state of its biological and architectural parts.
3. The function and operation analysis is an important step preceding the actual planning and it needs to balance out the demands of all the interested parties.
4. The composition analysis defined the placement of individual parts and elements within the overall composition of the garden. The garden has one main composition space and several side spaces. Groups of trees represent the dominating natural features, while the castle walls represent the dominating architectural feature. When it comes to composition, open views of the town and the surrounding nature are also important.

3. Results

The results of the historical research produced very little data. All we know is that the garden was a part of a ring of gardens situated on the slopes beneath the town walls. The maps and the other visual materials do not show any buildings or other peculiarities.
The house and the garden were developed gradually from the13th until the 15th century. The first written accounts mention that this area was used as a cemetery for burying the dead during the plague epidemic. Later, the slopes have been used to grow fruit trees. Other historical documents state, that in the15th to16th century it was the location of the executioner's house. In the 19th century the house and the garden were owned by a rich Sivoš family, but after the WWII they fell into disrepair. Later they became the property of the Slovak Fund of Fine Arts and now they belong to the academy of arts. In 2014 the house was fully reconstructed, but the garden remained in its original state. In 1956 the historical centre of Kremnica where the garden is situated was proclaimed an Urban Conservation Area and the medieval walled castle is now listed as a National Cultural Monument. This close contact with the important historical heritage makes the interconnecting of the educational demands and the preservation of the historical character of the space without violating its genius loci quite challenging.
The analysis of the natural elements *(Fig.□)* included the findings of a detailed dendrological study focused on the species and the current state of the trees and the herbaceous layer. The garden contains 17 trees of the following species: *Cerasus avium*, *□uglans regia*, *Malus domestica*, *Malus domestica*, *Picea abies*, *Prunus domestica*, *P□rus communis*, *Thu□a orientalis*. The garden also features a few bushes, particularly*Bu□us sempervirens*, *Sambucus nigra*, *Cor□lus avelana*, *S□ringa vulgaris* and *Crataegus monog□na*. The sloping parts of the garden are widely covered with *□edera heli□*. The herbaceous layer consists of grasses and herbs, although we have also detected the presence of some ornamental species, such as *A□uilegia caerulea*, *Vinca minor*, *□ellborus niger*.
During the survey of the architectural elements we focused mainly on the system of supporting walls and terraces, the remains of a staircase and the remains of a fountain. The garden features 4 support walls dividing it into four levels. The walls are made of natural stone and in a few places they are damaged and require reconstruction. The staircase that formed an access to the terraces is also in disrepair. In front of the house there is the base of a fountain. *(Fig.1)*

The function and operation analysis was completed upon the demand of the Communication and Visualisation Learning Centre and in accordance with the basic guidance of the Regional Monuments Board. The garden space is to be divided into several functional and operational parts:

- Central representative space connected to the building of the Learning Centre
- System of terraces to be used mainly for educational and work purposes
- Relaxation area
- Free spaces
- Herb garden accessible from the kitchen

The composition analysis defined the placement of individual parts and elements within the overall composition of the garden. The garden has one main composition space and several side spaces. Groups of trees represent the dominating natural features, while the castle walls represent the dominating architectural feature. When it comes to composition, open views of the town and the surrounding nature are also important.
Based on the data gained in the research and the field survey, we suggest three possibilities of the garden revitalisation, named the Joy, the Circle and the Wave.

3.1 The Joy

This project maximises the use of space of the garden for educational activities as demanded by the teachers and the students of the Academy of Fine Arts despite its sloped terrain. The project uses two terraces interconnected by ramps that will allow access to the highest level without a single barrier. The top terrace represents the work space offering an inspiring view of the historical centre of Kremnica and the Kremnica Hills in the background. The bottom terrace offers a space for

socialisation with the possibility to exhibit artwork on the supporting walls. These are made of materials that will blend in with the town walls in the background. A circular sitting area, which can also be used as a work space, adds a colourful accent to the garden. The area connected to the Learning Centre is used as the representation area. It is a natural grass covered surface dominated by a historically designed water fountain that probably used to be situated here. In a more secluded area of the garden near the entrance corridor to the castle, there are small terraced wooden areas offering space for open air creativity and relaxation. The existing fruit trees are mostly preserved, thus sustaining the traditional character of the garden and emphasising the historical aspect of the area beneath the town walls. *(Fig.□, Fig.□)*

3.2 The Circle

The garden is not being used mainly for its steep sloping terrain. This project is inspired by the original terraced layout. The original terraces are currently preserved in fragments in the shape of severely damaged supporting walls. The new walls, together with the staircase, would be situated in their exact original position. The suggested landscaping elements would take advantage of modern materials, such as gabion baskets or corten steel. The terraces can be used in many ways: an outdoor gallery, workshops or relaxation areas. The central garden area, which is directly connected to the building of the Learning Centre, is a centralised paved area dominated by a tree in the middle and a circular bench. The neighbouring gabion wall features a visually interesting water element with a trough adding a sound effect to the scene. In the more secluded part of the garden near the entrance corridor of the town castle we suggest a similar circular sitting area offering seclusion for quiet contemplation. The existing fruit trees are mostly preserved, thus sustaining the traditional character of the garden and emphasising the historical aspect of the area beneath the town walls. *(Fig.□, Fig.6)*

3.3 The Wave

The garden is situated on a slope, which currently prevents the teachers and students from using the area for their desired purposes. To enable a more intensive use of the space, it is necessary to design a vertical system of terraces that will make all the parts of the garden accessible and interconnected. The main feature of this project is a terrace that is a continuation of the original terrace and spreads out almost all the way to the south edge of the garden. The terrace would be created using a concrete support wall parallel to the curvature of the town walls. The construction would gradually blend in with the surrounding greenery thanks to the use of climbing plants on the supporting walls. Both ends of the terrace would feature a composition centre - a relaxation spot with a sitting area under a tree to the North and a place for socialisation with an open fire and a sitting area to the South. The terrace is accessible from the central area via two staircases. The Terrace is designed as a space for education and work, with resistant concrete furniture. The area connected directly to the building of the Learning Centre will be used as a representation area as well as a transition point connecting all the functional areas. The existing fruit trees are mostly preserved, thus sustaining the traditional character of the garden and emphasising the historical aspect of the area beneath the town walls. *(Fig.7, Fig.□)*

4. Conclusion

Presented projects represent the first phase of the preliminary study. The potential reconstruction works shall be carried out in accordance with the Florence Charter [1], mainly with the Article 15, which states: "*No restoration wor□ and, above all, no reconstruction wor□ on a historic garden shall be underta□en without thorough prior research to ensure that such wor□ is scientificall□ e□ecuted and which will involve ever□thing from e□cavation to the assembling of records relating to the garden in □uestion and to similar gardens. Before an□ practical wor□ starts, a pro□ect must be prepared on the basis of said research and must be submitted to a group of e□perts for □oint e□amination and approval*".

We consider the results of the research focused on the possibilities of revitalisation and interpretation of the garden to be very interesting. The objective of this part of the research was to suggest realistic forms of revitalisation of the historic garden of the Communication and Visualisation Learning Centre of the Academy of Fine Arts. The garden plays a very specific role, mainly as a place of learning for future artists. The three designs presented above meet the demands of this role and despite the small space and challenging terrain create opportunities for various kinds of activities. The garden also has a potential to become the space of artistic interpretation, thus acquiring a whole new dimension.

The involvement of the students at the workshop also rendered valuable results. The students had the opportunity to learn basic field study skills, correct methodological processes involved in revitalisation of gardens and present and advocate their suggestions and projects during the discussion time.

Acknowledgement: This research was supported by the KEGA research grant No. 017STU-4/2014: Historic gardens - part of cultural heritage.

Bibliographical References

[1] The Florence Charter: Historic Gardens ICOMOS-IFLA International Committee for Historic Gardens, Florence 1981

Fig. 1: **Current photo of the garden**

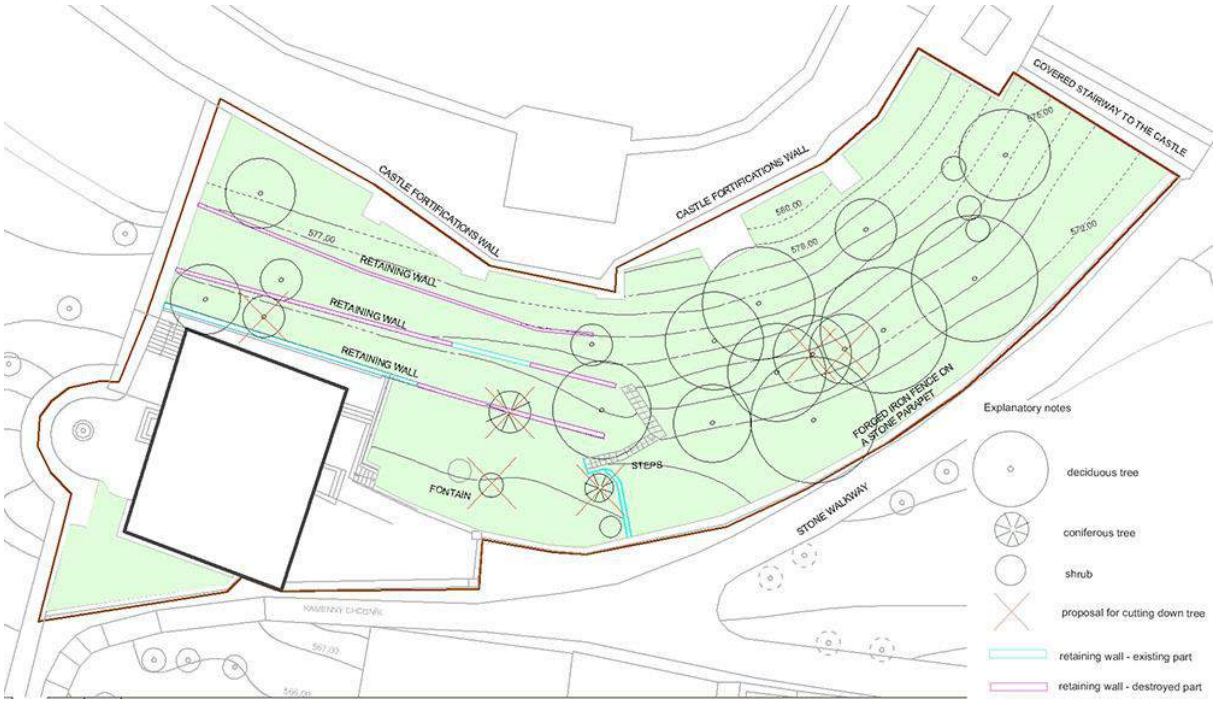

Fig. 2: **The analysis of the natural elements**

Fig. 3: **Ground plan, 1. Educational centre for visualisation and communication, 2.Central garden area, 3. Terraces, 4. Original fruit Garden, 5. Exterior workshop, 6. Castle walls**

Fig. 4: **Visualisation of exterior exhibion**

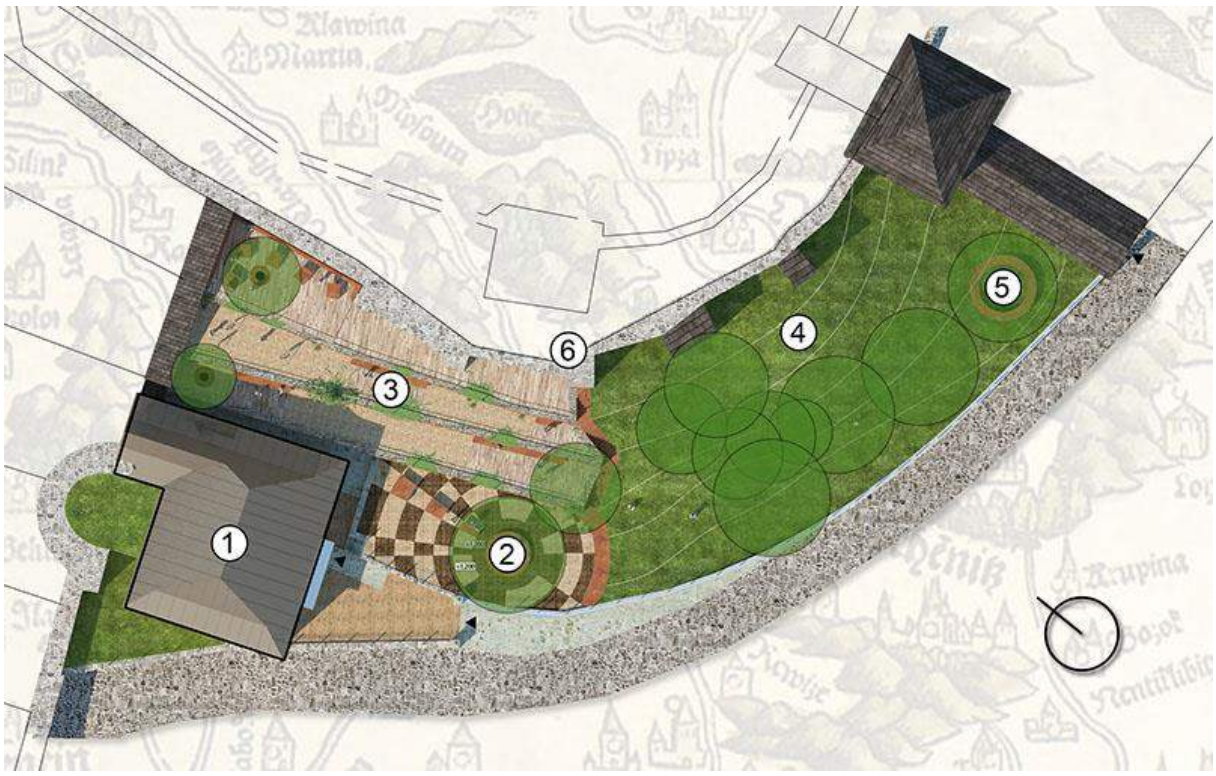

Fig. 5: **Ground plan, 1. Educational centre for visualisation and communication, 2.Central garden area, 3. Terraces, 4. Original fruit Garden, 5. Relaxation area, 6. Castle walls**

Fig. 6: **Visualisation of cental garden area**

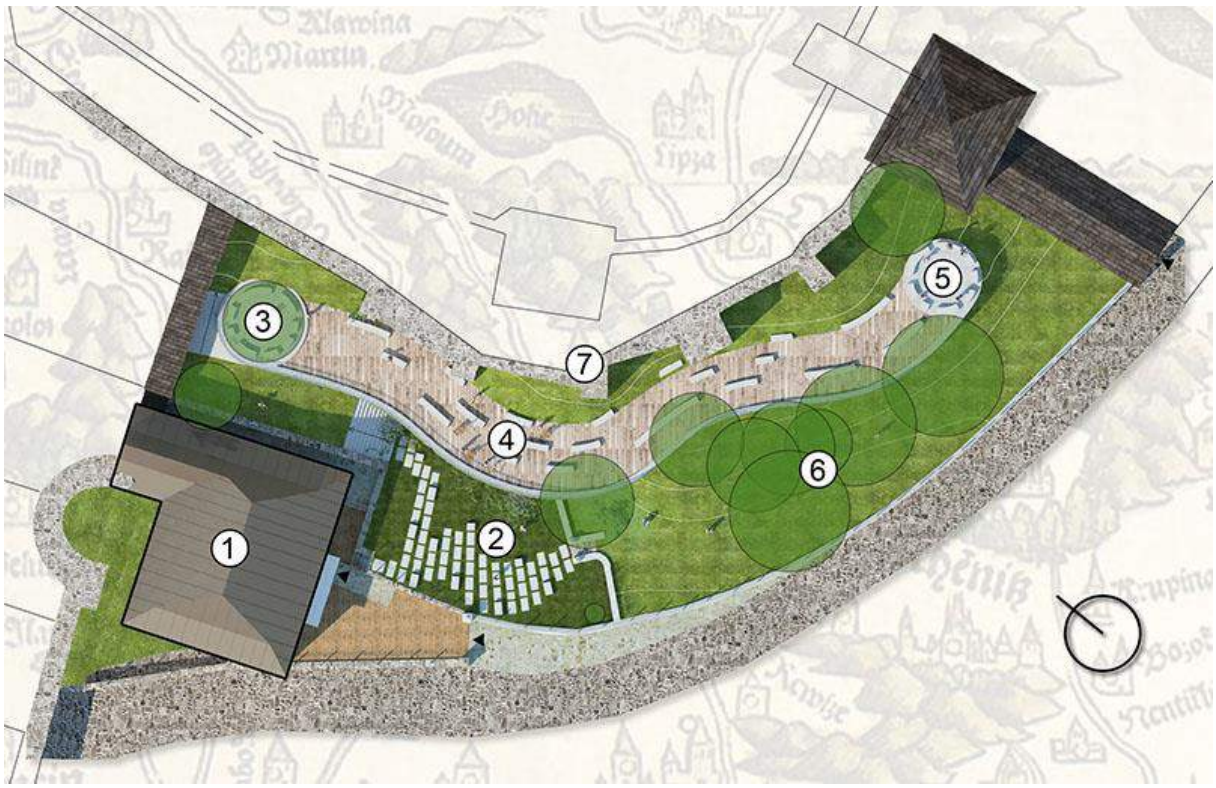

Fig. 7: **Ground plan, 1. Educational centre for visualisation and communication, 2.Central garden area, 3. Relaxation zone, 4. Main wave terrace, 5. Relaxation area, 6. Original fruit garden, 7. Castle walls**

Fig. 8: **Visualisation of cental garden area**

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The analysis and design. The classification in the writings of Augusto Cavallari Murat

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ABSTRACT

The desire to give a reading of urban structures interpretative reliable in many ways, through which the urban reality can be perceived and interpreted, it leads to the need to break with the traditional methods of research working through a different way of looking and inserting special graphic devices conventional and categorizations.
Within the framework of theoretical documentary, which sees in the use of the diagrammatic representation of the city a tool of analysis, description of the city and the project for the construction of the rules of the city itself, are developing the scientific research conducted by Augusto Cavallari Murat the method he developed in the context of investigations directed to the study of urban form and its representation.
The "rilievo filologico congetturale" of Augusto Cavallari Murat is inserted through this learning experience, within the framework that sees the different forms of representation can be turned to practical tools and operational knowledge of the historical city, the protection and enhancement cultural resources and the project of the future city. The classification applied to the knowledge of the city and returned through the “rilievo filologico congetturale” in the Cavallari Murat's studies, comes in this way glance as a completely present tool that is built inside a complex disciplinary interlacement between studies of geography, of architecture, of sociology and of history of the art.

Keywords: design, urban analysis, techniques of urban analysis, architecture

1. Augusto Cavallari Murat and the need of classification

Studies of "urban analysis", those conducted after the Second World War of the twenthieth century, which apply to architecture, city and urbanized areas, attempting to break the link with the ancient vision of the city described by historians as a conformation compact and limited to its historical center, away from that old urban-centric vision that allowed the city to project its image on the territory.
These studies are moving towards a broader and more complex interpretation that sees the urban facts in perspective of their geographical territory, highlighting an orientation that aims to a dynamic conception of the city.
Change the way you look at the city, no longer count the fixed urban images like paintings that frame the architectural compositions but are subject to the variations of the perception and the changes of objective things perceived in such a way as to arouse a subjectivity.
Constantly altering the prospects of observation, the city, in these studies, it is read and interpreted as an urban and territorial configuration in continuous transformation.
This change in the way we look at the city, leads, inevitably, to move away from traditional methods of description of the city and of its territory and to a renewal of description techniques.

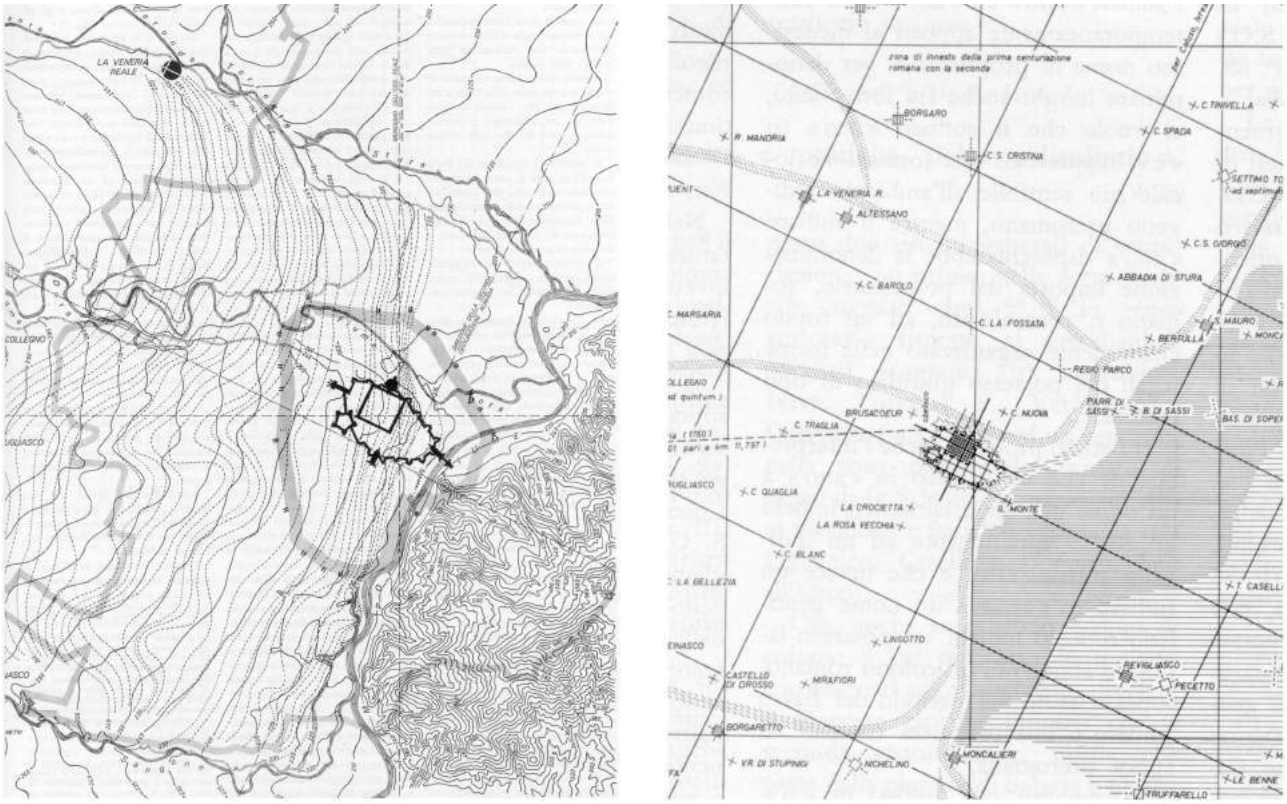


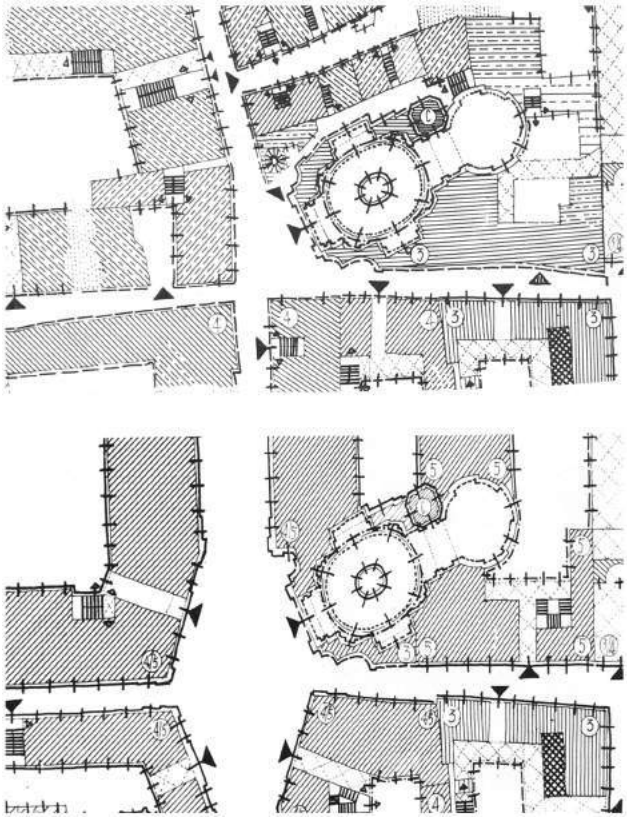
Fig. 1, 2: *Il tavoliere di Torino*. They are brought back, with the sketched line, the trend of the curves of level to hair of water of the *freatica stratum* at the end of the June 1911 with metre equidistance; with the continuous line, the trend of the curves of level of the surface of the ground with equidistance five metres.
Hypothetical elements and traced out parenthetic clauses in the t*avoliere di Torino* of Roman ancestors.
(from. Cavallari Murat, Augusto, *Forma urbana ed architettonica della Torino Barocca (dalle premesse classiche alle conclusioni neoclassiche)*. Torino: UTET, 1968.)

The new approach to urban analysis studies therefore requires a detailed and flexible method of investigation and consequently innovative annotation tools.
Philological research applied to " urban analysis ", which investigates and interprets the facts, intends to offer the ability to run retroactive monitoring, allowing to pass through all the various stages of metamorphosis of the city forcing the return of a census of the things perceived as to be at the service designer, and with the objective of not inhibit the intervention for design purposes, both of a reasoning reading and of an imagination equipped approach.

2. Augusto Cavallari Murat and the need of classification

Inside Ekumen of architects and scholars that have seen in the ancient city the place or the seat to renew the tools and disciplinary techniques own of urban analysis and of the architectural design, and who founded "an institution of schools" that theorize the project of architecture as a continuation of knowledge of the city, Augusto Cavallari Murat [1] starts an important experience related to the development of technical and descriptive representation of a city and a region.
In the construction of the analysis conducted by Cavallari Murat is no longer sufficient the stratrigraphic vertical investigation used to describe the urban conglomerations, perspectives and axonometric projections that frame a fragment of the city; this should be integrated with the analogous «stratrigraphic research» outside the historic city by coordinating everything with what the scholar summarizes in «stratrigraphic investigation of the geologists» in an overview that is referred to as a «very large horizontal radius search.»
The analysis of the city of Augusto Cavallari Murat, not confined itself to contemplate the physic consistency of the building and urban objects, it denies the urban static analysis, but gets up to study the whole structure of the city. The design of the city construction rules is not directed only at the surface structure and at the «basic building» but also at the perennial «variational construction» [2]; that picture of the urban structure that binds the transformations of the past and open to alternatives for future vision.
«If according to Vitruvius - writes Augusto Cavallari Murat - architecture is "*firmitas, commodus, venustas*", my handwriting should give enough information that meet the functional organization of the static strength, distribution, on the aesthetic quality of the architecture that I'm reading; I cannot therefore confine myself to be a pantograph; I must acquire the culture that needs to man. […]

I must give their imagination the power to scour the building as living really and to summarize with this special notational conventions using it; and then enjoy the architecture.» [3]
The methodological approach applied by Cavallari Murat in the analysis of the city revolves around the relationship between the reality and those instruments essential to the natural and applied sciences; «today - writes Augusto Cavallari Murat - there is the need of a systematic, clear and addressed directly classification to the criteria which inspire and upgraded to the current scientific thought and needs of the technique.»
The tool of classification, which is applied in the field of pure sciences; the *periodic system of the elements* or the classifications of the natural sciences and in the applied sciences; in the field of architecture with the classic orders, is a device that may not be stable over time but that needs constant changes and increments. In this regard, Cavallari claims that the classifications could arise only if they admit a law of continual renewal, they will merge the sources, but they will change as needs, thought and practice change.
In this vision, the systematic classification acquires in the studies of Cavallari Murat a connotation of an instrument of interpretation, to apply to the complex study of the urban analysis.
«Putting it roughly, we could say that every photographic subject requires diagrams about appropriate, to filter only those radiations of light that are useful for leading to achieve and to render the dumb the particulars that would be unnecessary and harmful for the scope.»
With this phrase Cavallari clarifies the concept behind the step between the use of the classification of the periodical type, applied to the pure sciences, or applied to the architecture.
The architecture, considered as an applied science, brings with it a complexity of different "entities branch" that only through the use of the simplification can be read, broken down, selected, and classified as "entities of the derivation of the potential".
You might then say, based on studies conducted by Cavallari, that a read-classing of a city and of its transformations in time, or of an architecture and its factory, in order to produce a dynamic reading of the urban and territorial phenomenology, can be acquired with the aid of simplifications and schematics geometric.



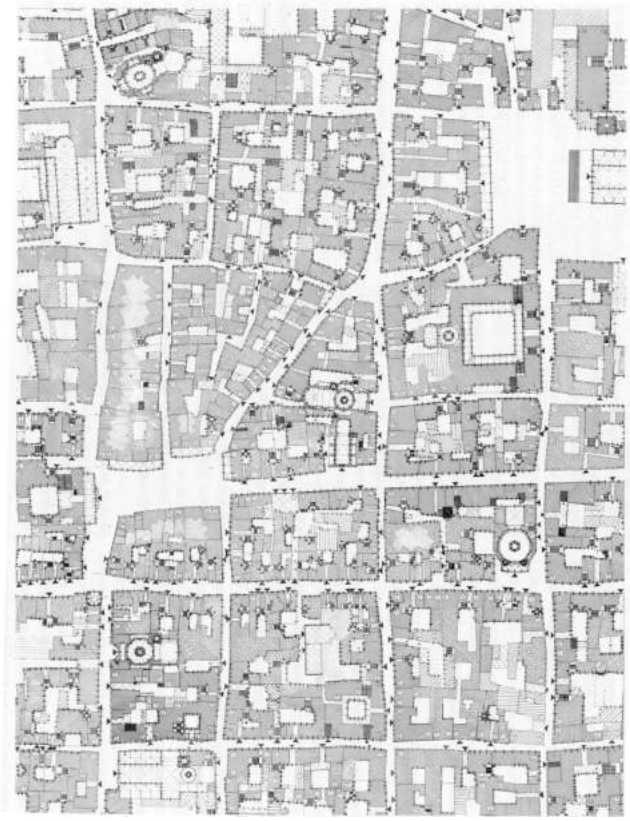
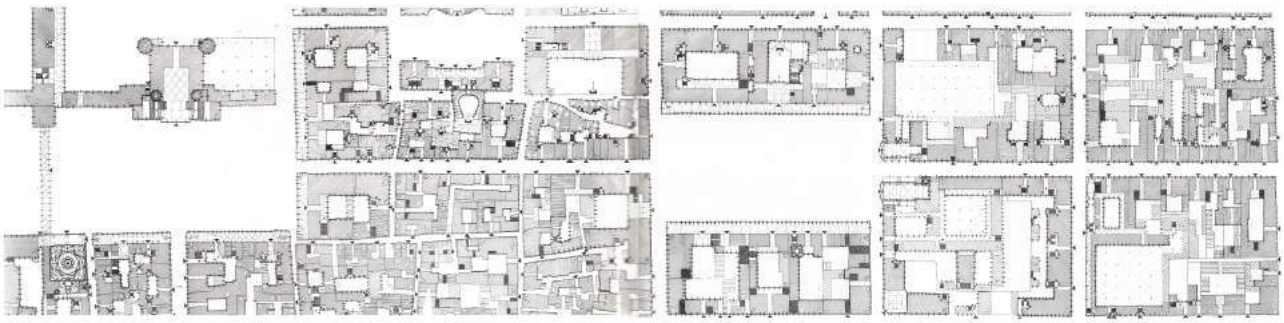


Fig. 3, 4, 5: *Rilievo filologico congetturale* before (early '700) and after the urban interventions of Juvarra which also include Via D'Italia, the current Milan.
Excerpt of the map philological conjectural representing the particular situation of the center of Turin before the "fundamental reshapings". (from. Cavallari Murat, Augusto, *Forma urbana ed architettonica della Torino Barocca (dalle premesse classiche alle conclusioni neoclassiche)*. Torino: UTET, 1968.)

3. The studies of Augusto Cavallari Murat's school about Torino

The experience of the turin school that best applies the scientific methodologies of Augusto Cavallari Murat, is the work of analysis that applies to the territory of the historical centre of Turin.
Through the use of the classification, and through an operation of simplification are producted some reliefs of the ancient environment of Turin. These special maps, prepared to record the results of the analysis conducted with a spirit critical of the architectural and city planning structure, identify three of the phases of the continuous renewal of the city; the Turin of roman foundation "Augusta Taurinorum", the "Turin baroque", the Turin after the "reshapings of the nineteenth century".
These different images are the result of a classification of the city planning and architectural structure over time conducted with a spirit of critical, marked by special features rearranged into groups and sub-groups, delude a static nature, but that if overlapping or read in sequence show a dynamic reading of the historical stratifications performed over time.
The analysis conducted by Cavallari on historical centers, develop as mentioned above mainly looking for the laws that resulted in alterations of plots originating in town construction.
The device developed by the turin school to achieve this objective, is located in building a system of representation that spread over cartographic base; a tool that as a result of a meticulous experimental activities will bring together "graphical symbols", "distribution symbols", "symbols stereometric" and "other cartographic and town planners symbols" [4], named by the research group "*rilievo filologico congetturale*".
The relief designs of the turin school, which are based on the desire to rebuild summary details of departure, the technical cues and the stylistic choices that founded the idea of composition and which triggered into the founders minds of the designers the brilliant aspect of the opera [5], they build in the relationship between the architectural figuration of archive drawings, (figurative and non-figurative archival materials such as project designs, embossed designs, site designs, non-figurative land registers, notarial type descriptions), and transposition in "*rilievo filologico congetturale*".
Pads, explains Cavallari, "you say conjectural because they can refer to urban scenes that disappeared, which ideally are recognized because of working hypotheses," assumptions that are founded through critical readings of the kit of that demonstrative original documents pertaining to the investigated opera.
In the specific case of graphics transposition of type mappings of "Turin Archive", a large critical mass is rediscovered by the research group of the Institute of technical architecture in a careful lab work with the desire to write down as many information by combining material reality with immaterial reality and starting a process of interweaving specification that the evolution of typography doesn't pose the problem of representing.



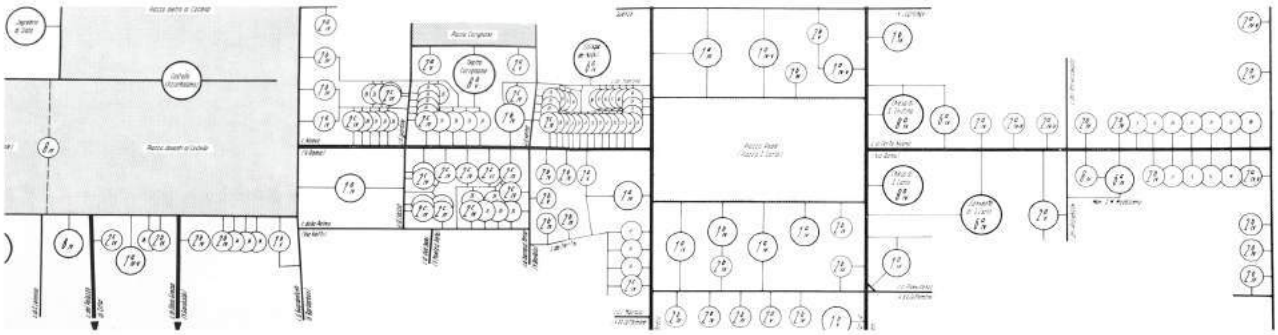
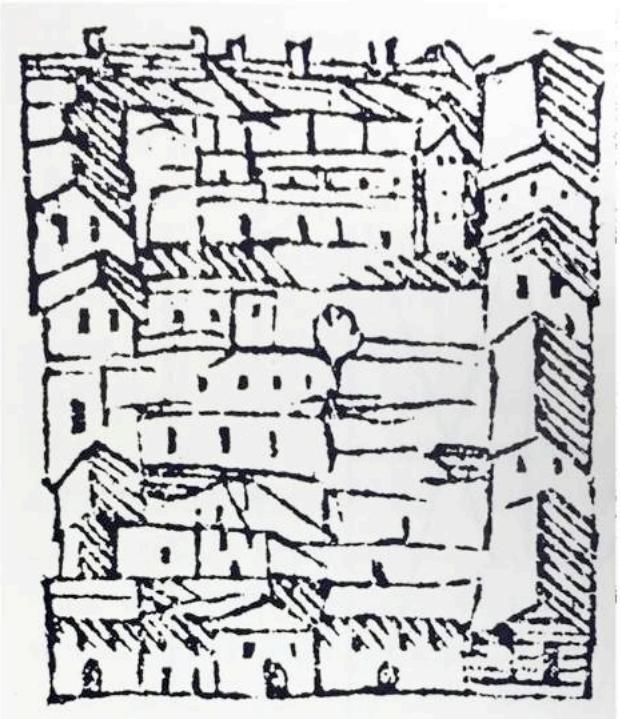


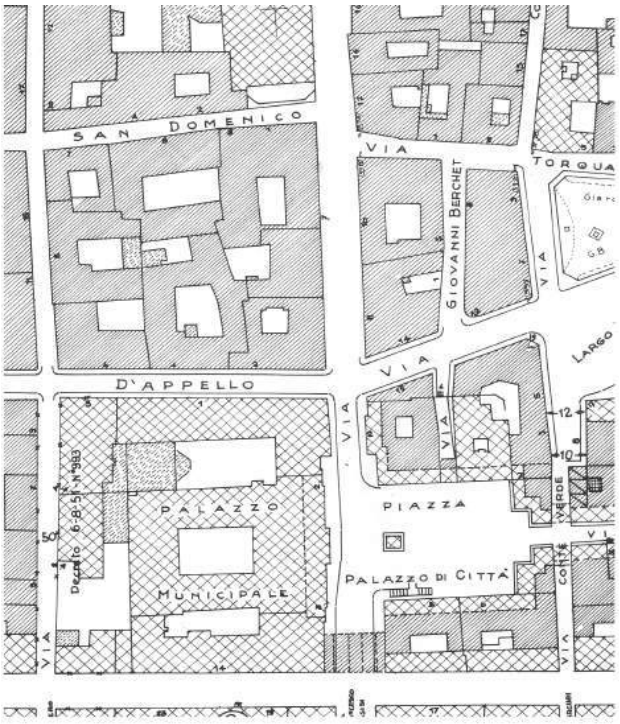
Fig. 3, 4, 5: Map *filologica e congetturale* and cell survey of the blocks of Via Roma, Torino.
(from. Cavallari Murat, Augusto, *Forma urbana ed architettonica della Torino Barocca (dalle premesse classiche alle conclusioni neoclassiche)*. Torino: UTET, 1968,)

«These discussions - says Carlo Ravagnati - move within a complex interplay between disciplinary studies of architecture, geography, anthropology and art history. […] The analysis of Cavallari Murat aren't moving looking for an architecture independent, *simplex*, i.e. time to study its own objects, their disciplinary techniques without ancillary character relationships with other fields of knowledge [...] On the contrary the analysis of Cavallari Murat trying to define a complex architecture, founded in respect of its articulation within a global reform of relations and within a function of knowledges that contribute to the definition of the city, strategic, "aimed" to the project: in a word, *multiplex.*» [6]
The design of relief, in this sense, returns in all its features an overview of urban structure by pointing out that, in the complexity of the information conveyed through the use of the diagram the "*diagrammaticità* of the design" allows you to dynamically play a summary representative can tell you about the history of the city.
The role of the time when, through the creative process of construction of the diagram, has in the descriptive action of the elements respect to the intuition, finds within the scheme a continuous relationship with the space that is at stake; the diagram can then be considered in this sense "the functioning of the mind".
This link between time and space finds within the structure of the scheme a double meaning: not only finds meaning in the process of building the diagram, but also within the drawing, where space is represented in a continuous temporal variation.
The diagram is therefore capable of producing a continuous movement of meaning and structure of a system constantly moving and ever changing.
The use of graphical representation is a means of reading through which the systems are manipulated and the flows are controllable by a process of selection that locates, selects and registers in order not to repeat things visible but to make them visible.
«Only drawing it seizes critically the motives to itself therefore there are pleasant and beautiful scenic motives that the inspiration of the eye and that walking you inside they denounce with purely intuitive admiration in spite of the substratum of a quite contrived latent geometric skeleton. » [7]
These studies turned by Cavallari Murat, « […] they produce synthetic representations […] proposals of conceptual abstraction able to acquire wider valence and to offer greater flexibility for supplemented readings. One more timeliness for the knowledge, for his rewriting within a vision riding at anchor in the beginning of the uniqueness of the science, which managed to tie faraway disciplines through a wise use of the analogy and of the metaphor. » [8]

4. The design as a cognitive activity

Cavallari Murat attributes, in his studies, a particular meaning to the report between the analytical practice and project practice; he offers, through the classification, a reading that sees two activities like two parts of the same cognitive progress.
The analysis leaves from an object towards its most concrete and full comprehension, but through the analytical phases that produce the descriptive representations; that are supposed real and concrete but that in fact loses through practices that admit the figurative multiplicity, are not it. His stable value itself dissolve and it never stops being temporary in an infinite plurality of representations, meanings and figures.
The analysis can go then neither to the direction of the knowledge of the city nor property as objective the scientific restitution of the city itself. The analytical process has therefore value, not in all that it closes with a knowledge complete of the city or of a territory not even because it is put on the direction of a possible completeness, but because it maintains the city and his territory in his ambiguity of analytical object built by the imagination.
The project instead start from a gap, an “empty compartment” would say Cavallari Murat [8], a gap that is filled by a work that there is still not and what must be produced at a progress that it selects, reorganises, recomposes diverged, not to say infinite architectural representations, through techniques that they lead to the formal definition of a programmatic text, and the control of his multiplicity.
Also in this knownledge phase, as he explains, we are in the same field of the imagination why only after the phase of an open inventive activity that frees the possible choices between the data and the alternatives of interpretation, “lighted at sufficient culture, at sufficient experience, at sufficient imagination and at sufficient courage”, it will be possible to define the project.
The inventive activity lets unite so, with a strong connection, the construction of the descriptions *diagrammatiche* of the city and the relief of the possible future transformations in an only knowledge process.
The classification applied to the knowledge of the city and returned through the “rilievo filologico congetturale” in the Cavallari Murat's studies, comes in this way glance as a completely present tool that is built inside a complex disciplinary interlacement between studies of geography, of architecture, of sociology and of history of the art.





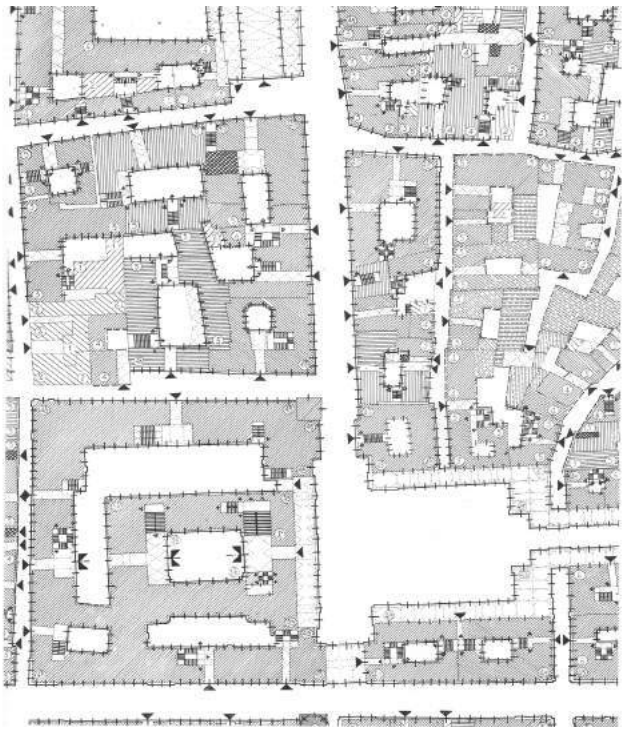


Fig. 3, 4, 5: Excerpt of the cadastral map of the Town Hall of Torino area. Excerpt of philological conjectural map of the municipality of Torino before the project of Via IV Marzo.
(from. Cavallari Murat, Augusto, *Forma urbana ed architettonica della Torino Barocca (dalle premesse classiche alle conclusioni neoclassiche)*. Torino: UTET, 1968.)

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Smart buildings and connections, a case study for India

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Abstract
This abstract reports about an architectural research about material and immaterial networks, when some small and smart buildings are intended as the basic regenerative cells of smart cities, a hi-tech key element allowing them to evolve towards the model of a clever and connected infrastructural grid. This is the objective that has animated the activity of a team including the author and formed in the framework of an advanced design course experience within the Alta Scuola Politecnica (ASP - High Polytechnic School, jointly organized by the Polytechnics of Milan and Turin) to define the virtual connections generated by a small building: a sustainable, energy independent clinic conceived for bringing basic health care services into poor and overpopulated developing contexts, like slums around high-density cities. The idea underlying the whole research is that to speed the improvement of socially disadvantaged micro-contexts, implants of mostly cheap energy and clean, cheap water, condensed in a few, small smart-tech "hubs", can play a fundamental role in activating a virtuous interplay between economic competitiveness and environmental healthiness; and that this can in turn contribute to lower the barriers between city slums and their surroundings. Smart cities, smart buildings, sustainable architecture, energy, models and images of representation, material and immaterial connections.

Keywords: connections, networks, sustainability, social

The challenging goal of the project is designing infrastructures to provide health care and basic services in developing countries, in complex situations such as slums or bidonvilles, inserting buildings able to produce energy where it is needed without transportation. The practical idea is to implement several small, prefabricated clinics to have a fast, cheap and sustainable solution but also be able to provide services for a long period and offer a starting point for local development.
The case study to design the general concept is a slum area in New Delhi of 6 square km where we designed the construction of 4 clinics, able to provide medical services and clean water, within a maximum walking distance of 1km. The New Delhi slum area is located near the center of the city, bordered by the railway tracks. The slums are a primary choice for the location of the clinics because of the high density of the living conditions and the lack of hygiene services, such as adequate toilet facilities and clean water. This population is at risk for illnesses related to lack of hygiene, contagious diseases, etc., meaning that they have more need for the kind of basic healthcare that our clinics are designed to provide. Additionally, we have planned many small clinics instead of one large one in order to serve the local population more affectively, allowing them to access a health clinic within walking distance of their residence and receive more personalized care.
The clinics are all standardized and with the maximum grade of prefabrication to cut costs. This idea allows us to build a relevant number of pieces in a central place, reducing the costs and the time of construction at the location. From the architectural point of view, we try to respect both the local construction tradition and energy issues. To do so we compare different solutions for each building element (envelope, roof, openings etc.) in order to give different possible configurations. By doing so we give our stakeholders the possibility to choose among different features in order to make the building suitable for different situations all over the

world. After the comparison, we have focused our case study in New Delhi, deepening the solutions that are more suitable for our location, according to their availability and respect for the context. The other main

requirement is sustainability, which means satisfying all the energy needs with green energy (considering that slums do not have electricity). To reduce the energy demand we use passive cooling strategies together with high insulation, in order to reach a high level of thermal capacity without using massive construction techniques. The shape of the building is simple and compact, in order to reduce the energy waste and fit into the dense urban fabric of the slums. The entire building is developed on one single level, while the only cutting off element being the movable platform of the solar panels on the roof.

The project initiated with the conception of a sustainable public building, such as a school or a medical clinic, that could provide a stimulus to the surrounding community. The project was conceived as a resource for developing countries, in order to promote social and economic development in a sustainable way. The building was intended to provide essential resources to the community, such as technological resources, electricity, or special services. In this way, the building could act as a catalyst for the further development of the neighbourhood.
From the beginning, an important element of the project was the desire to design a sustainable structure that would be versatile enough to function in a diverse range of environmental conditions, while at the same time remaining cost effective and maintaining a highly sustainable methodology. However, a fundamental challenge in the project developed is the desire to design a geographically versatile building while at the same time minimizing the transportation of materials. These two desires were in some ways contradictory, since the need for geographical versatility suggested a prefabricated design that would be manufactured off site, while the desire to minimize the transportation of materials suggested the use of a highly customized design using local materials. We have attempted to solve this dilemma by using a partially standardized and prefabricated design, while allowing for customizable elements, in order to make the building functional in a wider range of environments and also allow for the use of local materials and building traditions.
Since it was necessary to customize some aspects of the building, India was selected as a case study for the project. The specific case study location in New Delhi, India was selected for a variety of reasons, primarily involving environmental and economic conditions. For instance, India is sufficiently developed in order to provide access to local materials and industries that can be used to develop the essential elements of the project, such as steel, bamboo, and cladding materials. This was an important consideration because using local materials was a principle aspect of the design. Furthermore, the function of a medical clinic was chosen as opposed to a school because of the higher technical requirements involved. Because our building design has many technical aspects, including rotating solar panels, it is more suitable and cost effective as a clinic.
Another important aspect of the project was the development of a rotation system for the solar panels. The process involved optimizing the system's rotation capabilities in order to maximize the energy output in the most efficient way. The configuration of the rotation system was developed as the main innovation in the project, and the overall concept of the project evolved further around this innovation. Using the rotation system, the goal was to produce a large amount of energy in a small area, while keeping the building's energy consumption low, so the reliability of the health services is guaranteed and the surplus energy could be supplied to the surrounding community.
Thus the original idea of a public building acting as a social stimulus developed further into the concept of a diffused power plant. The diffused power plant concept involves the implementation of an array of high-energy producing buildings that can act as a power plant for the community, ideally relying entirely on renewable energy sources. The implementation of a diffused power plant could eventually replace the centralized power plant, keeping energy production inside the city and reducing the need for energy transport, creating in a practical way the concept of smart city. This concept requires further analysis and innovation; however, the focus on energy is especially relevant considering that the United Nations' goal is to provide electricity to everyone in the world before 2030 (United Nations Foundation, 2013). The need to increase our global energy production is complicated, considering the environmental consequences of typical energy production methods; therefore it is crucial to reach this demand in a sustainable way. According to the diffused power plant concept, innovations in architectural design and renewable energies may provide a solution. Although the specifics of our project have been developed around our case study in

New Delhi, it is important to keep in mind that the location of the building is adaptable. The function of the building is also adaptable. It can be used as a public building, such as a school or clinic, but it could also function as a private residence. The aim is to provide and affordable and sustainable building solution that can offer a positive output of green energy and can be modified to function almost anywhere in the world.
The project stakeholders include local governments, humanitarian aid organizations, environmental organizations, architecture and technology companies, such as PV panel producers, and the local residents in our case study. The requirements vary for the different stakeholders and the project attempts to benefit all stakeholders by not only focusing on sustainability, but also social considerations and the need for economic development in the third world.
The aim of our project is to provide a sustainable solution to medical treatment in the third world, using an innovative combination of high-tech and low-tech solutions. However, our project does not define sustainability as simply an environmental issue, but rather seeks to approach the concept of sustainability from three sides, considering the social and humanitarian needs of the residents, the environmental sustainability of the overall project, and the need for local economic development.

Social Considerations
The social issue develops from the need for humanitarian aid in the form of medical assistance and the provision of basic services to improve the standard of living and future opportunities of families living in slums. The following features demonstrate how the relevant social considerations have been implemented in the project.

Project Features
- Micro Clinic within Walking Distance
- Provision of Additional Services"
- Socially Accepted Design"

Environmental Sustainability
A central theme in the project was the desire to develop a sustainable architecture solution for public facilities in the third world. The premise was that sustainable solutions do not have to be expensive or even high tech. There is a need for development to be thought of from the sustainable perspective, no matter where the project is taking place and no matter the budget. All types of projects can benefit from sustainable ideas. Sustainability should not be considered as an obligation, but as an opportunity for creativity and progressive thinking.

Project Features
- Energy Independent
- Local Materials and Labor

Economic Development
A third feature of the project involves economic development. From the economic perspective, there are two primary concerns: the economic feasibility of the project, and the desire to support sustainable local development. Promoting sustainable development is important in order to provide more opportunities for third-world populations, minimizing the need to provide aid in the future. By offering direct aid, it is possible to improve the current living situation, but the only way to improve future autonomy is through sustainable development initiatives.

- Local Materials and labor
- Pre-Fabricated Design

Project Requirements

After a social and urban analysis of the slums, we can now adapt our general idea for the implementation of the clinics to the specific context. The requirements introduced in the previous section are now explained in more detail and contextualized.

Micro Clinic within Walking Distance

By using a micro clinic design, rather than a larger medical center, the project aims to provide a better experience for patients, with more personalized care. With small clinics located 1km apart, patients do not need motorized transportation to reach a clinic. This is crucial because slum residents do not have access to cars and the narrow streets make it difficult for emergency vehicles to enter slum areas.

Provision of Additional Services

Furthermore, the clinics are designed to provide additional services such as clean water and health education, in order to improve the unhygienic conditions of the slums and reduce the spread of preventable illnesses. Health education is important aspect of disease prevention. Although the majority of the slum population is literate (70%), they are lacking important health information regarding hygiene, child and pre-natal care, and the health risks of certain behaviors, such as smoking and drinking. Disease prevention through education is as important as disease treatment, and the small, localized design of the clinics is convenient for the distribution of educational materials and information at the neighborhood level.

Socially Accepted Design

Clinics are meant to satisfy the immediate needs of the population and also to stand the test of time and provide services for decades. In this direction they have elements thought to be merged with the urban context and be perceived as a positive nucleus for the development of health and society. For these reasons, the architecture of the clinics recovers some aspects of the local tradition, such as the entrance with arches and an open space."

Energy independent

The implementation of our public buildings is thought to be possible also in areas not connected to the electrical grid, without reducing the quality of the services provided. Health assistance needs some electric devices and the clinic of course must be provided with adequate lighting and a cooling system to cool the environment and medicines. To maintain these high quality services, the design of the clinics has moved in two complementary directions: smart tools to reduce the energy consumptions and a system able to provide electricity. To reduce electricity usage we adopted low consumption lights and a heat pump able to provide heating and cooling with a small usage of electricity. However, our biggest efforts were in the direction of increasing natural light and maximizing insulation and natural cooling systems. In this way, choosing materials wisely and designing a smart architecture, the energy needs of the building were reduced. The production of electricity is entrusted to an innovative photovoltaic system, intended to provide the requested electricity while minimizing the costs. To achieve the goal of sustainability and match the real needs of the population, when a surplus of energy is present it is used to purify water, in order to face one of the trickiest problems of the case study location.

Local Materials and Labor

This requirement has the dual purpose of reducing the use of transportation resources and involving local producers and manpower in the construction of a public building. First of all, using materials that can be found locally reduces the costs for the clinic and also stimulates local economies, increasing the social utility of the buildings and making the clinics more accepted. This goal has been achieved by integrating bamboo and steel in the structure, and using natural and local materials with excellent insulation properties for the envelope. The bamboo solution is deepened in the chapter about structure, while the characteristics of the envelop materials can be found in section 4. Additionally, using natural and organic materials, we have a more sustainable building in the whole life cycle, minimizing the environmental impact of the demolition and waste treatment.

Prefabricated Design

The clinics are designed to be easy to assemble, with a high grade of pre-fabrication to cut costs and time. The intervention to provide a social service in critical areas has to be fast, because health is a crucial issue in these areas. Moreover, the urban situation in developing countries is so changeable that a fast

implementation is a key requirement. High grade pre-fabrication reduces the assembly time and the collection of material in a central place is easier and cheaper. The IKEA logic of pre-fabrication, easy and well-explained assembly is also a way to avoid the problem of non-specialized manpower.

The main goal of the pre-fabrication and standardization of the clinics is cutting costs. Although this methodology limits the customizability of the building, it allows us to produce a larger number with lower specific costs, and this fact is crucial for the energy system, for example. Moreover, in this way, it is possible to exploit economies of scale in the production of structural components, maximizing the assembly phase in the place of production. The limit for the grade of pre-fabrication is represented by transportation constraints for our case study in Delhi.

Conclusions

The designed prototype turned out to be not only a building, but also an implementation strategy for confronting the issue of providing public services in a variety of complex high- density areas. Standardization and prefabrication have been here used to keep costs low without renouncing to high standards of services. The centrally-managed collection and production of materials before delivery makes the process of assembling and construction easy and fast. A possible follow- up of this effort could be refining the system of packaging and instructions for non-specialized skill labor, on the example of the IKEA model. This may involve all constituting elements of the building and inform the whole entire process. The improvement of a well-defined and simple intervention model could be interesting for non-profit humanitarian organizations as well as for governments interested in cost-effective solutions.

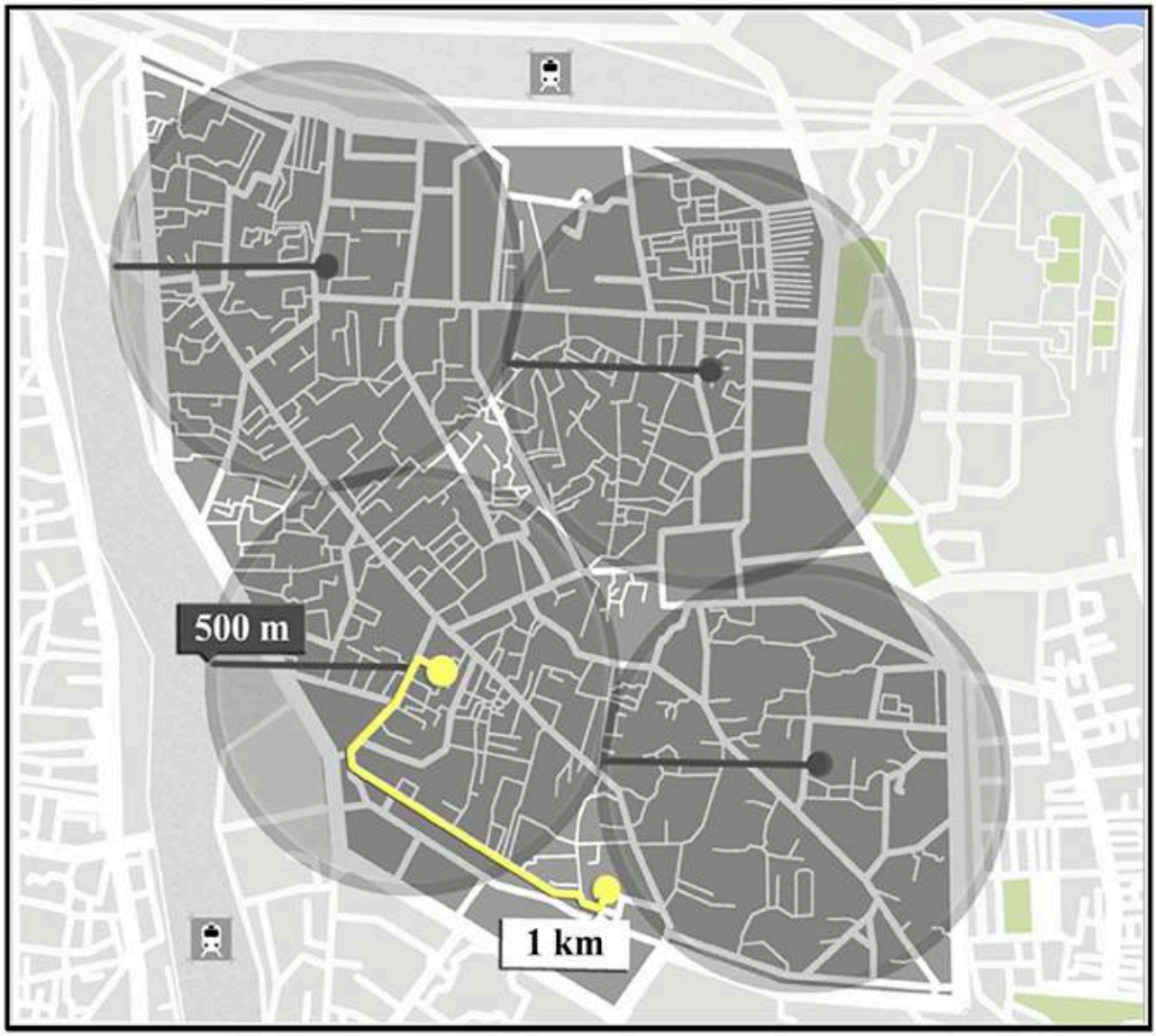

Fig. 1: Map of Clinic Positions in the slam area for New Delhi

Fig. 2: Example of a slam at New Delhi

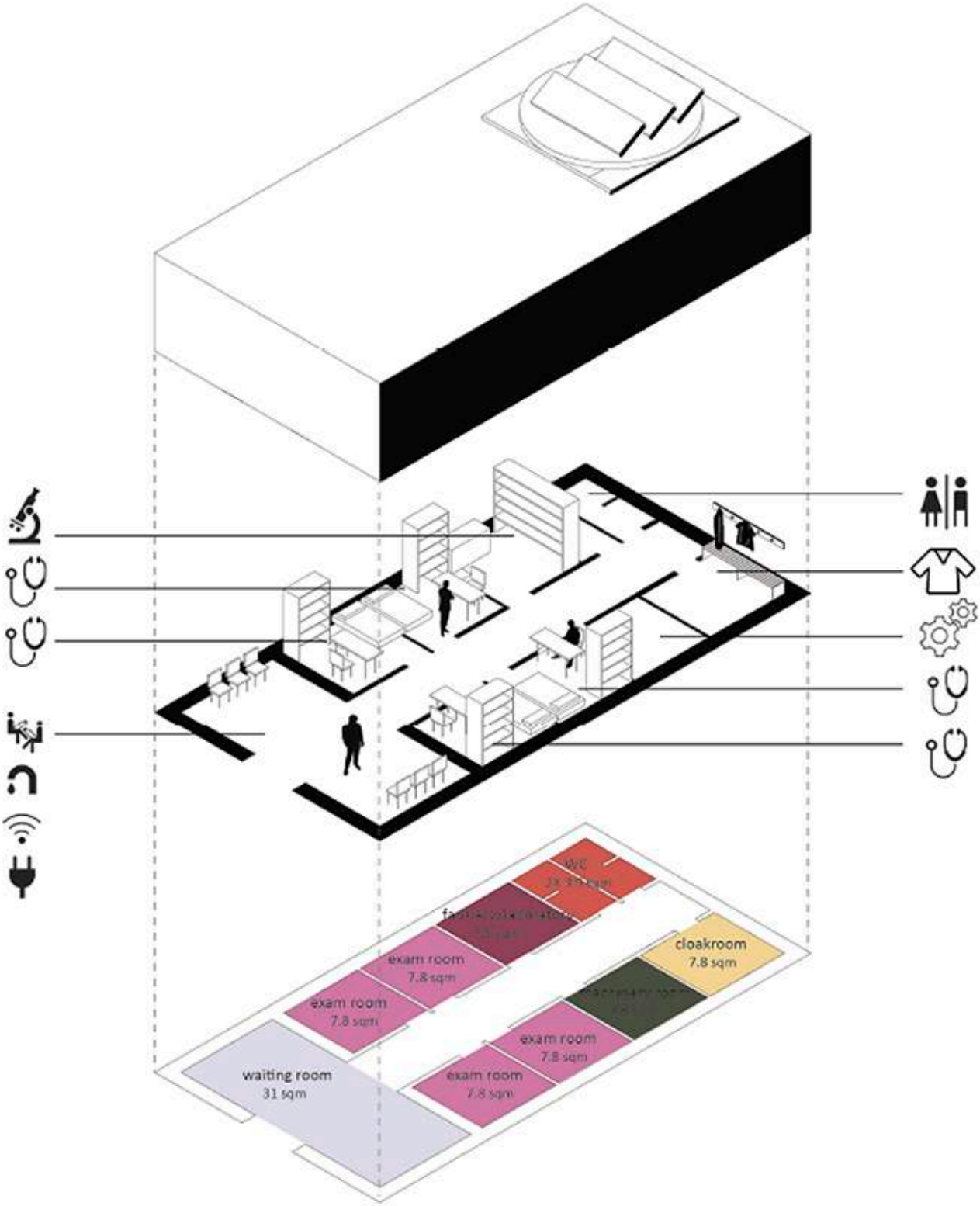

Fig. 3: Axonometric view of the clinic with functions

COCCONUT FIBER PANELS		
Product Description	Coconut fiber panels are producedby drying the exterior part of coconuts. After an easy and natural process, made by hand using just air and water, it is transformed into panels and pressed in order to reach the right rigidity. It is a completely natural product produced in India, Sri Lanka and Portugal. Nowadays it is also produced with industrial processes in rolls, panels, sheets and sandwiches (together with cork). Coconut is an almost infinite source and completely recyclable. It is characterized by a low thermal conductivity and high resistance to strike, bacteria and water	
Format and Size	Panels 1200x600 mm, width from 10-50 mm. Rolls 1000x100 mm, width 20/50 mm (10 mq packages)	
Applications	-Roofs -Envelope -Interior walls -Floors	
Ambiental Characteristics	Fully renewable Biodegradable	

Fig. 4: Local materials

SURPLUS OF ENERGY

PURIFYING WATER

GIVE ELECTRICITY TO THE GRID

PROVIDING FREE WI-FI

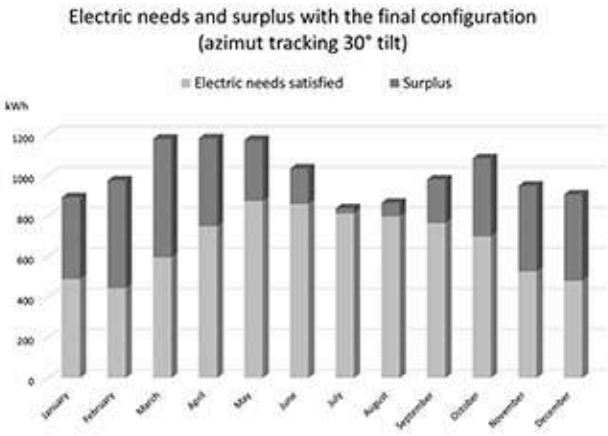

Fig. 5: Tools using surplus of energy

Fig. 6: Model of smart clinic

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Between Pompeii and the sea. The project of an Art District in ex Italtubi of Torre Annunziata.

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Abstract
The redevelopment project of the ex Italtubi of Torre Annunziata represents an important opportunity for the sustainable development, "green", "smart" of the territory of the Vesuvius area. The area, which covers a surface of over 20 hectares, is a strategic hub of particular geographical importance as set between the archaeological sites of Pompeii and the coastal system Torrese Stabiese, it acts as a "hinge" in an area heavily fragmented by the uncontrolled growth, unplanned, consisting of overlapping and not connected systems. The reorganization of the area is based on the creation of two distinct but highly complex systems interrelated: a large park of urban and territorial scale combined with the reconversion of industrial products, once used for steel production, in an Art District able to accommodate functions at the service not only of the project area, but of the entire territory. This dualism is aimed at strengthening the concept of "hinge"; it is in this design vision that the established system of the existing city, the sea and the archaeological site of Pompeii enter into relationship with each other, a close relationship, logical, historical, cultural. In this design, a central role is played by open spaces, by their quality, their scenic value, their "ecological" importance. The design choice is to mend, through the open spaces, the water and the green areas, the complex of historical and landscape environmental system of the Vesuvius area; a network of relationships to strengthen through the quality of these spaces to be entrusted with the ecological and environmental regeneration.

Keywords: Landscape design – Industrial heritage – Smart Planning – Reconversion – Art district

1. The recovery of brownfield sites: an urban regeneration opportunities.
The crisis of the industrial city and its transformative rules and logical settlement, has placed, on the table of local and national administrators, new questions and ideas on the fate of the abandoned areas inside the city.
The empty and enclosed urban spaces, designed without an apparent logic and connection with the surrounding landscape, continuously affect the urban morphology and memory.
The disposal of industrial areas is one of the issues that, due to the world economic crisis of recent years, has involved many cities especially in Europe and North - America. The link between cities and industry has always been very strong, impacting both positively and negatively on the urban development. If it is true that the city with the industrial development has profited from a substantial social and economic growth, it is also true that the industry has created real ruptures in the territory. This two-way relationship has greatly influenced the urban form, the design of the city and its spaces. There are cities born around large industrial complexes, Liverpool is a classic example, and conversely. In both cases there is no doubt that the industry's influence on urban development has been secondary.

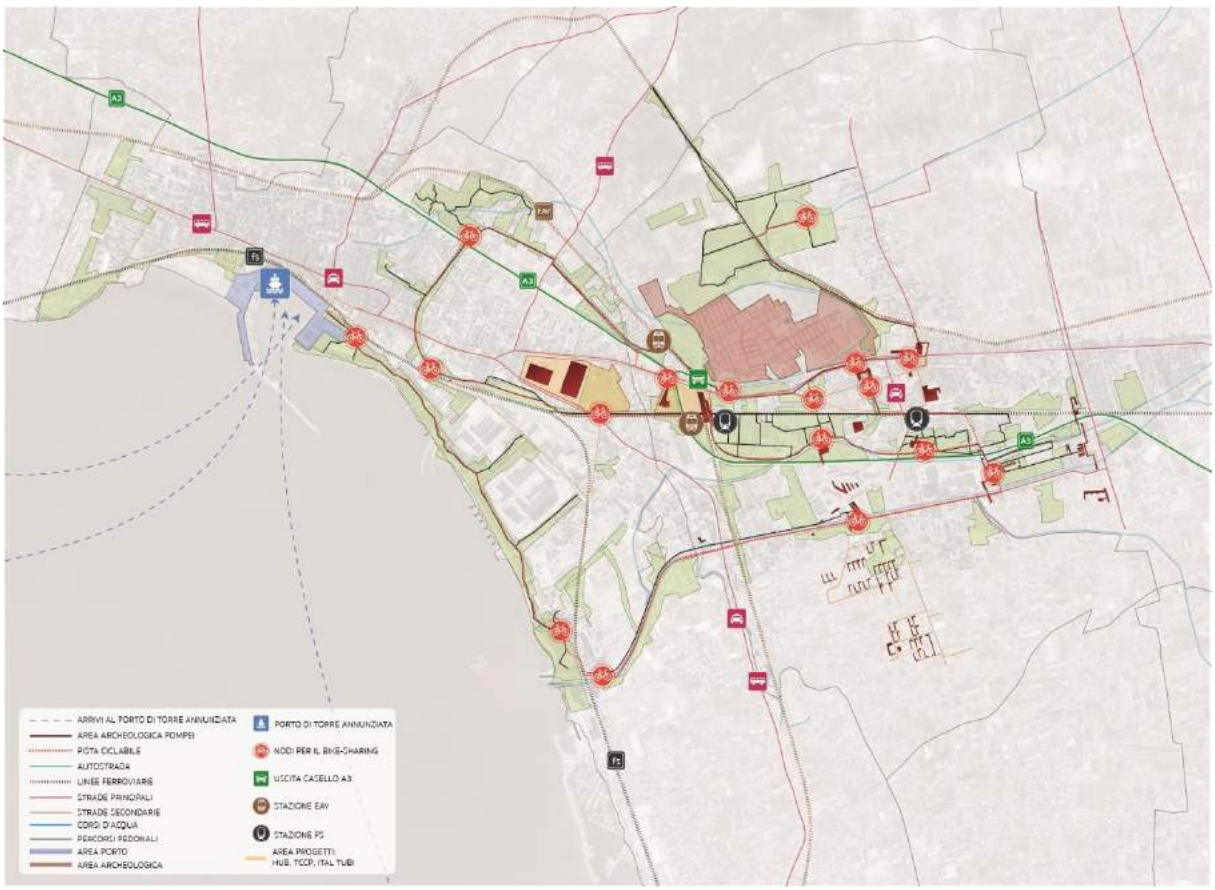

Fig. 1: Appreciating the context□mobility scheme.

"The amount of leftover and disused areas in European cities is so extended that it is unlikely that a new building program might be able to fill the current empty space. Few activities can stand comparison with the industries of the past in terms of direct and indirect consumption of soil"[1]. With these few words Bernardo Secchi in " Rethinking an redesigning the urban landscape ," explains the effects of the industrial crisis, the impact on the city but at the same time, try to direct the eye of the reader the designer, to the possible choices and design solutions until now almost unknown and few studied.

The absence in the contemporary city of "urbanity"[2] mentioned by Francoise Choay in "post urban Horizon " is linked precisely to this fragmentation of urban spaces, their consequent loss of identity, their discontinuity in the urban fabric. A loss of values which involved especially the public spaces, their environmental quality and their functional qualities .

The crisis of the industrial city has left gaps in urban fabrics, abandoned disused, but also opened the eyes of the designers to new project ideas, new images, new glances to the landscape and the transformation of these places that become urban opportunities.

These drosscapes , empty spaces of different size and nature of the contemporary city, become the places of the urban project in which intertwine and merge the relationships between the various components of ecological, environmental, urban planning and infrastructure, and the materials that create the city ."The discrepancy (dross) is considered as a natural part of every city which develops dynamically. It is an indicator of the health of urban development"[3].

The decline of industrial city has also coincided with the unregulated growth of cities, new suburbs, technological developments, new economies of scale. The industrial areas, gravitational centers for economic development of the territories have now lost their old centrality becoming generator of new insights on the development of cities, crucial points in urban transformations.

An example of urban renewal and regeneration of an ex industrial area is the project of the 798 in Beijing, earlier an industrial district and propagandist intervention of Maoist China. Today it represents one of the best design work on this issue. Transformed into a cultural district, the 798 with its huge spaces, that once welcomed one of the largest coal producing military industries in China, had become a large open-air museum with art galleries, exhibition spaces, bars, restaurants, schools and ateliers. The 798 has been transformed from a place of industrial production in a place of artistic

production and, despite its marginal position with respect to the historic center of Beijing, is now regarded as the new civic centrality.
The Ruhr, formerly an important region for mining and iron production in Germany, has been involved, since 1989, in a complex operation of renovation and functional conversion. The construction sheds, once workspaces and symbol of an historical - evolutionary process of human history, had now become vanishing cathedrals.
An important step, in this vast industrial restructuring program, deals with the ecological redevelopment, landscape and environment of the Emscher River. The area was previously occupied by Meiderich steelworks of Thyssen companies which occupied an area of about 230 hectares.
The project involved landscape architects, urban planners, architects, artists and historians united by one goal: create a new regional park that would combine the ecological and landscape value of this area with its industrial history. Pavilions like the fusion plant Meiderich have become exhibition rooms and art studios. The vast open areas have become a park of about 800 square kilometers covered by a dense network of pedestrian and cycle paths.
The project for the occupied area of the ex Italtubi is based on these examples, on these projectual design, on the scenarios aimed at the regeneration of the landscape and environment of these places, of these brownfields.

Fig. 2: Torre Annunziata, project area.

Fig. 3: Art District, masterplan.

Fig. 4: Torre Annunziata□ITALTUBI, current photos.

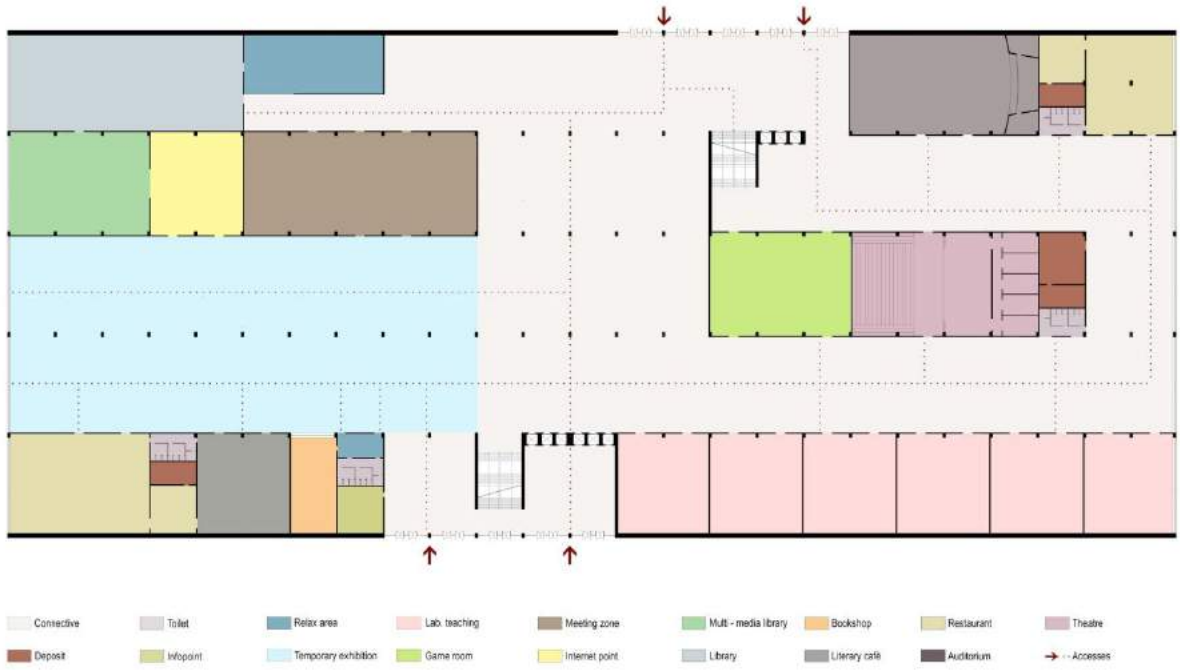

Fig. 5: Art District, ground floor.

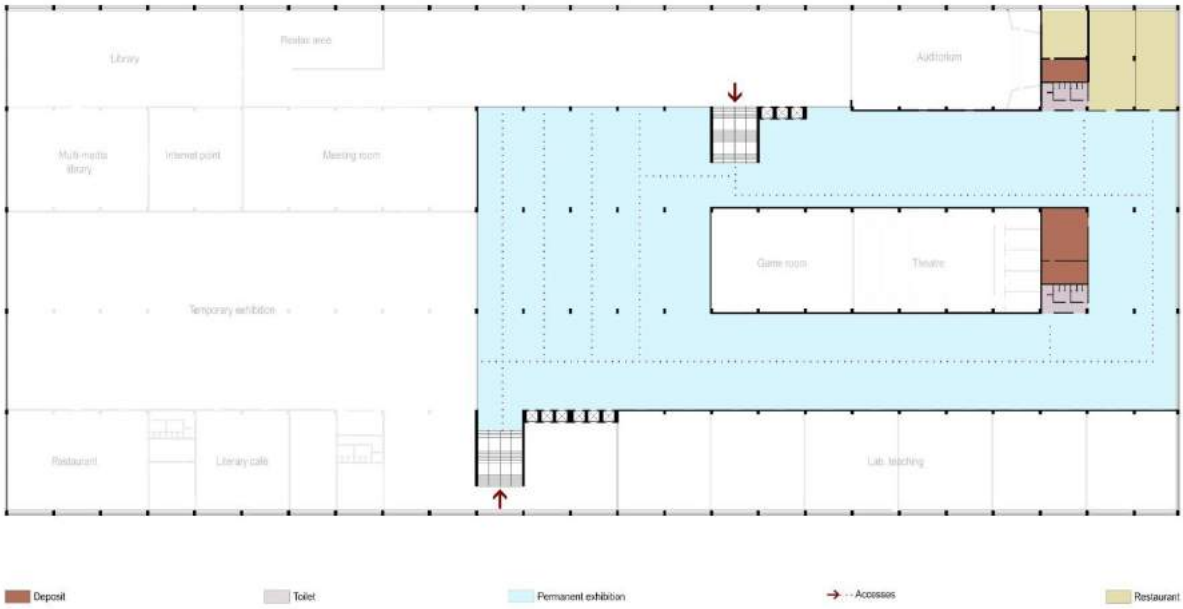

Fig. 6: Art District, first floor.

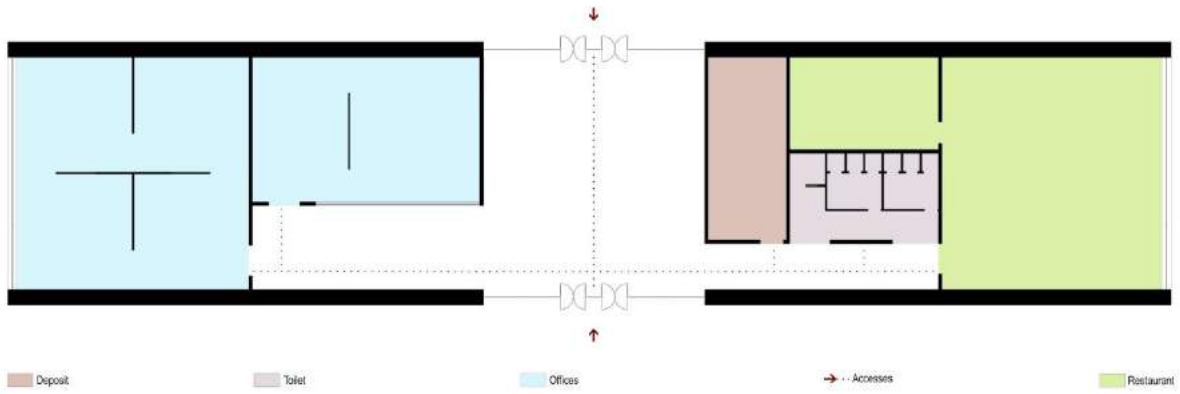

Fig. 7: Art District, administrative offices.

2. History and rationality as elements for the project design of ex Italtubi.

Disused for the past twenty-five years and reclaimed by asbestos in the 2000, the area of the ex Italtubi of Torre Annunziata is one of the most important and interesting urban renewal opportunities concerning brownfields in the national scene. The area, which covers approximately 19 hectares, is inserted in a region among the most beautiful of our country both for its environmental and landscape value that for the the historical and cultural one. It is set among the slopes of Vesuvius and the Torrese - Stabia coastline, which is separated at present by the dense bundle of tracks of the national rail line.

The intrinsic value of this urban "empty" "full" of history and opportunities becomes a place of reflection on design, the meeting between the written history and a future to be written. A place full of charm, set within an urban fabric with great features. A “non - urban area " to be exploited, to be "recycled", to be returned to the landscape, to the city and to the citizens. A public space "new", central, able to outline the dynamics of development of the city, the quality of life of citizens, and the environmental quality.

It is at these places and spaces that urban design gazes must turn to redesign and design.

The project is intended to ensure that the area, closed in itself, can become a place "open to the city" able to offer citizens new services, more public spaces, commercial areas, for restaurants and green areas accessible at all. The project aims planning to "break" the industrial precinct in its architecture and in the image and make sure that this area will become an integral part of the city, territory and landscape .

The pavilions are immense and cover an area of about 5 ha, 25 of the entire batch. Tall structures, silhouetted against the sky in remembrance of the past. A city within a city. A space that for too many years has remained closed and abandoned. The ability to transform and regenerate is part of the logic of urban development based on principles dictated by ecological dynamics which in these places can be enhanced. The first step is to change the urban planning point of view, look for new cultural approaches that are able to give new life to matter. The urban planning of areas such as the ex Italtubi need to focus on a wider range of variables, developed in order to create a dynamic approach to the planning that is in continuous evolution.

The idea of converting this former industrial area into a "new 798", an Art District able to enhance the places in harmony with the surrounding landscape and the industrial architecture, comes from the awareness that this new role will be a driving force for development for the entire torrese and stabiese area, an excellence, a historical cultural unicum.

The area is characterized by the presence of two main artifacts that, for their architectural and functional characteristics, represent factors of permanence of greater impact on design choices. These two elements have always been the fulcrum of the entire production chain of Italtubi and for this reason the masterplan project starts with the careful observation of these already existing structures, including the recording officers of the production areas, with the specific aim of enhancing their peculiarities and safeguarding the main distinguishing features. The reading of the historic trim has unequivocally suggested the overall urban development of the entire area with the layout of the new design features in a clean design, rational and "clean" The aim is to organize within the old container a distribution system and a simple exhibition, linear and rational, able to optimize the use of all the available spaces and to give back a strong and, at the same time, "attractive" imagine to the building and new features, so as to turn it into one of the privileged places of culture.

The architectural structure represented by the two main existing elements is renewed thanks to an intervention which, keep on respecting the environment and the spacious interiors, is characterized by an identity different from that of existing buildings becoming part of the conversion trend of the

archeological industrial spaces into places dedicated to culture and art in its various forms and expressions.
The standards design tend to a maximum retention and preservation of existing structures to enhance its historic character and authenticity of the preserved parts also alternating with technologically advanced materials and placing new historical artifact in close and reciprocal relationship enhancement.
The morphological axis defined by the pre-existing artifact is the most important generative sign in which outline the various spaces and functions. The project is focused on delivering a perspective art gallery which together with spaces dedicated to educational workshops, temporary art installations, wide-ranging cultural events, artistic and technological installations in public spaces dedicated to catering, to trade, to congress activities, multiple use of halls, social events and all the complementary services
The floor plan that flows out has allowed the construction, between the two main architectural and historic, of a large public square on which will overlook the restaurant and business trade. A "green" square able to recall at the same time the historical memories of these spaces.
The project plans, for the south area of the lot, the realization of a large urban park of about 8 ha, a green and wooded collective space that is set to become the connecting place between the city and the Art District. Although the area destined to the urban park and the architectural elements retain some independence among themselves, at the same time even if “working " independently they keep being firmly connected in a physical bond through the pathways and functions that characterize them.
In this project proposal, the public space re - assumes importance in the dynamics of development of the city, in the quality of life. It is in public spaces, in the architecture to "zero volume", that the city is redesigned and designed. It is in these spaces that the urban ecosystem regains its shape, is enriched with biodiversity, social life, a new "urbanity" capable of overcoming social inequalities, access to functions and services for all. The urban green takes on a new value, the ecological one, in addition to purely aesthetic and recreational functions to serve the people. An eco-dimensional process in urban planning leads to bind territories and their inhabitants in a vision in the longer -term urban development, to adopt new models of economic and social development are able to renew our ways of consuming , producing, working and living.

Fig. 8: Art District, night rendering North- East view.

Fig. 9: Art District, rendering North- West view.

Fig. 10: Art District, temporary exhibitions.

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Fig. 11: Art District, teaching laboratory.

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Innovative Solutions to the Urban Contex Degradation: the case study of Pompei and the Telemetric Control Center project

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Abstract
The preservation and valorization of the historical, cultural and landscape heritage also goes through the redefinition and creation of new systems to serve the accessibility of places and landscape.
In response to the new needs of the contemporary city and referring to the challenge on climate change promoted by the recent "climate change conference" in Paris in 2015 that led to an international climate agreement to limit global warming below 2 C, the design of connection and exchange networks within cities, becomes an opportunity of research and development towards innovative solutions to degradation phenomena of the urban context.
From this arises the Telemetric Control Center project for the city of Pompeii, for its symbolic value and because of its notoriety.
It concerns the design of a headquarters for the stationing and remote control of a system of bike and car-sharing.
The aim is to ensure, through the use of communications and Information Technology (ICT), a service of Mobility Management which confers to a city of history and tradition, the ambition of the Smart City.
Defending the condition of places improving sustainable mobility, facilitate access to services by creating a system of communication interface accessible to everyone, able to ensure the monitoring of intermodal exchanges through the tracing of an electronic map of reality: "Internet of Things ".

Keywords: Climate change, ICT, Smart City, Innovation, Internet of Things

1. Pompei Telemetric Control Center
Living the present becomes each day more a challenge. The weight of our choices is increasing and has an ever greater of ray relapse, because even if a bee, in its smallest form may appear harmless, same is not true when, together with the other, form a swarm. The awareness of the consequences of our actions is now widespread, the difference lies in the unconcern and indifference inside the consciousness of the single, but something is moving and tries to materialize.
The year 2015 ended with the final agreement of Paris, that among November 30 and December 2 hosted the Climate Change Conference, or COP21-CMP11. The agreement must be ratified, accepted or approved by at least 55 countries to become effective in 2020.
The aim is obviously to reduce greenhouse gas emissions and thus contain the climate change that threatens our planet. Scientists are unanimous in indicating the threshold that should not be exceeded: we must prevent that the middle atmosphere of the planet increases by more than two degrees Celsius. Besides, it would enter into a dynamic almost irreversible.
Compared to the agreement of six years before, in Copenhagen, has been made steps forward.
Among the main differences emerge:

- The imposition of a limit to the increase in global temperature as against pre-industrial values to 1.5
- The adhesion of the whole world, including the biggest polluters: Europe, China, India and the United States, committed to cut emissions
- The introduction of the five-year control of the applications necessary to achieve the intended objectives
- The allocation of funds to promote green energy

There are all prerequisites to place ourselves before a profound change in the history of humankind. What are the consequences depend on us and our commitment to contribute to the improvement of our future and of the lives of future generations.
It is also true that we must offering citizens a possibility of choice, and this means a range of alternatives to the means currently at their disposal, not only functional but also incentives and thus motivating. First of all is the issue of "sustainable" mobility and emission reduction, of the preservation and development of the city and its culture venues. Reducing the volume of the exhaust gases and noise pollution not only produces intangible benefits effects that are those on the global atmosphere, but also visible as the conservation and the non-alteration of the architectural and urban heritage. The implementation of the system of transport and connections, improve the fruition of places for citizens and tourists and becomes instrument of promotion of the city and its suburbs that will become more easily accessible and so livable.
In the spectrum of this reality and its external solicitations lies the case study of the project called: TELEMETRIC CONTROL CENTER for the city of Pompeii. It is the design of a structure for the parking and the remote control of a bike and car-sharing system which, through the use of ICT, provides a Mobility Management service, accessible to everyone through the traceability of an electronic map of reality .

1.2 The technology to serve the project
Imagines a system with a number of tangible and intangible (digital) components

Fig. 1: Graphic scheme of the Telemetric Control Service

The first are divided into three main categories of groups:

1. Means of transport (electric cars, bicycles, scooters ..)
2. Fuel and parking stations
3. Electronic and technological components for data acquisition such as :

- CLOUD CONNECTIONS: electronic devices (DSRC, NFCM 3G / 4G connectivity etc. ..) on board of the individual vehicles that allow you to collect a variety of information such as speed, location, route, sudden stop or sudden acceleration, loss of stability, survey of accidents and reception of messages for help.
- SATELLITE TRACKING: using for example receivers (GNSS), combined with the ability to put more vehicles in communication with each other
- NFC: a very small tool, a plate without battery, which contains a small antenna and a microchip. When the plate is detected by the mobile phone, it transmits the information to the APP. An evolution of the RFID technology, which allows communication between two end devices of TWO WA□ type and not ONE WA□, like the exchange of Bluetooth data between two phones

Digital components are:

1. The main CLOUD (Computing Platform), which collects and elaborates data

2. A final fruition APP allows the user to interact with the services offered through the knowledge of the position of the various trading centers of the vehicles, the type and quantity available.

Reached the rental point, the NFC system reads the registered user to the platform and allows access to the means of transport. This system makes it convenient, especially in the case of car-sharing the possibility of not having to know and provide in advance the duration of use of the vehicle. Each unit is controlled and tracked from the main cloud that manages the distribution of means in the various marshalling points as well as collecting useful information on tourist flow, longer transit areas, consumption and traffic data. The design experiment under consideration focuses the attention on the conception of a physical control center in which to place the CLOUD management offices, as well as a rest area and parking of vehicles and bikes, it becomes a kind of green nucleus, meant as destination and rest point given its strategic position near the archaeological site and the area designated for the construction of the new railway hub.

1.3 The place of the project

Design the space modification, especially in view of innovation, means deep reflection and full knowledge of the reality in which to be inserted. Whether it is redevelopment of the existing, or design of the new, the issue of architecture integration into consolidated urban areas is now inescapable object of study and reflection. But then where is placed the place of the project

Let's try to describe a city, a country, a region, as theorized by Carmine Gambardella, like it was a cell. It has its own genetic patrimony, the result of the evolutionary process and that grows by storing the positive and negative input it receives from the outside and which will significantly influence the quality of life.

This cell is equipped with its nucleus, usually considered more vulnerable and in need of protection, precisely because it the main keeper of the information, but this has also a contour, which is just as gentle since it is from here that penetrate and come out input and output, and here is located the place of the project, in the ability to enter, acquire the information of the assets and exit in an elastic and dynamic way and without damaging the around, and then the cell in its entirety.

In the dynamism resides evolution.

But "that it is in harmony or in opposition to the given context, the project remains in any case an alteration of a previous balance" emphasizes Cino Zucchi, in an interview by Marco Casamonti, on the occasion of the exhibition he curated of the Italian Pavilion, entitled "Grafts", considering so every architecture intervention as a form of graft on the existing.

It linked to the Morris definition of architecture for whom "the architecture is the set of changes and alterations - grafts - introduced on the Earth's surface in sight of human needs, except the pure desert." et according to Carmine Gambardella, there where there are no material preexistences exist conceptual preexistences, citing as an example Paolo Soleri and his Arcosanti in the Arizona desert.

This is even more true when facing the complexity of the Italian reality, since everywhere you come across a site that has already been format long ago. We must therefore know how to absorb the pre-existence and transform it into a new configuration result of knowledge and awareness already acquired.

The acquisition of knowledge is a process of immersion within the reality, what that Raffaele Panella calls "rooting", a form of inquiry to find out the secret of the place roots up to derive the "confirmatory principle of places", far beyond the genius loci of Norbert Schulz: "a system of relationships and physical signs that should give a sense of conformation of a place." An analysis of the stratigraphy of the events that led to the present the architecture of the past, which still today resist and are presented to us in the form of "fragments".

2. The Project Design

The Telemetric Control Centre of the city of Pompeii, could not be imagined except in strategic interchange area, near the area designated to the construction of the new railway hub, close to the excavations and then of the highway exit leading to the city.

Currently characterized by an expanse of uncultivated land, bordered on the south by the state railway and to the east by the elevated highway to Castellammare, the area is mainly accessed by Highway 18 and by a secondary artery that branched off westward to the residential areas. Among the objectives of the project, the attempt to establish with the pre-existence a relationship of continuity both cultural (link with the urban identity, the memory of places, the image of the city) that morphological (physical link with preexistences, with the site geographical, topographical character, the foundation tracks).

Fig. 2: Graphic scheme of the project area

Pompei is the cell that is experiencing a traumatic event, in a time Dt, which harms it leaving what now remains to us: a fragment, the non-anthropic.
Intervene on this site confronts us with two choices: the inaction or reconstruction. Rebuilding but always with an eye to the past, where In the cell edge.
"Building the new preserving an ancient heart".

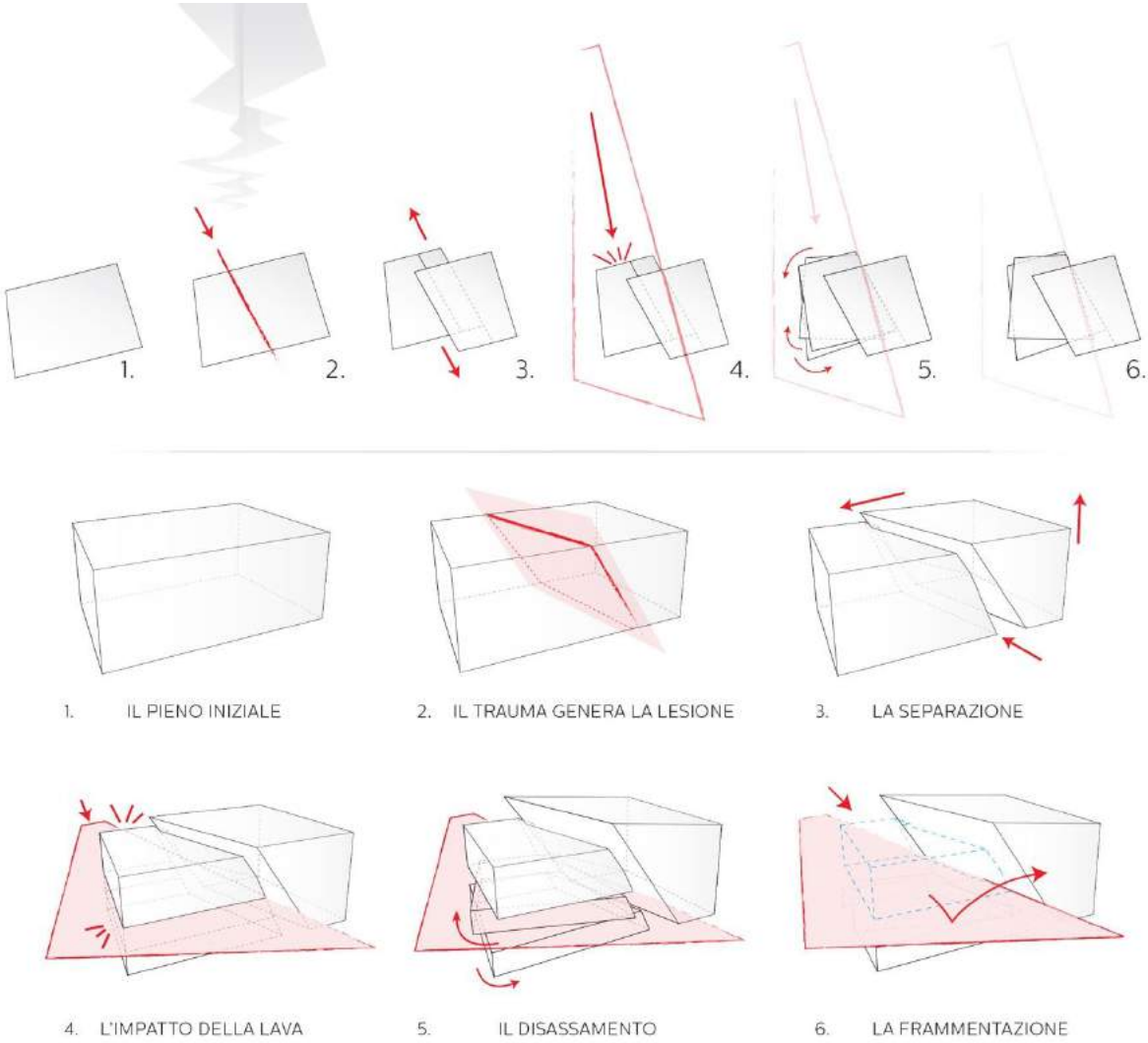

Fig. 3: Graphic scheme of the project generation

The history and the succession of its events, guide the drawing in the generation of the new.
Everything starts from the original body: the full, matter, form generator and guardian of knowledge. On the one hand, the desire to excavate and reveal the contents, on the other hand tend not to overpass the limit, to honor the compactness and completeness. Condition that you are unable to preserve as nothing is detached from phenomena of the surrounding world. So here is the traumatic event; in the case of Pompeii, the eruption of the volcano, which represents in itself so many things: the new, the expected but also unexpected, the inevitable and almost forced contamination.
The first quake damages the solid creating a lesion that, as a result of continuous stresses, raises the inevitable separation of the parties, their disconnection and thus the loss of unity. To the shock follows the strong impact of the lava: new energy, overwhelming, uncontrollable and inevitable, which further damages the body generating the "offset". Some of the parts are lost, and to us remains the fragment, that from "sign" of solid remains, becomes generator of the "sign."
What originates the initial solid core The Drawing.
The representation of the tracks, the plots, the distinctive presences, the punctual signs, of the limits set by facilities and infrastructure, the delineation of the routes and possible access, the projection of an imaginative scenery results of the knowledge acquisition and brave attempt of crossing the limit.
It belongs to the project experiment, also a careful reflection on the empty / full ratio.
What represents the void in a body Subtracting material, lack, discontinuity
Or the vacuum is part of the whole, an appendix, an essential component to the perception of the whole Represent the void can mean to draw anything on the sheet, since it is generated from the borders defined by the full, yet despite does not require any manual effort, the project of the void, the subtraction of matter, is among the most complex processes of the architectural composition.
An architecture that is able to create a harmonious dialogue between solids and voids, until reaching the overall harmony which aspires to that achieved by the classical age proportions, the design of a dynamic space, made of interconnected levels ,of tracks, of stimulus, communication and separation, so a space of relations and not of static objects.
In the case project the void represents the loss, the laceration of unit, fragmentation and misalignment of the parties. A disjunction that occurs in form and function, which however is only apparent, since the connection between the two stays in the basement, in which the two units are communicating, symbolizing the continuity that always bind various fragments of the whole.
The void is then the sign of the separation that follows the trauma and generates the decomposition; but it is also the transparency of glass parts that seem to be there to remember a volume that no longer exists, of which only the opaque parts remain, a kind of contemporary ruins.
The project aims thus to the outline of a story and tries to give to the protagonist parts of this story an important role in the use of space and in the sketched landscape piece.
The area, originally uncultivated, is now crossed by pedestrian and driveways paved paths, led by the geometry generated by the texture of the ground below that define, in their intersections, green space for parking and the walk, with benches and trees to stay at shade and patchwork of different lawns and flower areas, then of scents and colors.

Fig. 4: Photo Insertion

The project is part of a wider and more complex system of interventions designed for the Pompeii area, placing itself in line with the concept for the redevelopment of the former industrial area italtubi and with the new Hub.

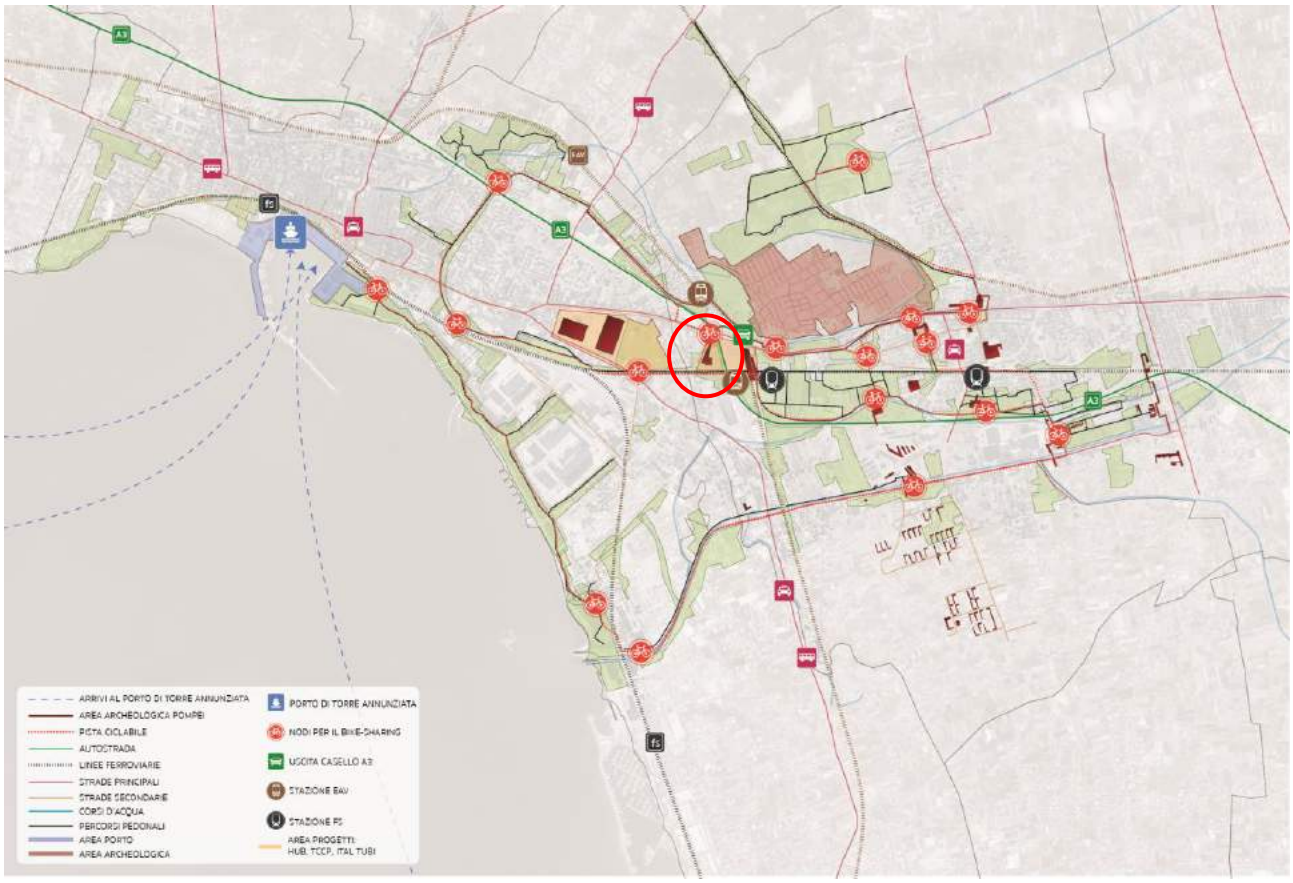

Fig. 5: Graphic scheme that shows the infrastructure system managed by the cloud

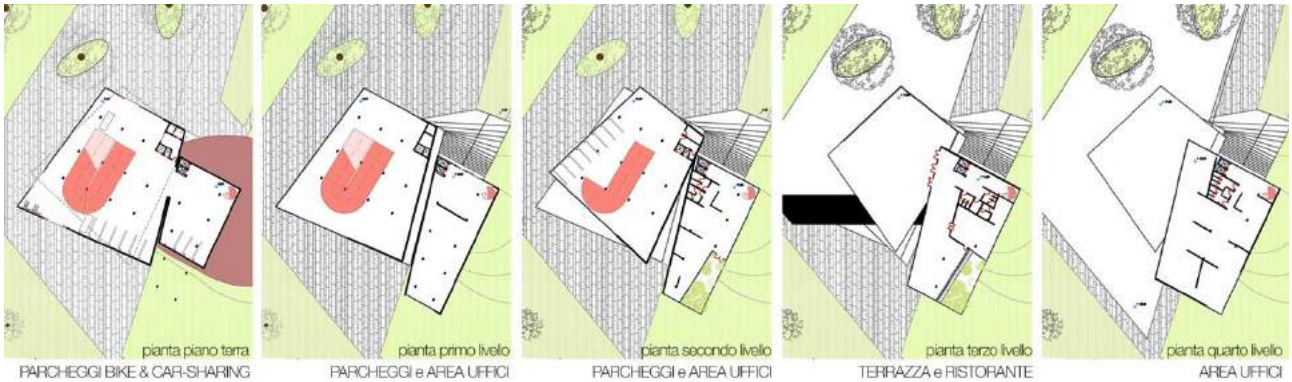

Fig. 6: Project plants

The TCCP consists of two main parts:
- one destined to the parking of vehicles for the bike and car sharing which is distributed on two levels connected between them by ramp and elevators. The ramp is the sign of the connection between the parts, the ligament that has never been broken and for this reason is reinforced by the color red. The ground floor is also linked to another portion of the building through the underground connection that always plays the parking function, covering a total area of 2200 Mq, for a total of 100 seats between cars, bikes and scooters. It is accessed by two paved entrances one of which covered by the great platform that stands on the volume. This symbolizes the gesture of the impact that caused the injury and is transformed into a walk occasionally interrupted by the eruption of the nature (which invades the space as well as in a forgotten ruin) that ends on the rooftop turned into a huge outdoor terrace. The tourist who comes in Pompeii with the train or car, or even the citizen, can take advantage of these spaces to rest, perhaps with an outdoor picnic or lunch / dinner at the restaurant or just for a leisurely walk before visit the excavations of the city or the other attractors.

Fig. 7: Render SOUTH view

Fig. 8: Render NORTH-EAST

- the other part of the building is instead destined to offices for the Cloud management and the other monitoring services. This part of the building seems to be detached from its neighbor a result of the lifting of the ground below. It is reached or through the underground car park or through the steps that arise from the paved paths. The spaces are opened and for the most part glazed, with partial shielding and movable partitions that define perimeters half open with the aim of leaving the liberty of work areas management. Here the connection, that in the other portion of the building was entrusted to the ramp, is represented by the staircase, which is also red, standing out in the building in a fluid form of deliberate contrast with the angularity of the envelope that houses it.

The first floor (350 sqm) is designed in part to welcome those who access from the stairs of the paved path and in part to be a stop and rest place (relax room) for exclusive use of employees during the break time. The second (490 square meters) and fourth (745 square meters) floor, are entirely used for the workstations, scanned by a few interior partitions, designed to ensure direct light in any environment.

The third floor separates the functions and is meant as a restaurant / hot table cause it is located on the same level as the outdoor terrace on which the restaurant opens transforming it into one accessory space. Even in this element it will be proposed again the issue of contamination of nature; the volume is dug and overgrown with vegetation that becomes a natural shading tool too.

Fig. 9: Render NORTH VIEW

Fig. 10: Render NORTH and WEST VIEW

Fig. 11: SECTION A-A (North-West)

Pompeii, the city submerged by the lava and ash that tells a story of death and rebirth, is a deep source of interpretation and an equally strong incentive to create. Walking through the ruins brought back to light and try to relive a disappeared reality, a different era, is a form of incomparable training to the imagination. It teaches to look at the exhibit as part of the whole and to hone the sharpness of vision to find the narrative of architecture, of the city, of habitat.
The exceptional nature of the source does not preclude the use of the methodology.
The designer, which is an urban planner, architect, engineer, designer ... can learn to look to any form or built reality such a cell. Of all it can be identified the nucleus and the outline and everything can be to appreciate the stratigraphy, the history, the event in the time Dt that changed the location contaminating it, so transforming us in the Robinson Crusoe of our island, able to gain from the box tool, which is the whole of our cultural heritage combined with the data we have collected and assimilated. We will be able to contribute to the growth of habitat, but not as a concept linked to residence, but to human needs.

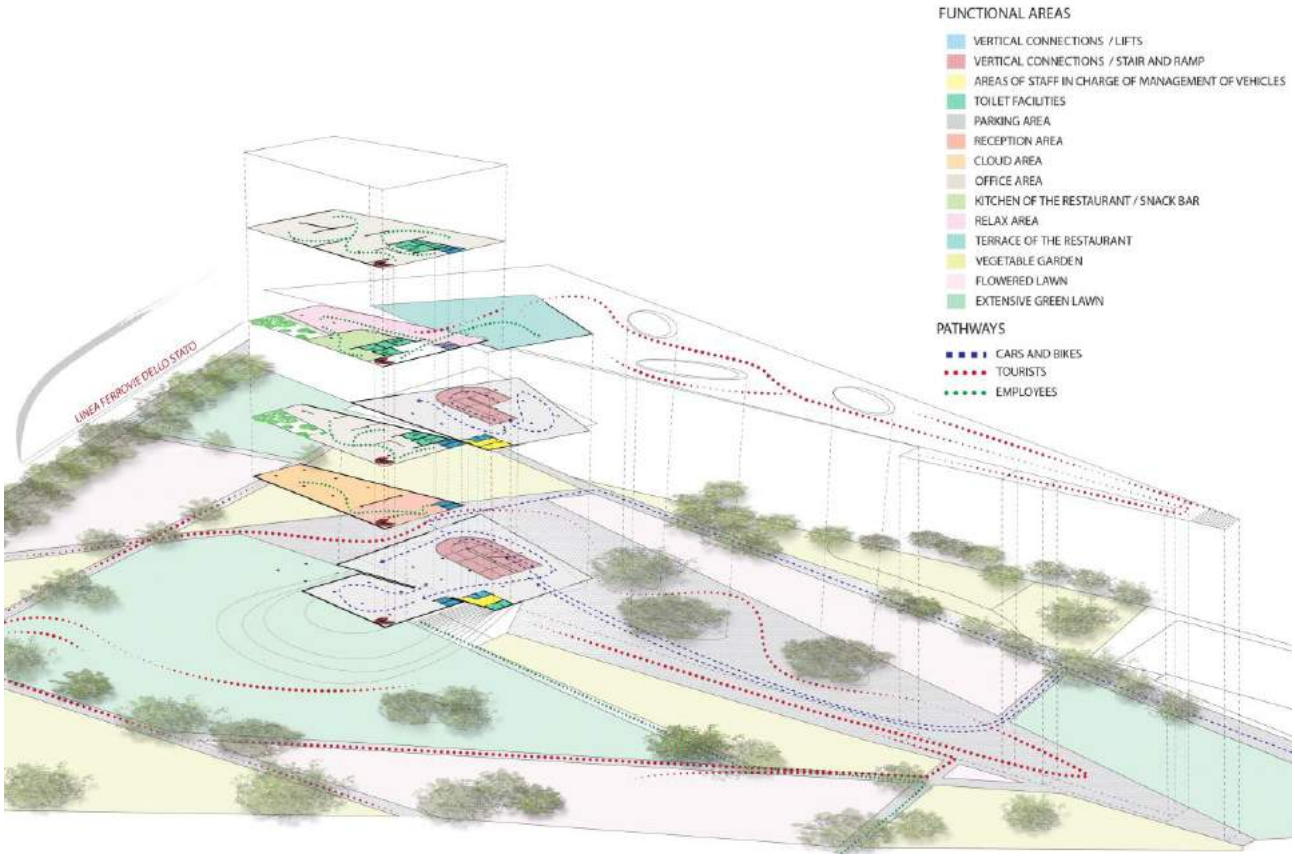

Fig. 12: Functional scheme of fruitions areas and paths

Fig. 13: Render of the office area in the top and of the parking in the bottom

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Study on the Geometrical Instability of the Building of the Church of Santa Maria La Mayor y Real de Sar

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Abstract
We are aiming at the study of the case of a church has been that was built in the outskirts of Santiago de Compostela, near the river Sar. According to historical sources, its construction was initiated in the year of 1134. Seven centuries later, on the 14th August 1895, it has been classified as a Spanish national monument, having since then been submitted to several works of restoration and rehabilitation, commissioned by the official governing entities.
Due to the inclination that both the interior columns and the exterior walls present, the referred monument became considerably famous, giving the impression to the observer that the arches that sustain the roof tended to fall apart. In the 16th century, the tilt of the tectonic elements attained such a considerable dimension that finally contributed to the collapse of the central vault.
In the restoration of the church, the central vault has been maintained, having the walls and the tilted columns as a structural support. Nevertheless, and in order to solve the situation and confer thus some stability to the building, there were later added some exterior high buttresses.
The present research tends at demonstrating that the problem of instability should be primarily associated to the inadequate geometric design that determined the form of the building, and not to issues raised by inappropriate materials or the misuse of constructive processes.

Keywords: romanesque architecture, structural reinforcement, geometric instability, medieval models.

1. Introduction

We are conducting a research about the evolution of the built shape in medieval churches, aiming at the recognition of both the function and the performance of the most outstanding elements and invariables that characterize the transition between and throughout the Romanesque and the Gothic period. In this article we are bringing to discussion the concrete case of Santa Maria Mayor y Real de Sar.
Researchers and other experts on Romanesque have to deal with the Cathedral and with the example of this Church, dating from the end of the 12th century, that has been built very close to the river Sar, under Marian patronage. Paradoxically the eventual pride on this construction has been affected either by mistakes of the Master mason, the height of the lateral aisles, by the orography of the land (frequently it is flooded by the river) or by any other. Therefore buttresses were built in the 16th or 18th centuries with the purpose of avoiding the collapse of the northern walls. These features have conferred a characteristic of notability to the building. Many like to appreciate the inclination of the walls and interior columns towards the lateral aisles.

Fig. 1: Church of the Collegiate of Santa Maria la Mayor y Real de Sar. Credits due to the authors.

After a splendorous period with all sort of benefices, Santa Maria La Mayor y Real de Sar, the Collegiata was converted into the parish of the Archdiocese, in the 19th century.
In 1895 the building integrated the Nacional Heritage and in the year of 2000, the Xunta de Galicia promoted it to Museo de Arte Sacro of the Colegiate where is kept the foundational parchmin sealed by the Bishop Diego Gelmírez. This house was the retreat of monks of St Augustine rule that promoted the foundation of the Order of Santiago in 1170.
Built in the 12th century this church is, along with the Cathedral where Romanesque work can be studied in its original features.
There still persists, among the community of historians, some mysticism about an eventual secrecy that certain corporations of masons would have kept about the structural form in the Gothic period. The Gothic form did potentiate a significant augmentation of the height and the free interior space of the cathedrals built according to the rules that presided to that architectural style. However, following our understanding, there was not any kind of secrecy and even more; we do not believe that nothing exoteric occurred in this evolutional process of the built shape in those medieval times in the passage from Romanesque to the Gothic.
Undoubtedly there was a human will to go further through in spatial amplitude and height regarding buildings and revealing an innate sense to erect with most economy, therefore with the purpose of using a lesser quantity of stone material. These were essentially the invariants that dictated and provided the discovery and the increment of knowledge that may render possible the attainment of a more efficient geometry, both in the structural point of view, promoting the possibility to overcome a span that everyone aspired at becoming bigger.
This new knowledge that those master masons were progressively acquiring – the attainment of a geometrical structure more powerful and efficient – dictated a subsequent technology and a constructive form that did bring to humankind the so-called Gothic form. Nevertheless, this evolution of knowledge did not take place in a precise moment in history; it was progressively evolving throughout time, slowly, as a result of successive experimentation, acquired in the time span that mediated in the building process of hundreds of churches that succeeded in cascade. It has been a slow evolutional, based on the experience consubstantiated by every attempt to innovate and the subsequent interpretation of errors and bad performance that took place on these experimentations and that dictated the adoption of corrections, to which corresponded new steps of innovation, introducing new successive approaches until the epilogue of the newer formal geometry.
Furthermore, there is no such thing as a clear frontier between both styles, in the temporal phase of the ending of the one and the beginning of the other. There are in the Romanesque and the Gothic common tectonic elements, used in those times of transition between both periods. This fact demonstrates *de per se* that the knowledge related to the Gothic did not take place at a determined temporal moment through a precise discovery or due to the development of a new concept or theory

that would have radically transform the structural knowledge. This did not take place in fact. It did not exist such as a new rational and logical theory that allowed the medieval builder directly to risk the conceptual leap from Romanesque form to the Gothic. Such an attitude of supposing that some detained the constructive secret that allowed them to withdraw dividends regarding the rest of the builders, would be contaminated of lyricism. The whole process was slow, based on the method of attempt and subsequent error and finally the adoption of the measure to overcome the error. The simple acknowledgement of the error constituted the lever that allowed innovation.

2 – The Case of the Church of the Collegiate of Santa Maria La Mayor y Real de Sar

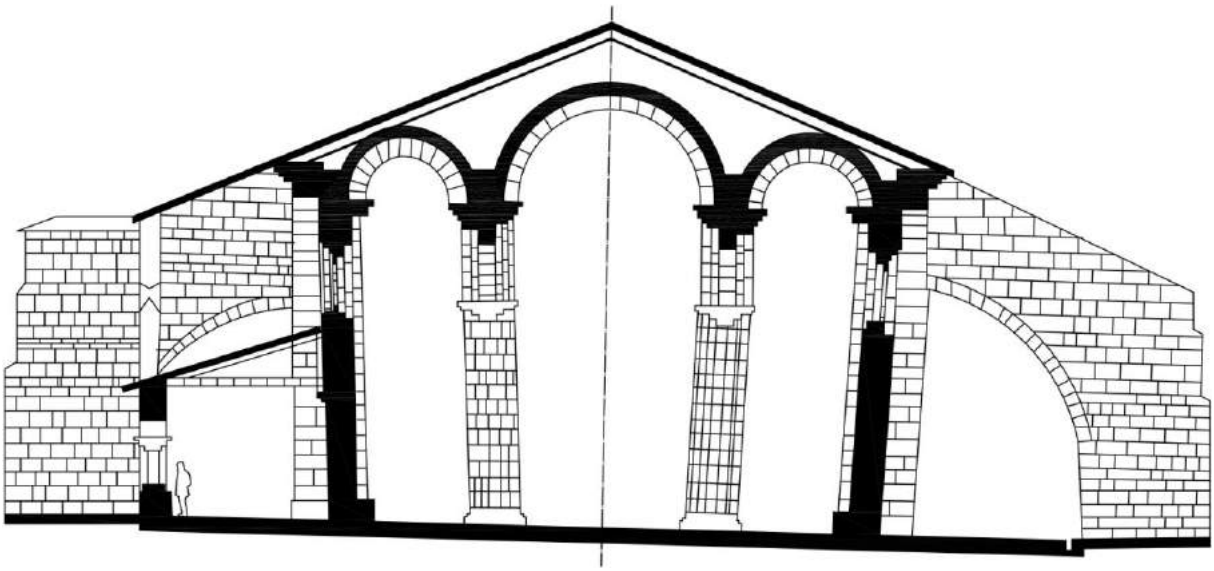

Fig. 2: Schematic section of the church of Santa Maria la Mayor y Real de Sar. Credits due to A. B. Diogo.

In this paper we are presenting a case-study where the evolution that took place in the formal plan on the construction of a church was wrong and it caused its collapse. It is the Church of the Collegiate of Santa Maria La Mayor Real de Sar, in the outskirts of Santiago de Compostela, in Spain, situated on the river bank of the Sar. The construction of this monument was initiated in the year of 1136, at the same time that the building of the Cathedral of Santiago de Compostela did take place. The erection of the church was however slow and complicated, having taken more than a decade, even if it is in fact a considerable small edification. The Church after its construction presented problems and it was later necessary to implement works of reconstruction in several campaigns, namely in the 16th, 17th and 20th centuries, to face the problems and structural-tectonic pathologies that affected it. We present some photos both of internal and external features of the building and an elementary section putting into evidence its structural schema.
This galician church is known by the inclination that the columns and the walls present, according to what you appreciate on the photos above, that visually suggest to the subject a sensation of instability, transmitting the sensation that the vaulted roof is on the imminence of falling apart (fig. 5).

Fig. 3: Buttresses and façade of the church of the Collegiate of Santa Maria la Mayor y Real de Sar. Credits due to the authors.

Fig. 3: North aspect of the church of Santa Maria la Mayor y Real de Sar. Credits due to the authors.

Along with the increase of the horizontal displacement of the columns and the walls came the partial collapse of the roof in the first, second and third sections of the church, after the *presbiterium*. In our study, along which conclusions we present in this article, the cause of the collapse was due to the geometrical error in the original shape of the church. Therefore, it was a conceptual mistake.
In the works of rebuilding the church that took place after the collapse of the vault, in spite of the geometrical formal error, there was an option for maintaining the geometric configuration of the vault, supported by the walls and the pillars later tilted, although to provide the necessary stability to the church, therefore in the attempt to overcome the conceptual error of the initial geometry, then aggravated by the inclination patent in the vertical elements, they decided to add flying buttresses to support the external walls, in accordance to what the figures XXXX and XXXX prove. The reconstruction with flying buttresses was only built in the 16th century, even if these structural elements had made its appearance in the 12th century. Nothing relevant or innovative was introduced in the solution adopted by the reconstruction of the church.
The implementation of this solution, nevertheless did contribute to disfigure in some way the original form of the church. These new flying buttresses were a later constructive addition that has altered the formal composition of the edification, but resulted in an efficient solution for the resolution of the structural problem raised by the inefficient initial form.
These new flying buttresses transfer now the force of horizontal buttresses, that occurs on the top of the walls or pillars, directly to the exterior, in balance and preventing it from rendering those constructive elements unstable. It was a corrective solution of recourse, fully ingenious and perspicacious on the level of structural behavior which has completely altered the formal aesthetics of the composition of the church.
In this research we conclude that the instability of the Church of Santa Maria de Sar took place due to the erroneous of the geometry used in its constructive form. They attempted to innovate in the form of the co-lateral aisles but they were not succeeded. As it is well acknowledged one of the invariants corresponding to the Romanesque is the barrel vault, also designated as tunnel vault (fig XXX). In Romanesque and in the roofing of the lateral aisles, simultaneously to the groin vaults was used the geometry of the barrel vault and this latter was the solution adopted in Santa Maria de Sar (fig XXX). The basis of the geometry of the barrel vault is the circumference. Nowadays, it is well-known that the circular arch and the tunnel vault are structural structures that are less efficient for these geometries produce bending and, along with this, traction. The stone material does not resist to traction, therefore it is not a good building solution using this material to resource to roman arch and tunnel vault. The capacity to create space is conditioned by these geometries, so there are limitations in height and extent of Romanesque architecture.

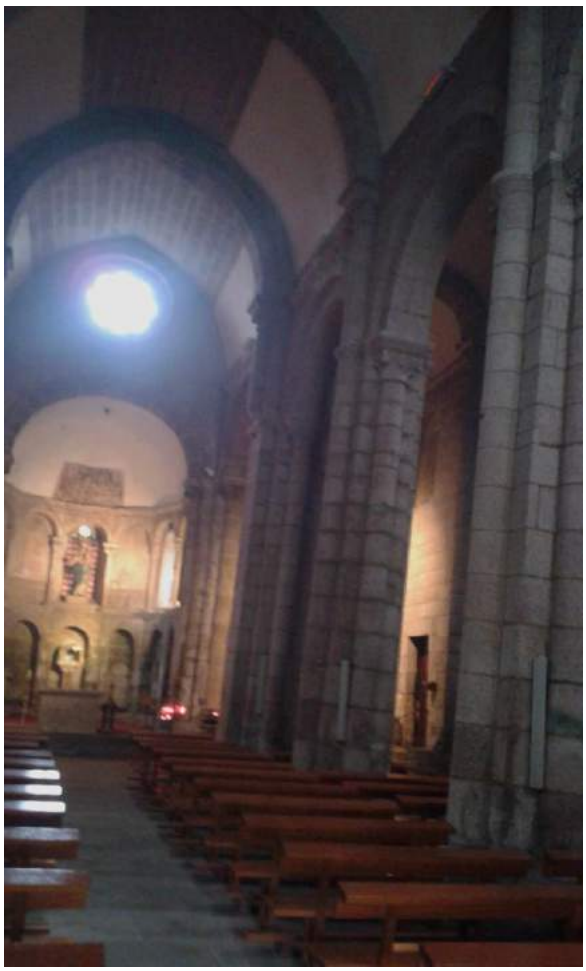

Fig. 4, 5: Exterior features of the northern “flying buttresses”. Interior aspect of the church of Santa Maria la Mayor y Real de Sar, puting in evidence the deformation of the pillars. Credits due to the authors.

The church of Santa Maria de Sar presents a certain particularity. It has an unusual interior space according to its formal configuration, since the higher vault level of the central aisle is very similar to that of the co-lateral aisles. The height of the central aisle is almost identical to that of the co-lateral aisles. This formal solution is scarcely used in the Romanesque, where the vaults of the co-lateral aisles present a height that is lower than that of the central aisle, normally being mid height of the columns of the central aisle height. There is an evident intention of innovating in the construction of the Church of Santa Maria de Sar.

Fig. 6: Exterior features of the eastern presbyterium and of the added northern buttresses.

There is a connection between the intention of innovating and that of this building being so close to Santiago de Compostela Cathedral. Naturally, the relation of proximity is relevant and generated a certain competition between the master masons.
The Cathedral also includes three aisles, but in the schema the adopted rule follows the general pattern being the central aisle height double in comparison with the height of the co-lateral aisles, being the roof of these the rib vault. In Santa Maria de Sar, the builders went further, in relation to the height of the lateral aisles, revealing an audacity superior to that of the builders of Santiago's Cathedral. They did not follow the proportional rules that normally were implemented in this formal typology, when they erected lateral circular arches too much elevated in comparison to the central one. Through these new sets of proportions, and without having augmented the dimensions of the buttressing walls, the lateral arches cannot balance the force of buttress that is created by the central arch. Romanesque architecture did not use as a formal resource the plan of three aisles presenting the same height altogether. [i]

Fig. 7: Interior aspect of the church of the central aisle of Santiago de Compostela Cathedral showing a Romanesque style.

This solution was bold but deficient, considering the structural working. It was the principal conceptual mistake that was made in the Church of Santa Maria de Sar. Both the master masons of the Romanesque architecture and the architects of Roman period did not master the deficient performance of the circular geometry as structure. This sort of knowledge was only much later apprehended, in the later phase of the Gothic. Simultaneously to the poor structural performance of the circular arch and the tunnel vault, the formal solution bearing three aisles with similar height introduced another factor of bad behavior, for the necessary support of the buttressing force does not process efficiently, for the vertical load lacks in the area of insertion of the co-lateral aisle

Fig. 8: Section through the central aisle of Santiago de Compostela Cathedral.

3 – Structural analysis of the built solution

We have built a structural model to study the structural behavior of the initial configuration of the church. In this analysis of this research we have used a model of finite elements built on purpose for the study of masonry buildings. We have considered in the model that the vault corresponds to two dimensional arches, which is the base of a hypothesis that describes reality adequately.
On figure 2, we present the elaborate model that is considered in this study. From the results that are obtained, we may conclude that the initial geometry of the Church of Santa Maria La Mayor y Real de Sar was not acceptable and calculations may show that the collapse of the blocks might occur. The rupture of the arches structure occurs immediately to the third interaction of calculation, in join number 26 of the model, which suffers a rupture by traction; that is, block number 5 of the model of finite elements rotates over block number 4, and finally collapsing in the building interior.

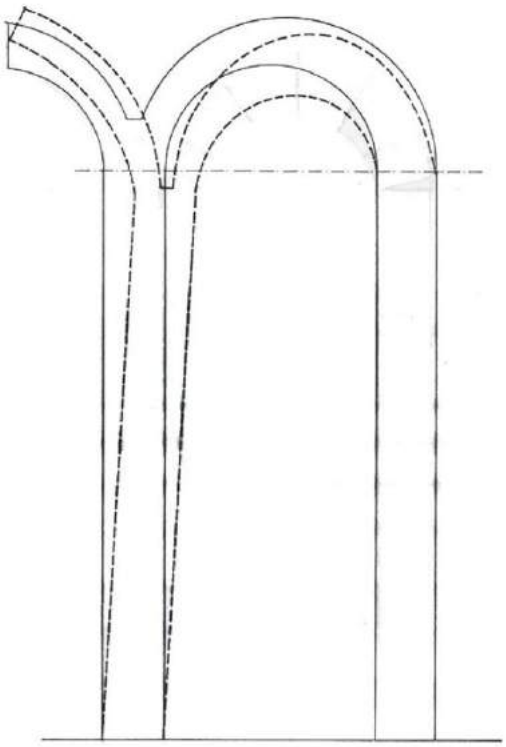

Fig. 9: Mechanisms of destabilization of the structure of the Church that almost reached full collapse. Credits due to A. B. Diogo.

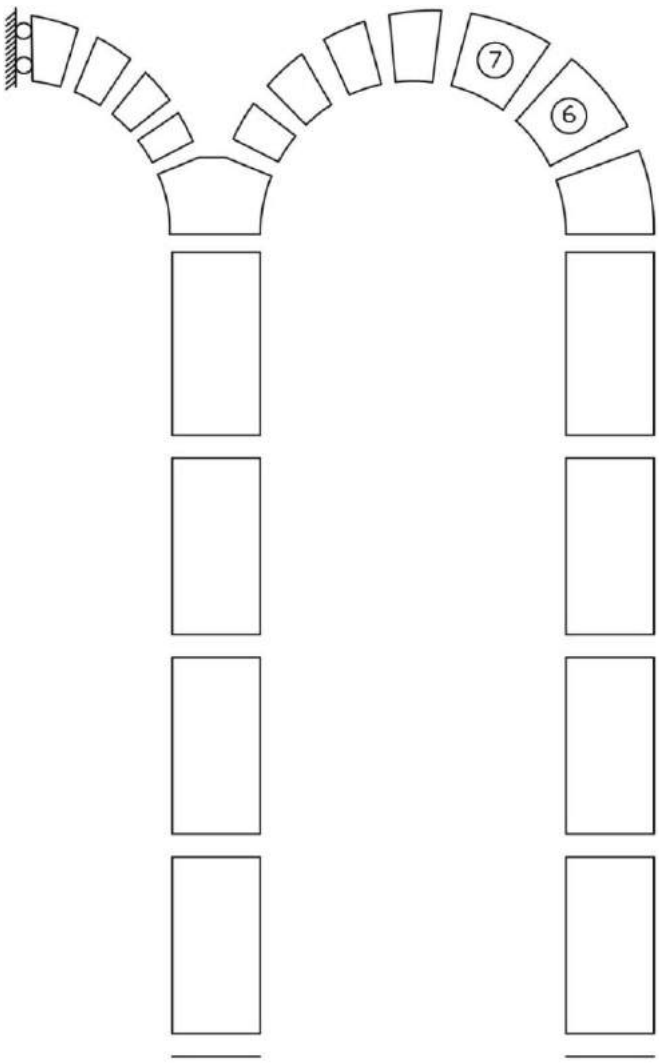

Fig. Malha de elementos discretos adoptada para a Igreja de Sar.

Fig. 10: Schematic drawing putting into evidence a grid composed of discreet elements adopted for the Church of Santa Maria La Mayor de Sar. Credits due to A. B. Diogo.

4 – Results analysis and reaching conclusions

From the analysis of the results obtained, we found out that the top of the column on the right suffers a dislocation towards the right, thus imposing a horizontal force to the lateral arch, right on its insertion on the central one, which tends to induce a rotation impulses on the blocks of the lateral arch. The above referred movements tend to provoke a deviation in the direction of the force that is transmitted by each block to the next, since that joins of the arch tend to open, reducing thus the area of contact between each block. Finally, we reach the moment when the internal load is concentrated only on one particular point, then, such as the case of the passage from block 6 to block 7, and the transmitted load has a destabilizing direction, since it is not inserted in block 6, provoking its collapse through rotation and its falling down into the interior of the edification.

On figures 9 and 10 we are aiming at presenting schemes that illustrate the mechanisms of destabilization. Obviously, after the rupture of the lateral arch we have to register the rupture of the join number 34, by shear, prior to the final collapse of the central arch.

The columns, both central and lateral, do not collapse for, after the rupture of the vault, they are only subject to their own weight and the direction of this force is vertical and by consequence it is only aligned with the blocks' section, despite the inclination of the central column, then it is a stabilizing force that keeps the rest of the columns standing.

We conclude then that the elaborate model confirms the mistake related to the adopted geometry for the formal design of the church, which justifies the collapse that the church underwent.

On the reconstruction of the Church, and with the purpose of correcting the formal initial anomaly, it was an option to add and build massive lateral flying buttresses, inserted in the plans of the central

and co-lateral aisles. The referred flying buttresses do transport in direct balance the buttressing force developed by the central arch towards the exterior of the building and with this formal solution it has been solved the issue of the destabilization of the arches that the church had presented, along with its original geometrical design.

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Notes

[i] A igreja de Alcobaça, em Portugal, pertencente à ordem de Cister, com construç□o iniciada em 1172, apresenta igualmente naves laterais com altura id□ntica à da nave central.

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Reflect□Visual communication for a new social "third space".

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Abstract
Oldenburg (1989) suggests that for a Health existence, citizens must live in a balance of three realms: home life, the work place, and the inclusively sociable place (the french "rendez vous"). A kind of "Third Place"- where people can gather and put aside the concernes of work and home, and hang out simply for the pleasure of good company and lively conversation - are the heart of a community's social vitality and thr grassroth of democracy.
This concept can be extended and filled with deeper objectives, aimed at single or shared "laic meditation", but more widely toward the spiritual dimension, to compensate for the alienation fostered (especially in young people, for example) by the white nights and the happy hour or situations of stress and conflict. We must therefore return again to reflect, to find ourselves and others.
For these spaces, the visual characters may confirm - metaphorically - the trend that from history (Candy, 2011 and 2012) evoke and actualize the use of mirrors and reflective surfaces, in the art (Zeky, 2007) and in architecture: from Jan van Heik Escher and Pistoletto, to English Mark's House (study Two Islands) or Mirror Houses in Bolzano (Peter Pitchler), or the Marseille Vieux Port (Foster) until Lucid Stead in Joshua Tree in California (of Pillip K. Smith III). Methodologically, the contribution will start from a careful and systematic review of studies, including theoretical and traditional, to arrive at examples and design experiments, visual in nature.

Keywords: urban therapy, social exchanges, informal socializing, enhancement, life quality

1. For a definition
Ray Oldenburg, American urban sociologist, is known for its scientific attention to places of public gathering - more or less formal - for a more informed civil society, for a more interactive and participatory democracy. Degree in Social Studies at Minnesota Mankato State University (master and Ph.D. in Sociology at the University of Minnesota) is currently Professor Emeritus at the Department of Sociology of the University of West Florida in Pensacola. He is a consultant for entrepreneurs, planners, institutions and communities (secular or religious) that seek to create quality places within their facilities.
He defines the "Third Places" (TP) [1] as intermediate places between the familiar space of the house (*first place*) and the place of work (*second place*), which allow to forget worries and enjoy relaxing in company of others, or to do in group "spontaneous" activities, in a more educated and committed level. And even more, according to the principle of "no-substitutability of places", he argues the need of the three "kingdoms": home, office and "social". From the agora in the ancient Greek democracy; to the *caf*□ during French Revolution; to the London one during the Enlightenment; up to the tavern during American Revolution. Open to an informal socializing, such places can be the heart of the life of a community, to promote and encourage greater social balance, mitigating status differences among various people; as well as they can increase the public aggregation and provide psychological support to people and organizations. Oldenburg argues that these places are born from the need to build "infrastructure for human relationships".

The author addresses the analysis to America (to the city whose social and economic characteristics differ, in part, from ours, while for other aspects include similarities). For everyone, it may be also a need of a value character, rather than physical: the one of spirituality in contemporary toward space for secular meditation and places of speech and silence.

2. Characterizing aspects

We can briefly list here some characterizing aspects: the new forms of "urbanity" tied to territoriality; spaces "for the discursive togetherness"; pleasure, and sociability, neutrality and equity.
The “democratic" sociability, mentioned by Simmel [2] was once targeted to intellectual circles familiar to him, confined to restricted social classes by wealth and culture: today can be interpreted as a broader effort to create a thread in the fragmentation of experiences and social identity. While for someone (ex. J□rgen Habermas [3]) public sphere is a discursive space where citizens can meet and discuss freely about everything that is part of the community life. These are places where you can shape public opinion through proper information and debate. Although public sphere and public places are different, they join in a moment when, in accordance with everyone's opinions, the people in the place give born to speeches who contribute to direct and stimulate public opinion.
Since it is not sure that sociability is linked only to the public sphere, as formation of political activities, it is essential to expand the research to places that produce new forms of "urbanity" and aggregation [4] and analyze what are the places and their emotional experiences that contribute to interactions, supportive or not.
From ancient times, to the Nineteenth century when they have been defined, up to the contemporary society, third places have changed over time (without forgetting the role of web) but the characteristics defined by Oldenburg are still valid: “neutrality”, for example, offers a "*neutral ground*" where participants are at ease, enjoying it freely and increasing the possibilities of relationship between equals. If friendships and other informal acquaintances are limited to private life, the city loses potential. Neutral ground makes possible more informal relationships between people, avoiding the feeling of isolation that someone may experience. Third places must be able to satisfy the need of relax, distraction and sociability that people have before, during and after the daily tasks and routines; therefore the activities that take place there will not be rigidly organized, planned and structured; “equity” confirms that to Oldenburg "*The third Place is a Leveler*", the third place is a leveler. It provides equal treatment for people who access and interact freely, the social status is not important and people of different culture and socio-economical origin can meet and socialize. The concept comes from *Levelers*, the name of an extreme left British political party, born during the reign of Charles I (1625-1649), who argued the need to eliminate all differences in position and rank among people. From the Seventeenth century the concept has passed the political referring to the pursuit of equality between men: it is the time (as we said before) when the first cafés were born, intended as a meeting place and image of democracy.
Even the concept of *togetherness* (as union and solidarity) contribute to the definition of TP: Ash Amin [5], for example argues that such public spaces are places of encounter and exchange, regardless of their established and ruled function, for different experiences much inclusive, cooperative and confrontational. To Habermas *togetherness* includes forms, in a minor way, of "getting together" in public.

3. Third place as urban and social therapy

Among the potentially critical aspects that TS could potentially improve, there are urban stress, overcrowding, noise, insecurity.
“The stress” (from Lat. *strictus,* "tight") has a purely negative connotation in the popular imagination, a mental and physical status of a person that prevents to deal with everyday situations with clarity of mind and serenity: "stress of modern life; driving across town during rush hour has become a significant stress ". But within certain limits it is not negative because it may foster a personal

development. It has been widely shown that city dwellers are more stressed than the ones in rural areas: this difference is because of the large amount of stimulation of the urban environment and the rhythm of a more vibrant life. Some causes are: crowds, noise, limitation of individual freedom, less customization, crime and insecurity rate [6].
“The crowding” can have positive effects, creating a sense of security, or negative, causing anxiety (*overcrowding*). To assess the effects it is necessary to distinguish between wanted and suffered. In the first case crowding has positive effects: a person often tries situations with high social and spatial density wanting to "forget oneself" within the group. Examples of this type are concerts or sporting events, where the emotional involvement increases in contact with others. In addition to the desire to be in that situation it is aware that it will have a limited and predetermined duration.
Overcrowding is considered a facilitator when a person has to perform simple physical tasks (walking or running). In case of complex and cognitive tasks, it can be seen a decrease of performance and mechanisms of *cut-off*. In crowded places a person feels canceled as an individual, this causes a minor sense of social responsibility and a greater tendency to illegal behavior, even if not criminal.
The architectural elements of a building that help to increase the feeling of crowding are: single spaces without partitions, low ceilings, curved corners, poor views to the outside and walls painted in dark colors.
Taking in consideration buildings in its whole, those with low horizontal development are perceived less crowded than those with vertically development.
“The noise” is "an unwanted sound." It is a discomfort, physical and psychological, based on the position of a person which must suffer the acoustic stress.
Determinant factors for the severity of the effects of noise are: lack of control on the sound source, predictability, volume, stability. The first consequence of exposure to noisy environments is the loss of hearing sensitivity. Noise acts on the physiological level causing high blood pressure, due to vasoconstriction of peripheral blood vessels, headache, nausea. Psychologically it causes anxiety, irritability and emotional instability. To overcome these problems it can be used *masking*, covering unwanted noise with background music (ex. the music in shopping centers to cover shouting, register’s sound, etc.). Of course, such tricks are inconclusive to ensure a good night rest, compromised in pathological terms with pseudo cultural initiatives such as the "white nights".
Noise affects the social aspects of life: in noisy environments you are less inclined to have relationships and conversations.

4. Silence and word

In a picture by Louis Khan, school is represented by two people arguing under a tree, and by Oldenburg communication, speaking, is the essential "game" of the third space. The vision of a sociologist and an architect is focused on word as reason of togetherness and sharing: dialogue has always been the most direct form of confrontation, and even in conflict is often a healthy debate. In the globalized world we live in today, constantly at the side of other, stranger, new, it is clear that communication is even more useful than in the past.
It is often clear how dangerous the opposite is and how many misunderstandings the inability to communicate and mediate create, in all circumstances, in all ways.
The synthesis of this argument boils down to two factors, the first is that we live in a present with continuous sounds, noises and words, practically in an absolute and eternal acoustic pollution, the second is that there is an open question on the close proximity between believers who profess different religions exploited for political ends.

5. Ideas for a meta-project: Reflecting

Regarding visual analysis in this area between analysis and design approaches we can confirm some consolidated methods, as the Chicago school one, that among the Twenties and Thirties deals with the relationship between the city and membership forms. Park, Burgess and Mckenzie define the city

as the sum of emotions, habits, feelings and traditions that have stratified during the course of time, from generation to generation. The city is split into areas and groupings of people and each one has its own characteristics and define a particular type of citizien.
In complementary terms, the New Look school sees the perception and knowledge of the environment influenced by social relations and consequent values. Ittelson and Proshansky have defined the environment as the set of physical, symbolic, cultural and social aspects in which a person moves actively. This is the transactional perspective in which person and environment are to be considered together and have a constant exchanging relationship. The conclusion is that individuals perceive the environment on the basis of activities and behaviors, and different environments lead to different perceptual experiences.
From the Gestalt tradition, Kurt Zadek Lewin [7] proposes to deal with the issue in terms of "holistic", considering the user based on the actions, personality and daily life in response to an environmental stirring both psychologically and socially.
The resulting "Field Theory" (comparable with Marcolli) allows to identify certain categories of first reference:
- *Living space*: is a subjective and personal vision, in the set of perceptions, knowledge and emotions, values and meanings that attribute motivations and needs;
- *Border area of the living space and the e□ternal environment*, with a continuous exchange between them, in which a person is affected by physical and social world. Two activities of this category are the perceptual process and the execution of an action;
- *Area across the border in which life ta□es place without influences on living space* at that time because the current facts are not perceived.
These studies can be supplemented with consolidated contributions by Kevin Lynch and Gibson in some ways, but also by Mario Botta and Paolo Crepet in other way, with the query "where emotions live" [8].
From this it is evident that perception and understanding of psychological characteristics (and not) become fundamental environment to reclaim the places and live better [9].
Consequently, as we stated at the beginning, an integral part of these possible new urban realities will be formed by places of speech and silence, for a new spirituality in the contemporary, with new spaces for secular meditation: new spaces for reflection. So it can be taken into consideration - not only in a metaphorical sense - the mirror that, while reflecting, visually replicates the world: duplicating it reversing right and left; showing an environment that looks real, but it is instead, as defined by Michel Foucault, a space 'heterotopic' where we see where we are not, an unreal space that opens up virtually behind the surface but, at the same time, it absolutely is a real place, connected to all the surrounding space.
Mirrored surfaces are increasingly used for art installations and contemporary architecture, dressing city and ideas with light facets. Because of the reflective capacity and the irresistible trick aimed at broadening the spaces, mirror becomes the star of many projects playing with his qualities to distort the perception and create amazing visual effects of camouflage.
Among the works of architecture that have made this material its main design element, there is **Mark□s House**, a Tudor-style house by the British studio Two Islands, that has upholstered with reflective panels, putting it atop a stand of mirrors, to simulate a structure that seems to float in midair.
Of the same principle are **Mirror Houses**, two houses projected by the architect Peter Pichler, in an apple orchard, in the South Tyrolean Dolomites. In this scenario, a large glass mirrored faces outward capturing the surrounding landscape.
In Marseille, the reflecting surface is **Vieux Port**, by Foster □ Partners studio, that realized it as a simple reflex cover: a canopy covering a public space in the ancient port area causing passers-by to look up discovering their images reflected.
Phillip K. Smith III in Joshua Tree, in the California desert, has created **Lucid Stead**, transforming an existing shack with mirrors that make transparent the structure around as if there were nothing. To adapt to the rhythm of the desert after dark, the house aligns with the desert and follows the natural mutations of light, revealing a play of shadows, reflections, projections and changes.

In artistic field, mirrored surfaces are customary, such as sculptures by Jeff Koons and Anish Kapoor or the works of Michelangelo Pistoletto, the "lord of mirrors': his **Etruscan** is the emblem of the relationship between man and his picture, the main character comes from the past, just to stand in front of a mirror, he touches it as he wants to keep it up and enters into the future coming from the past.
Unlike performances so fantastic and imaginary, a mirror (with particular attention to the third space) will be the bearer of metaphors (visual and not) of the strong need of reflection - both personal and collective – that is increasingly urgency

Fig. 1: "House of the People", Brussels, Victor Horta. Image taken from website http://charmingclutter livejournal.com/930.html.
This building, realized in the late Nineteenth and early Twentieth century, was demolished in the 60's with no scruples, initially with the idea of rebuilding it elsewhere; in reality the parts were disassembled and scattered in the outskirts of town. Of the "House of the People" remain only a few vintage pictures and pieces of iron bitten by rust.

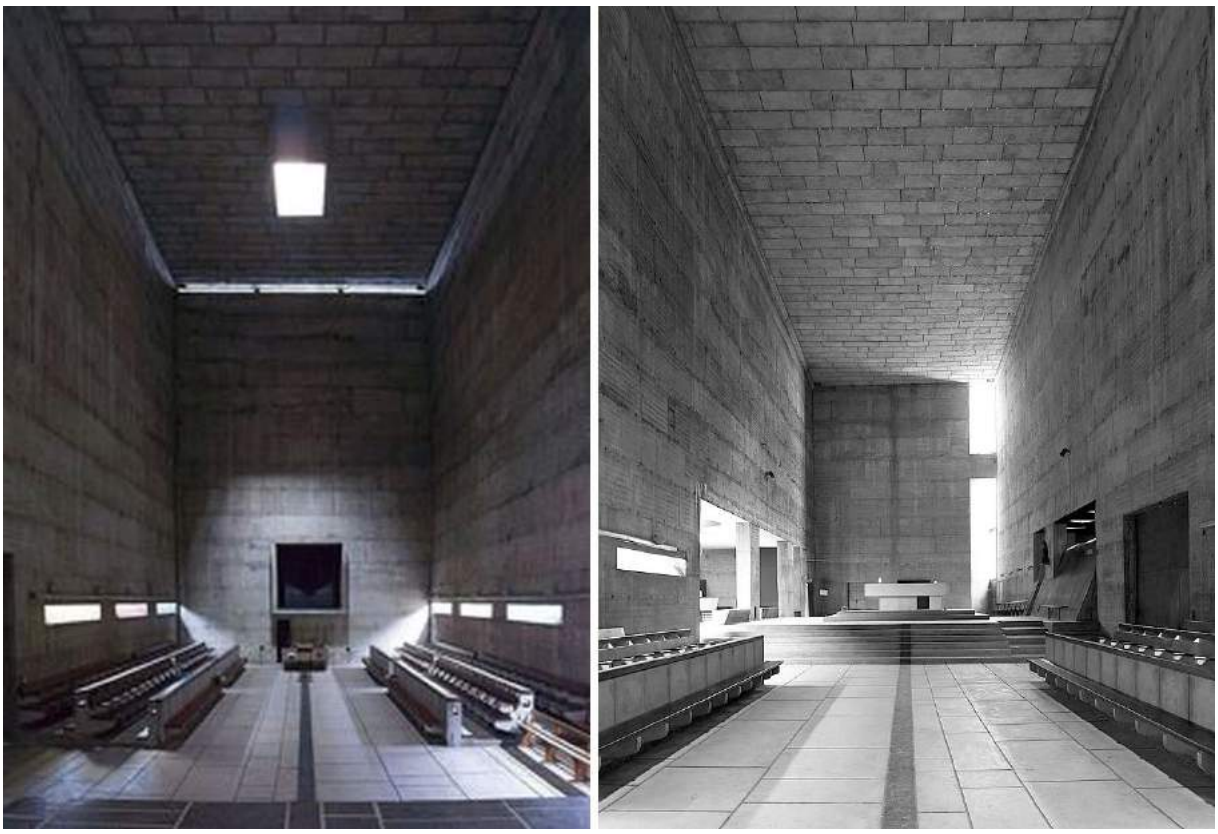

Fig. 2: The chapel **"**La Tourette", Arbresle (France), Le Corbusier. Image taken from website https://www.pinterest.com/raldana88/modern-chapel/.
The example of a place of silence in "Third Place", shielded from external electromagnetic waves and noises to prevent that cell phones and networking devices may disturb the peace. The main stress for those who live in the city is noise pollution, and this is true for the Christian and the Muslim, the rich and the poor; together in a secular chapel everyone will talk to their God, but meanwhile will save the soul from daily hell of city life.

Fig. 3: Officine Grandi Riparazioni, Torino. Image taken from website http://www.nuovasocieta.it/metropoli/alle-officine-grandi-riparazioni-nascera-il-centro-nazionale-big-data/.
Torino has large covered spaces to be rediscover and revalue, who have an enviable history in the name and on behalf of which it is necessary for urgent action to relaunch the project of an open and inclusive city. The OGR are one of the most important examples of buildings that are demanding the return to life, to the meaning of their lives in the vicinity of high population density places and high concentration of cultural institutions, academic and research sites.

Fig. 4: Cavallerizza Reale, Torino, installation. Image taken from website http://www.delfinadepietro.altervista.org/delfina□web/colonne.html.

Another example of space - in the city of Turin - which can create interconnections within a broad and heterogeneous social stratum that needs to encounter, dialogue and expression. Cavallerizza Reale has become a symbol of protest by young artists against special interests aimed at the subdivision and the privatization of the building intended to luxury residential use.

Fig. 5: the Feltrinelli Red, Milano. Image taken from website http://www.s-notes.net/2013/10/feltrinelli-red-read-eat-dream.html.

Unity is strength, in this case more than ever. Where it is needed there is the meeting and exchange between entities that we perceive distant, but not at all, a museum could integrate with the free workshops of art and craft, or a theater with an acting school, or a school of design or fashion. As in the example shown here, the libraries have become literary cafes, with reading rooms, consultation, discussion and refreshment, for read, talk, and also consume at the bar without any obligation to purchase in the library.

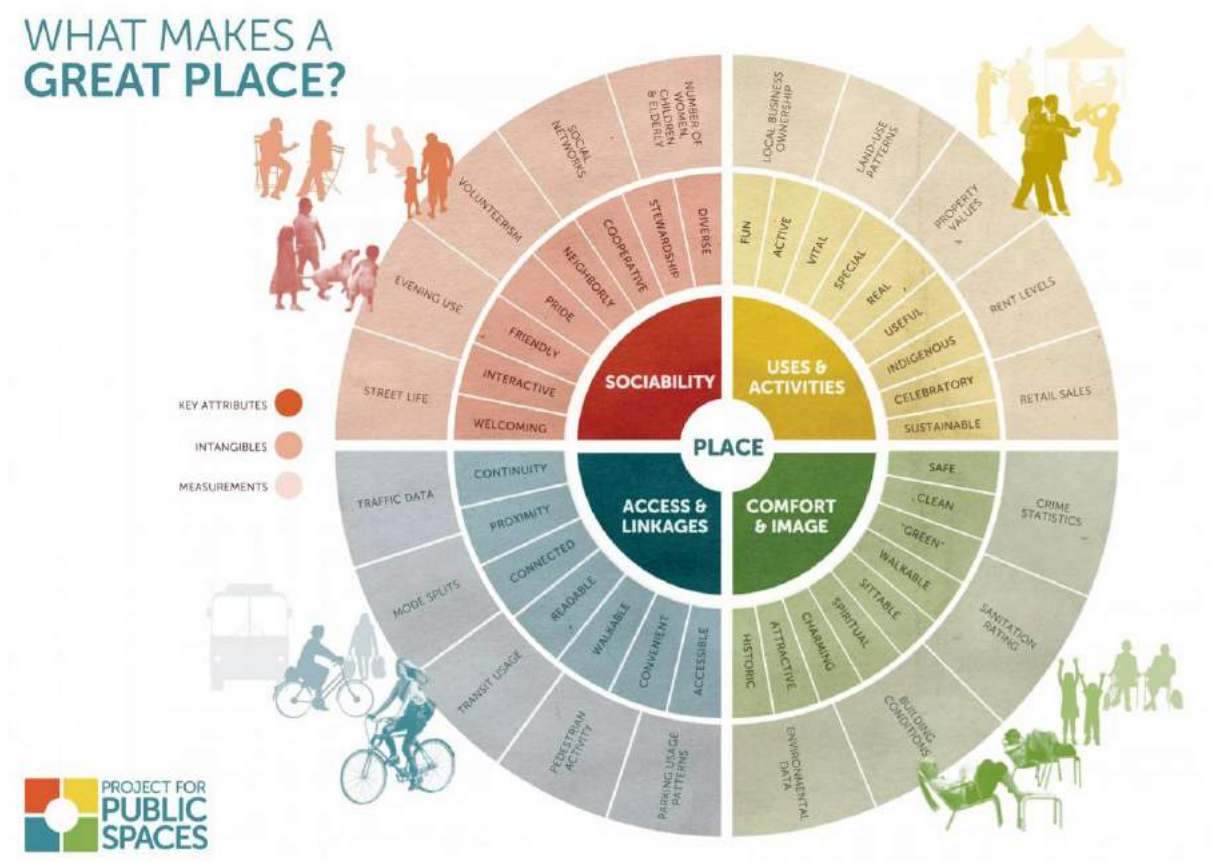

Fig. 6: Project for Public space, *What makes a great place*, digital elaborated. The diagram illustrates the directions for the creation of pleasant places. At the center there are the keywords, then the intangible qualities and finally how to measure the quality of a space.

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Le Vie dei Mercanti XIV International Forum
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A Critical Vision

Criticism and Theoretical in Innovation Creativity of Architectural Among Emergence and Education.

"An Empirical Study on the architectural education & Producing the Architectural Innovator in our environmental built "

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Abstract:

Changeability is one of the fungal axioms on which Allah has created the mankind to achieve the targets that he aims by acquiring newly creative of behaviour for the sake of better life. In the contemporary ear, Innovation became a crucial for the progress backwardness of communities. This makes it incumbent for all the institutions to put forward their strategies to generate and produce the individuals who have the capability of creativity and challenge the problems. So this is the importance of this critical vision.

The purpose of the fundamental research is to try to formulate realistic (a critical) vision for the essence of creativity, innovative thought, architectural creative operation, educates and produce innovator creator architectures, based on creativity in the organized educational process. Through studying the relation of architectural education, produce innovator, creator how to produce architecture innovative thinking. The research also focused on studying the architectural designing as an effective method to formulate the young innovative architecture, reaching the ruling creative thought in our traditional architecture and how to enforce and teach them in our contemporary reality, starting from studying the innovative creative concepts of the simple innovative shapes, showing the effective extent on the characteristics of architectural innovative formation and its effect on the creative sense and practice until reaches the new architectural product the extent to accept the innovative idea by the public opinion.

The study shows a modern vision to identify creativity innovation in the architecture, creativity operation and relation between architectural education with produce the creator and architectural ideas of innovation. This will be done through a two main branches: firstly, The theoretical proposal represented in the history of innovative creative thought, development of creativity theories, innovative creative concepts, targets of creative concepts, standard innovative values, manner of creative operation and its innovative stages through different designing stages,…. Etc. The second branch is preparing a practical critical vision about the manner of studying the architectural creativity in the designing operation, studying revolutions as influential factors on formulating the creative thought, produce innovators, know how to measure creativity innovative techniques to discover the architectural innovator, and methods of developing its skills train him on innovation, manner of creativity in architectural education and professor's role in the architecture departments to form and produce creative and innovative architectures.

The research concludes the importance of the critical studies for architectural innovations, the role of universities to produce the creator innovator architectures, the need for innovative and creative teaching programs, encourage of useful constructive difference, accept criticism, new ideas develop interactive characteristics that grow innovation. The importance of making innovation as independent teaching topics materials, and teach them in all subjects, modify the routine traditional programs and its containment on divergent creative thinking approach. The importance of making, brainstorming sessions with the students at the beginning of designing projects teach them criticism and analogy in the architectural creativity. The study recommends the necessity of developing architectural programs to activate the ability of the divergent creative thinking, and develop the innovative side of architect. There must be a constitutional immunity for the creator and innovator in order to produce nontraditional ideas and prepare programs to discover the innovators and take care of the architectural innovators.

Keywords: Innovation – creation – architecture – criticism design – globalization

1. Introduction:

In our contemporary, Innovation creativity became a crucial for the progress and backwardness of communities. This makes it incumbent for all the institutions to put forward their strategies to generate and produce the individuals who have the capability of creativity and challenge the problems. So this is the importance of this critical vision. Thus, we have to reformulate the critical perspective of thought for both innovation and creation generally, and for architecture specifically based on a reasonable, romantic and psychological perspective. Changeability in the stages of life is one of the instinctive postulates on which Allah has created man. Change for achieving all desired goals is a new innovation for a better life. When we contemplate and consider the innovative perspective of our traditional architecture, we will find that their cultural extension hasn't helped in their continuity. So, these buildings have been considered through an objective and reasonable perspective of a materialistic reference, ignoring the invisible spirit that depends on a dogmatic reference which was the innovative and creative basis of our traditional architecture.

The purpose of the fundamental research is to try to formulate realistic (a critical) vision for the essence of creativity, innovative thought, architectural creative operation, educates and produce innovator creator architectures, based on creativity in the organized educational process. Through studying the relation of architectural education, produce innovator, creator how to produce architecture innovative thinking. The research also focused on studying the architectural designing as an effective method to formulate the young, innovative architecture, reaching the ruling creative thought in our traditional architecture and how to enforce and teach them in our contemporary reality, starting from studying the innovative creative concepts of the simple innovative shapes. This will be done through a two main branches: firstly, The theoretical side that is represented in the history of the innovative, creative thought, the history and the development of the innovative and creative perspective and the general innovative theories and values; the creative and innovative concept, the creative production, the creative environment and the creative process. The second branch is preparing a practical critical vision about the manner of studying the architectural creativity in the designing operation, studying revolutions as influential factors on formulating the innovative creative thought, produce innovators, innovative creative disability, know how to measure creativity and innovative techniques to discover the architectural innovator, and methods of developing its skills train him on creativity and innovation, manner of creativity in architectural education professor's role in the architecture departments to form and produce creative and innovative architectures.

2. Research Problematic Issues:

The extent of a concept's fertility is in its ability to secrete the largest number of research problematic issues. The concept that we are discussing now is rich in its several problematic issues. The wrong concepts that prevented the study of creation are considered one of the problematic issues in our research. Those concepts will be shown as follows:-

- Is creation an organized educational process or a normal process that is governed by its special laws and cannot be predicted
- The creative and innovative thinking differs between classicism and modernism; as each person is created within his / her thinking frame.
- The creative and innovative person has his own distinguished nature; as, he is considered an inspirer whether his reference is dogmatic or materialistic.
- Do creation and innovation extend to the field of architecture, building and arts or they are limited only to the artist or the inventor; as each one is innovative in his field depending on the fact that innovations cover various fields in life whether artistic, scientific or practical
- Creativity and innovation are not limited to some societies only or to a specific age; as aging does not hinder or stand against innovation.
- The criticism of architectural creation and innovation for buildings between the prevailing perspective at the time of constructing them and the perspective of the current era (that is featured by information openness).

For example, the shrine of **Al-Sultan Hasan** in his Mosque in front of the **kiplah** assumes three fronts in spite of what Ibn Taimiah mentioned what the legitimate controls stressed regarding the prohibition of building shrines or tombs inside mosques or in front of the kiblah. But when designing that mosque, as **"Hasan Abdel-Wahhab"** mentioned in his book **the History of Anient mosques**, the area was a market called Al-Rameelah [26, 32]. The designer through his innovative thought wanted to make the shrine visible from all directions to encourage the passers-by to ask Allah's forgiveness for the owner of that shrine. What we want to stress is that through a creative and innovative attempt depending on an abstract perspective, the architectural work can agree with the legitimate controls or not [*].

3. Research Hypotheses:

- Creativity and innovation are both the main goal or desire that the architect is all the time trying to achieve when formulating the architectural work as well as the main effect on the critical perspective in analysing the architectural product, whether before or after practicing.

* Researcher criticism

- Attempting to depend on creation and innovation in the architectural theories generally and the architectural product specifically when criticizing the architectural product has become a main goal in the information openness for judging the final product… Etc.
- The architectural beauty of our traditional architecture did not appear extemporaneously, but it depended on intellectual basics and governing innovative and creative theories that have been formulated by a creative and innovative architect and that are in agreement with each era of the different eras and are in close relation to those eras in terms of time and place.
- The governing legitimate controls were the main bases that formulate the creative and innovative thought in relation to our traditional architecture. Those controls also insure the integrity of the design thought, but they are not enough for achieving creativity; as creation depends on other conditions.
- As a result of globalization due to jumps and the quick rhythm of our modern life, both creation and innovation have become the determinant of progress and backwardness of nations.
- The importance of the architectural criticism as a tool for correcting the modern architectural creative and innovative theory, its development, its application and its correction as well as its relation to the different creative levels: objectively, formally and psychologically…. Etc. Moreover, the innovative theory is important because it's considered a tool for the objective criticism of our ancient and modern buildings; as both are complementary and corrector for the other, not only as a criterion of judgment but also as a special application tool for the architectural product.
- The innovative architectural creative person, how we can discover him and develop his talent in our university study.

4. Research Objective:

The objective of the research originally was a critical perspective of the architectural creation, then the idea has been crystallized to the relation of the architectural education and the production of a creative and innovative person in addition to the production of the innovative thoughts or ideas and the study of them as a critical way of judging the architectural beauty. The objective after that has become the studying how to teach the subject of the architectural design and its relation with distinguishing the creator and the innovator relying on the method of teaching the architectural design as a main subject of achieving and distinguishing the young architect creator and innovator reaching the creative thinking of architectural design product and how to apply it in our contemporary reality in our university. Confirming that the architectural creative importance is necessary for meeting our needs over the ages which starts from the traditional heritage architecture to the modern ones.

The main purpose of the fundamental research is to try to formulate realistic (a critical) vision for the essence of creativity, innovative thought, architectural creative operation, educates and produce innovator creator architectures, based on creativity in the organized educational process. Through studying the relation of architectural education, produce innovator, creator how to produce architecture innovative thinking. The research also focused on studying the architectural designing as an effective method to formulate the young innovative architecture, reaching the ruling creative thought in our traditional architecture and how to enforce and teach them in our contemporary reality, starting from studying the innovative creative concepts of the simple innovative shapes, showing the effective extent on the characteristics of architectural innovative formation and its effect on the creative sense and practice until reach the new architectural product the extent to accept the innovative idea by the public opinion.

To achieve this aim, there are some branch aims confirming and assisting the achievement outlined as follows:

- Study the impact of architectural creativity and innovation on all personality of innovator and creator product, creative productive and creative environment
- Formulation of what the innovative thinking of the creative process is, the objectives of creative innovative thinking, creative standard values, forms of creativity and innovation and their compatibility with our social environment
- How creative and innovative, through various design levels of architectural product and their stages from the beginning of the theoretical level (theories of creativity) then, Creative till innovative and forming reaching the level of morality.
- Revolutions as factors affecting the formulation of architectural creative and innovative thinking and forming the creators and the creative and innovative disability
- How to measure creativity, governance, methods of creative, innovative styles and the ways of development and training on creativity and innovation such as foresight, psychoanalysis, objective analysis and the psychological one as an essential and standard parameter for drawing and drafting of configurable of the final architectural creative product
- How to innovate in architectural education and the role of the teacher and university professor in creativity and innovation in the faculties of engineering, architecture sections for the formation and secretion of creative and innovative architects, (young creators and innovators).

5. Research Methodology:-

The research will adopt a theoretical inductive methodology with benefitting with all theoretical tools and the available applied evidences. The study is divided into two parts; the first part discusses the

theoretical proposal represented in the history of innovative creative thought, development of creativity theories, innovative creative concepts, targets of creative concepts, standard innovative values, manner of creative operation and its innovative stages through different designing stages,…. Etc. The other part is preparing a practical critical vision about the manner of studying the architectural creativity in the designing operation, studying revolutions as influential factors on formulating the creative thought, produce innovators, know how to measure innovative techniques to discover the architectural innovator, and methods of developing its skills train him on innovation, manner of creativity in architectural education and professor's role in the architecture departments to form and produce creative architectures.

6. History Development of the Innovative Creative Perspective:

The development of creation has obtained importance as it helps in identifying the main basics and criteria of innovation and creation with their broad lines during different ages till the modern age. In our modern age, both Russia and America are introducing educational programs and activities which agree with the creation and the development of talents and innovations. The launch of the first Russian satellite **"SPUTINK"** was the beginning of studying creation and innovation in the educational programs.**"Guilford, Makinnon, Rans and others"** entered this field, and thus held many conferences of creation. **"Broner"** has confirmed that the reason of falling at that time was the mode of **"the Classical Thinking"** and he has supposed the absence of **"the Creative Thinking".**[10] Then, **"Alfred Binet Theophil Simon"** developed the intelligence scale that was known by **Stanford** scale in **California**. As a result, the creative thinking has prevailed in relation to the requirements and demands of the contemporary scientific techniques [48].

Since the 1960s, the creation has obtained an increasing care and importance. Consequently, there have been creation tests and tests of measuring the personal features. Thus, the concept of creation covers the cognitive mental processes and the modes of personal thinking…. Etc. And as a result, innovative and creative theories have appeared and a number of measures and criteria for creating programs and its learning have been developed. This already started when **"Guilford"** differentiated between two types of thinking: **convergent thinking limite**d) and **divergent thinking free or branched** He also stressed the importance of intelligence of creation and innovation. Thus, the creative researches were called **"the highest achievements".** [20, 25]

7. Creative Innovative Concept and creator, innovator:

In the age of information openness, the age of jumps and quick rhythm, creation has become the determinant of the progress and backwardness of nations. The comprehensive concept of both of creation and innovation is **"creating and inventing a new thing",** but it's not a new thing; as innovations have been since a very long time in the different life fields, from the innovation of using stones in manufacturing weapons and in the building to use of the nuclear power and the field of outer space. Depending on that, the definition of creation and innovation extend to include inventions, innovations, artistic creations and scientific discoveries. In the Arabic language dictionary a person has created a means **"has innovated, has originated and has formed".** [8] **Allah is the Creator of the heavens and Earth means that He created the creature in the beast form and shape.** Also, when we say that a person has invented something means that he was the first one who did that thing and innovated it.

Creation as is defined by the British encyclopedia is the ability to find a new solution for a problem, or it's new solutions and ideas according to **"Reber"**. Whereas **"Treffinger"** considers creation as one of the distinguished concepts. [57] Actually, there is no one comprehensive definition for both researchers. As a result, we can consider and summarized creation and innovation in four fields: the creative person, production, process and environment of creativity. In fact, it's difficult to reach a single definition, and it's not required to define creation because it bears all meanings as a phenomenon with many faces. This makes both discretion and innovations are possible and available. **"Torrance"** sees that the creative process includes a lot of aspects and it also includes the ability of generating a distinguished product. **"Rand"** defined creation as a serious knowledge addition to the stored knowledge. It's the recollection of thoughts and the total rebuilding as **"Gestalt"** defined it. [45, 46, 54, 55]

Innovation and creative product are considered two criteria for innovation and creation, whereas innovator as a sponsor of innovative environmental formula which are considered additional formulae that may change the situation and activate innovations.**"Treffinger"** has classified the innovation levels into four innovative elements (properties or characteristics of which they make use, methods and processes release ideas, context innovator is tackling, outputs produced by innovative, creative efforts). Innovation is based on flexible thinking, steps of modification and required tests in order to release new thing. This has confirmed what has been referred by **"Torrance"** concerning his three simulations; reality, truth and generalization, surprise wonderment during proposing solutions. Due to these different definitions, we could agree that creation of a thing not existing in reality, having an open pattern that can neither be defined by objective models, nor by old, usual information is characterized by experiment validity measurability. [20]

7.1. Innovator Creator:

He is distinguished in the emotional and cognitive field by three characteristics through three fields; "mentality with its cognitive features, motivation evolution (his capability to get rid of ordinary, intellectual

pattern, as **"Simpson"** has asserted"; in addition to self – discipline, independence, ability to remember, tend to adventure and rejection any control or authority imposed on him, as **"Clarlk"** has said. [13, 50]

7.2. Innovative Production:

It is distinguished by an extraordinary, creative and new product theoretically or practically. [17] (We find **Hassan Fathi**, in the Construction field, is an innovative construction who has launched a theory of Poor Construction with its practical and theoretical aspects)[] ; his product represents a new exploration or a creative innovation in respect of its various levels, types and backgrounds whether materially or morally. The creative product is based on the innovative study with its behavioural patterns; as**″ Mackinnon″** has indicated. The thought to lead to an original and new production, which is considered uncommon and applicable, is a process results in a new innovation; in accordance with **″Meed″** concept, therefore the innovation is defined by its ability to produce a new useful things within a very short definite time. [2, 36, 40]

7.3. An Innovative Environment:

An innovative Environment is referred to a group of helping, surrounding environmental circumstances that can create the innovation through exciting the innovative process in the innovator's mind. The creation is considered a social phenomenon having a cultured and civilized content defined by the external internal environment as well as type of interaction with its special and general conditions related to society, culture and the surrounding atmosphere. [55]

7.4. An Innovative Process:

This process passes through several phases beginning with analysing, studying and solving the problems, patterns of thought where the processing of data constituting the innovative process is based on the thought intrinsically, leading to the innovative and creative product. Starting from" **preparation**, **containment fermentation, then brightness, verification and evaluation**" represented by recognition of problem, flexibility, spontaneity and genuineness of the solution along with combining them together inside a single mold; as **"Med Nick"** has referred. [41, 45, 52, 54, 56]

8. Significance of Innovation Study:

Nowadays, along with our sights to various differences and problems that require an innovative, unusual decision, such as adopting trial and errors as a way to confront these problems has become no longer suitable, so the innovators resort to use the practical method to end up these problems. The innovative thought has a great significance that has become a necessary skill should be practiced in all life fields including architecture and urbanization field*.*

A study of creation innovation is considered one of the means that makes interaction available with problems using effective and innovative methods that make the concerned innovators,[1] such as **″Barnes"**, are calling for these new and innovative opportunities by adopting the innovative, creative approach. The institutions are very concerned with this creation Innovation as they try to find creative solutions and ideas that may contribute in coping with new circumstances and variables. Innovation may be used in taking the required decisions and solving the innovative problems and ideas of which we are in dire need. Throughout the history, we see to what extent the inventors, authors innovators have suffered. We admitted by the innovation's great significance, and without these creative innovations, the life has become primitive, monotonic with no progress that gives life entertainment, spirituality development,…. Etc. [23,44]

9. Objectives of Innovative Thought:

One of the most important objectives of the innovative thought is an excellence and development (that leads to the best production as it came with new things or add the new into old and traditional things); supposing and recognizing the problem, defining its dimensions along with proposing the innovative solutions for it; orientalism and prediction for future construction (future research is one of crucial issues that became more difficult nowadays due to informational openness that requires understanding of present, comprehension of the past, looking forward to the future and awareness of prosperity that may occur. The future, innovative outlook is not considered an imagination as it is a predicted practice; avoiding typical dependence and traditional methods of thinking. It contributes in solving the problems before they occur; therefore, the creative, innovative thinking helps take decisive decisions.[17,20]

10. Innovation Creation from Islamic Perspective:

Islam saves the human kind from backwardness and illiteracy in addition to disbelief and heathenism. Even the innovators found there a rich and suitable atmosphere for their innovation and its development. The Messenger of Allah, Prophet Mohamed Peace Be Upon Him has extracted His Companions (May Allah Be Pleased With Them); El Seddik has shown, Al – Farouk's justice in addition to Ali's boldness. We also found Man is trustee and charged with confidence, affliction and succession that require an innovative, creative ability in order to keep survival in life. Innovation is one of Allah's gifts, and the man is in dire need for innovative capability as inference of creation's evidences to Allah is considered an evocation to the innovative efforts and energies. The concept of innovation is a special concept in its dogmatic dimensions as Islam is calling for contemplation and appreciation. Development of innovation is the aim behind calling for stabilizing faith (Iman), and Man's welfare.[19, 20, 21]

11. Phases of Innovation Process and Theories of creation innovation:

Innovation is a process related to thinking ending with a new product. As a result of different opinions towards (creative, innovative process), the authors have formulated and classified the process into four phases; one of which is the model of **"Wallas"** which is considered the oldest theory in preparation and readiness, containment contemplation emergence of the problem, then brightness inspiration innovation; finally came verification confirmation and evidence. Phase of preparation defines the problem with all its respects. As a preparation for a solution, adopting containment and fermentation after trying the disappointed methods in order to reach a wonderful solution that will be clear to the innovator's mind. Imagination shall be active; as **"Huwaidy"** said, whereas inspiration brightness came to bring out the idea suddenly having an idea of a solution to the innovation; which is known as **"El – Eureka"** experience. [5, 58]

At this moment, the innovative idea is brought out. Ending by verification, confirmation or reconsideration, which is considered among finishing phase putting the innovative work in its final form. Innovation process happens within sequential steps. It occurs easily as an innovator spends very long or short time in reviewing the information and preparing the innovation research; so the innovative process is considered an interdependent that has been classified only for the purpose of study. It has been measured by the final product starting from the seed put in the beginnings, then comes fermentation as the idea emerges from time to time till it reaches to the intellectual inspiration; and finally the idea becomes completely clear in innovator's mind and thought. The innovative process ends by verification of the idea emerging firstly in the form of motivated processes; inspection points preparation, second and third represented by anxiety, relaxation and clarity of ideas; then comes the fourth embodied in implementation, evaluation modification.... Etc.[30] While**"Rossman"** has classified the phases into observation, analyzing, deletion of all information then comes formulation; analyzing, checking the emergence of idea formulation of thought to reach finally to the promising solution. This is confirmed by **"Osborn"** as he has divided the innovative process into three phases; starting from defining the problem, preparation, finding developing the intellectual alternatives in order to find a solution, evaluation and choosing the final solution. [43, 49]

11.1. Theories of creation Innovation:

There are several different theories explaining the innovation process; each is dealing with creative innovation within different levels; taking into consideration its trends principles. We found **"Correlative Theory"** is embodied in correlative, constitutional ability by using a new, innovative structural method by which the mental state is changed into a correlated group having similar characteristics, called by **"Corresponding Thinking"** which is one of the basics of the creative process, so the correlative links constitute several innovative processes. Consequences of the innovative process connect with the experience, where it can be formulated in new forms through trial and errors. **"Thorndike"** is considered one of the supporters of this creative, innovative, correlated intellectual trend caused by a relation between a response a motive; whereas **"Maltzman Mednick"** are responsible for this tendency. While **"Gestalt Theory"** is concerned about the form or the whole depending on insight occurring inside the mind in order to reformulate reorganize as a way to find a solution to the difficult problems. This theory focuses on cognitive, intellectual and creative innovation represented by observation of components relations of the scope; then insight method comes suddenly as an outlet to the problem. This theory is connected with contemplation as a creative and innovative function motivated by the mental and cognitive process unintentionally; **"Kohler, Kaffka, Wertheimer"** support this theory strongly. Whereas **"psychological analysis theory"** explains the innovation as to the superior concept**,** having several similar points where it tries to use the psychological dynamics so as to interpret the creative, innovative process. However, **"Behavioural Theory"** stipulates that the creative, innovative thought is equal to the intellectual enhancement; so the thought began to develop continuously avoiding decay, depreciation and vanishing. The relationship between the response and motives is still existing according to the basic postulates adopted by innovators. [31] Finally,**"Human theory"** focuses on the universe of the human nature, including means of warm communication affected by confidence and emotion.[48] It has been sponsored by **"Faroam, Karl, Mostaks"** who have appreciated the personnel's ability to innovate, and believed that the innovative energies and abilities can be matured if there is a social atmosphere free of suppression stress. [20]

In sum, all theories consider the constructive creation and innovation as mental habits accumulated by the relationship between the response and motive in order to reach the required enhancement supported by many effects to achieve the creative, innovative thought. [*]

12. Factors affecting on 25th January Revolution, its consequences on the formulation of the innovative thought, innovators and creative obstruction:

There are many factors contribute in developing and upgrading the productive, innovative abilities; these factors can be classified into self environmental factors. **The self factors** represented by the biological building as the creative innovator is characterized by mental abilities and qualities (great innovative ones), feeling of security and freedom (which is considered an essential side in his character; inspiring him to innovate ad create), accomplishment of self- concept (by imposing many questions for

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himself, defining the desired targets; this makes matters more understandable), the ability to analyze, disassemble and compose (that means the ability to analyze the thing into its initial elements and components; then composing these things in order to be integrated and comprehensive; this means the ability to create, innovate, compose and evaluate. Therefore, the creative, innovative thought can recognize the problem, its remarks and necessary information. It can also verify the consequences of this problem as the innovator finally can get out the scope of logic to the world of irrational creation innovation. **The environmental factors affected on innovation creation** are embodied in the family with the meaning of harmony, love and friendliness, academic atmosphere with its communication relations and effective development, community that inspires the innovators with trust, security and motivation. Therefore, innovation is produced as a result of an interaction between individual' personality and his social surroundings where he acquires his experience and freedom of thought.

There are also **factors undermining the creative innovation**; which are embodied in the personal aspect, such as lack of confidence, over enthusiasm, usual and routine thinking, arrogance, rashness and depending on dictation knowledge not on making use of skills. Obstacles of innovation in our Egyptian society after the 25th January Revolution embodied in many negative, cultural remnants, economic decline, lack of safety security, traditional orientation, negativism of media, disregarding the innovators; youth and children, shortage of libraries and fear of being failed. [*] There are cognitive obstacles related to person's recognition of the problem. [4] Defining the problem hardly, rashness, absence of motives, commitment to the familiarity, choosing the unsuitable means and lack of confidence. [28] There is a list including more than 25 obstacles; cognitive, emotional, cultural, environmental, intellectual and expressions; as **"Hicks"** has indicated. However, **"Campbell"** has believed that these obstacles are confined to fear, bradyphrenia, having no desire to influence on others, not tackling the maters seriously. [11, 20, 27]

13. Creative, innovative thinking: its elements abilities:

It means the skills constituting the author, innovator; that have been classified by many researches and writings into several convergent or divergent intellectual abilities as to society, evaluative abilities (before, during, after the practice), discrimination and intelligence. One of the most important abilities that affect on many fields is **Fluency** that means the ability to produce, formulate new uses and ideas, generate several alternative ideas (due to the response to any specific provocation) and release these ideas quickly and easily due to innovator's previous experience. Fluency of ideas association (connection) that produces many expressions, or **fluency of expressions** that is a crucial aspect in the **constructive innovation**, which means the ability to release and generate many creative, innovative ideas to solve a specific problem. Fluency of expression and form by presenting updates and additions to the original form of drawings. **Flexibility** of generating updated, innovative, unexpected ideas; using all aspects of the problem adopting two basic forms of flexibility: spontaneous flexibility (related to a specific situation), the other is related to flexibility of adaptability in order to confront a situation. **Originality** means the creative, innovative ideas that should be new and original different from other similar ideas. [30,32] **Analyzing** all the elements separately in order to know all details of the formation to be reformulated. **Composition** means forming components, elements and relations in an integrated formula, adding new touches to this formation. **Commitment to tendency** by continuing the innovation effort in order to change the innovative ideas for the product released within the same course from being a seed to a big tree.

Focused on treatment of a problem within a specific time. **Sensitivity to problems** by knowing the contrary or the default, and imposing the suitable questions concerning the problem. **Defining the problem** by specifying it, formulating and defining its dimensions. **Evaluation** by choosing the best innovative ideas. **Prediction** by expecting the future solutions and results. **Logic thinking** in order to recognize the factors affecting on the problem, **Details** mean enrichment of the innovative solutions by adding details and touches to be more integrated and excited. In addition to **synthesis** and **abstraction** (to combine the two forms or more and produce a unique content). Suspension to postpone completion of the process in order to have innovative ideas; according to what has been added by **"Torrance"**. [15, 48, 54, 55]

14. Factors affecting on the creative, innovative thinking its abilities:

These factors can be classified into individual factors such as the psychological security, open, great experience, self- evaluation and manipulation elements concepts by using different forms and colours; environmental and cultural factors vary according to the customs and traditions; visual factors by using expressional senses when the innovator is unable to relate and release his ideas; intellectual factors as his ideas is not characterized by flexibility; cognitive factors by using an emotional, timely, routine…. Etc. outlook. Imagination enriches the innovation creation, asserting on innovative, creative relaxation. [48]

15. Forms of innovation creation:

Due to the several cultural differences and scientific purposes, there are many forms of innovation and creativity with their general fields. According to the different backgrounds, we found a single subject in the architecture having many variable dimensions in accordance with the adopted approaches; that make a person unable to create or innovate for long periods. The innovator is experiencing a sudden mutation

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similar to **"inspiration"** which makes him unique and different from other people. Artistic innovation is different from a scientific one. However, architecture is considered the art gathering between two kinds of innovation creation; reflected in the content external form as well.

Artistic innovation expresses the innovator's internal state reflected in external, material product, whether (sculpture, music, narration, …. Etc.), while the scientific innovation works as an agent between external needs and targets in order to release a new thing, treating a specific defect such as in engineering, physics, …. Etc. While **Architecture** is characterized by a great innovation creation; that can reflect the innovator's character and the external problems as well; this thing may be represented in architecture and theatre's writings. The rules of innovation have important characteristics required not only for preparation of innovative theory, but also for developing talents depended mainly on its trends.[48] **"Cattell"** has reviewed the innovator's characteristics in natural and human sciences; as he found them distinguished by intelligence, rejection of traditions, emotional balance, maturity, quietness and tendency to contemplate.[12] **"Roe"** has added sobriety, good manners, having a great ability to work produce and self-confidence. [47] **"Cattell Butcher"** has indicated that the scientific innovator is characterized by being introvert and skeptical. **"Makinon"** has added the characteristics of mental flexibility, originality, activeness and unselfishness to the scientific innovator. [20, 36]

16. Artistic Innovation:

The innovator distinguishes between four requirements of the artistic and constructional work; which are formed, code, behaviour and meaning. The innovator has a greater level of mental ability, fluency, sensitivity to problems, originality, flexibility and sensation; as they tackle many branches of art, essential issues, philosophy aesthetic, valuable trends. [9] The architectural, artistic innovators are characterized by being very intelligent, imaginative. They have great interests, an ability to find problems and reveal their feelings to others. [12]

We can conclude that all innovative fields, however different, have **a similar point in Architecture** which gathers between the artistic and scientific innovation in order to reach an original, new accomplishment having psychological value to release a material product can be applied and measured. Therefore, we are now discussing how to measure innovation. [*]

17. Innovation Measurement:

Measurement has a fundamental role as any existing thing in the world must be measurable even though the sciences as well as their methods of innovation. Specialists put means of measurement to recognize the innovators. (This measurement must be applied in the field of architectural engineering). Studies have found that innovators can be discovered or measured by intelligence tests; there are other variable tests help him find a solution for the problem, depending on the divergent thinking (branched). [48] **"There are several, variable tools… measurement of innovation using tests for mental factors…. Innovative thinking…. Export standards…. Personality…. Academic qualifications or capacity…. Curriculum vitae…. Innovative, creative activity... other standards and tests"** [20] Traditional Intelligence Test is a means of prediction for academic intelligence, but it is not a means for measuring creativity and innovation. Having the ability of creativity, imagination, innovation, and reaching for new ideas comes from tests of intelligence concept. [51] So, if we want to measure creativity and innovation, we shall have an accuracy and awareness because we have to identify the goal of the measurement process. The scientific approach is the followed way in the world these days. [30]

He was studying, during his bachelor, **"The Scientific Approach to Thinking"** as he was on the faculty of engineering at Cairo university in 1991. [] The field of creativity is mainly concerned with interpreting the power which governs the mind when it exceeds discoveries and creative ideas. There is no only one way or one test, [39] for estimating quantity differences of strength and weakness and putting a number of standards through which turning to quantitative description'll be possible. Most of measurement methods have used one of these three ways: **Objective Analysis** (which includes imitation of actual quality, determination of methodology to achieve efficiency), **Issuing Autonomy** (through a study for autonomies and creative experience of the final product), and finally using **Psychological Tests for Creativity** (this method has divided lists into personality, biographies of creative people, and their creative behaviour). All method of measurement shall be suitable for the lifetime. One of the examples of measurements is a creative thinking test in performance for "**Tvrans**" "**Gelevord, Wallach Kogan Jetzel Jackson"** test**.**

We will review, quickly, the test of "**Wallach Kogan"** which is composed of two batteries: the verbal battery that includes usages, alternative and similar activities. The second is pictorial batt that includes meanings of shapes and lines through which it will be interpreted. For **"Gelevord"** test, it measures, the scope of the creative abilities of thinking by analyzing it to many factors starting from the sensitivity of problems, energy, flexibility, originality, analysis, and structure,.... Etc to renewability. This measurement creates cubes that have three sides include contents, processes and results and it has developed until it reaches to 180 cells. [25, 59]

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Measurements, as mentioned above, are either **verbal** to excite imagination and skill as it gives the person story and list of names, for example, in the time of its common use or a story which has sad addresses or an extraordinary situation out of which he needs expected results. While **the formal** measurements are concerned with fantasizing skills using formal cognitive stimulants and variations of architectural creativity and innovation and shape, sculpture and drawing which are considered to be its physical result. Examples of such tests are tests of completing shapes or images.

We see the necessity of activating this test for students to join department of architecture, or the test of designing a form or through mazes and questionnaires, to overcome the traditional intellectual vision of thinking. [8] After that, we find that several tests which based on the creative process. Creative thinking measures to what extent it relates to the branched creative thinking such as **"Torrance"** dynamic thinking which resulting from originality, flexibility and the relationship, including three activities which are: **Formation** (of image or shape), **Complement** (of shape or image to give an attractive form), **Addition** (of new shapes or ideas). It is an important matter for evaluating and estimating architectural creative and innovative person and its capability to be applicable in this department and for appointing lecturers in the "**Department of Architecture**". Both creativity and innovation are complicated and multi-faceted, faces and angles which are measured with many strategies for evaluation to describe a creative and innovative ability, searching for methods give indications and signs for verification which is considered to be a difficult matter. The innovative tests are merely an entrance of the many entrances for getting to know the creator and innovator persons but our architectural writings are still limited. [*]

18. Creative and innovative methods and how to develop and practice them creative and innovative methods and producing innovative and creative person

Nation's progress is measured by their capacity of innovation and creativity in their environment which may return with physical output on them. The matter which entails developing creative talents. A creative education is the base of Renaissance and construction of civilizations so that the developed countries are interested in it. [7] The benefit of our scientific research in our universities is mainly producing a successful young architectural creative and innovative person who does not produce a master or PhD thesis that does not have a physical result in reality. Anyone can practice creativity depending on his susceptibility. [33]

In the Department of Architecture and Arts, developing creativity is a responsibility through independent programs help in resolving problems and dilemmas within the available potentials by providing comfortable and secure atmosphere for the student from which imagination launches to generate and discuss creative thinking in brainstorming sessions as it enables him to sort out what is going on inside his mind such as unconventional thought. This process will happen by provoking him through certain situations during specific and certain period of time and through his ability of diversity and intellectual transforming from originality to modernization and scarcity. Creativity is not only innate matter, but it is also a skill like any skill must be developed and there is no one way or method but there are many ways. [*]

25th of January Revolution is mainly a thought of a creative person to get out of the conventional reality to regenerative vision, but it should have a physical result with reality leads to development in all fields. The **matter that does not happen so it leads to 30th of June Revolution for demanding a remarkable physical** impact with difference in the content. [*]

Among them are **Guiding Methods** (a creative or innovative person may sometimes face problems or pressures which may obstruct his creative results, the matter which may lead to frustrations so we have to help him to get rid of these problems. Secondly, there are **Educational Methods** (which are concerned with creative thinking in solving problems that encounter him). Thirdly, **Laboratory Methods** (which are mainly concerned with practicing individual how to generate and create ideas to resolve dilemmas and crises through a new vision designs). This happens through the model of increasing knowledge, development. We will review some of these methods quickly.

The method of **"Osborn"** which aims at employing knowledge in creative thinking to solve problems which is called **"Creative Solution of Problems".** This solution is a broad umbrella which contains many strategies, interference between functional limitations and balances in resolving problems between creative thinking and critical thinking, using both of them, the creator, the process, the path, the result, and atmosphere. Solving problems and dilemmas requires these two ways of thinking as they are integrated with each other. As for **the creative thinking** it aims at generating new relations and thereby realizes gaps, constraints and challenges with many and various possibilities. While **critical thinking** centers on analysis, development and evaluation, presenting ideas for testing the best ones and for supporting them to judge results to reach to the right and effectiveness in taking decisions.

The model of (CPS) has three components which are represented in understanding the problem (it has stages starting from finding the problem, collecting data and identifying them), generating ideas (includes reaching for a solution and accepting it) and planning for implementation. The brainstorming is

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considered to be the nearest used way in this model. For using it, you should distinguish between brainstorming and verbal chaos. Brainstorming is a process of producing and generating creative and innovative ideas and then evaluating them**. "Kattan & Bossiter"** define generating ideas of liberation and disengagement as that it is a resolution of problems that aims at enabling individuals to discuss, identifying possible alternatives and choosing the perfect ones. [20, 33] According to him, generating ideas shall be used during teaching students of the architecture department. [*]

Asserting that the lack of assessment or paying attention to the idea in the beginning, slowing down and waiting until after the completion of generating all ideas and not neglecting quantity so we will have qualitative and quantitative as the qualitative produces the quantitative one. Keeping away from criticism, making ideas sorted out in a streamline and avoiding evaluating it so as not to cause hesitation of the creative and innovative person in presenting his ideas through not criticizing any individual who is contrary to the idea of the other one with availability of freedom and liberty in thinking to unleash and reducing levels of reservation for employing the imaginative ability. Moreover, he shall be interested in quantity which helps in solving and developing thought. The stages of brainstorming are illustrating the problem, analyzing it in a session, expressing, formulating and visualizing solutions, assessment and choosing the best.

The fact that brainstorming is important for reaching to a creative and innovative architect, but it does not happen in Architecture Departments. It should not be concerned with evaluating projects and analyzing it without making, brainstorming for student to produce creative projects, but we find that most of the projects have the same routine [*]. There are other ways as **"Oterpac"** method which is based on the same methods of brainstorming, but at the group level such as **"Giedion"** which aims at uniting differences by collecting elements, ideas and different things. The problem seems to be strange and unclear and we think of it through a metaphor by making strange matters similar, making similar matters strange and in which the psychological and emotional methods are used more. [24] Moreover, it aims at connecting elements which are unrelated to each other by especially using metaphor and eloquence in measuring symmetry and acting in the systematic frame for reaching to creative and innovative solutions. As for **"Maltzman"** method, it asserts the importance of originality as a main element in forming creative process and provoking individual's feelings to do it, [17] the matter which has happened on the architecture of the post modernization period by devising from the past and formulating it in a new and modern formulation. [*]

While **"De Bono"** has made the intellectual program in which he invented the marginal thinking and making the difference between the main thinking. He has defining that in "**Cort**" program starting from "**Cort 1: cort6**" through expansion (wideness in the field of organizational awareness (of perceptual process), interacting (between thinking and others thought), creativity (focusing on creative thinking and information), implementation and action (the mind and production of creative ideas), asserting that thinking is a skill which can be learned and it must have all programs and methods to have and generate creative individual. [16,20, 38, 60]

19. Creativity of architecture in University Education:

Concerning with creativity is the main result of insufficiency of traditional learning. [34] Learning creativity becomes an important goal since half of the seventies, so educational institutions shall think of developing the ability of thinking skills for solving dilemmas and problems. Caring about creative innovation of the architectural students help them to avoid psychological problems as a result of suppression of their creativity (the task of adaption and understanding the requirements of the age is an educational task which is considered to be the responsibility of universities) to have more effective role in the society and to make development which leads to production and modernization instead of making revolutions for demanding development, modernization and increasing income. [*] Creative teaching has been defined as methods help in learning new and modern subjects in order to become able to face their problems and solving it by new and innovative ways and methods so it is not spontaneous or automatically matter as it entails founding creative and innovative environment in which innovation is an integral part.

For example, graduation project teaching methods are as in Cairo University or as it was taught by Dr.**"Bahaa Bakry"** ,may Allah forgive him, in the institute of 15th of May provided that its subject shall be any innovative idea about peace, revolution, democracy, freedom and etc. Through these different topics student can form meanings about architecture, innovating many names from the suitable projects, have the same context and interacting with them during brainstorming sessions then he reaches to the content of the suggested project for which a study will be formulated. The beginning is verbal term then turns to formal term through formulating the content, the shape and after defining its concept verbally, problems in description , analysis, creativity, innovation, evaluation and re-drafting for reaching to a final new updated and innovative idea or building which is composed of repeated unit and its elements repeated spatially to be a block reflects ,through its composition and visual formation, innovative building which can be implemented so that this unit can be repeated in the three spatial directions (x,y,z). [*]

The university plays its role in the development of creative and talented people during its executive planned programs. The best program is the one that meets the greatest needs requirements. We see, as

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did Prof. "**Hani Serag" & " Samy Serag",** in the subject of architectural design visual desigen for the first year when he was teaching it in Architecture Department in El Sherouq Academy, he was teaching the project of Dreams Villa which starts with making fictional maquette for a building then turning it to villa or building stems from imagination and innovation as it gives the debutante architectural student the opportunity to be creative, away from restrictions limitations so the student learns thinking freedom and three-dimensional thinking not a thought of two dimensions in the design once he joins the department of architecture. The matter which affects and reflected on the formation of the creative innovative architect. [*] As shown in Figure-1. There is no doubt that we have creative professor (teachers) but we lack tools, experiences and documentation of these works which our educational institutions shall borne.

Fig.1. Subject of architectural design visual desigen which teaching in Architecture Department in El Sherouq Academy.
Source:(internet)

20. The role of the curriculum in learning creativity:

Creativity and innovation will not come spontaneously, but need courses and challenge so it returns to its positive shape. The creative process does not come out of a vacuum and does not arise from nothingness as it is related to theme and material. Instead, creative process comes through re-studying which helps in the process of creating excitement, activating it and putting an individual creative studying program that contains scientific visualization and leading to creativity and innovation and keeping away from fascination. This process presents creativity related to themes and subject so it transformed from just a fact to produce material, taking into account in its curriculum, creative ability, and different abilities such as fluency, flexibility, originality, details,…. Etc as mentioned before. The creative intellectual learning is necessary, but not by teaching it as a separate, independent subject, but it must be related to all subjects, with the necessity of developing critical and creative, innovative intellectual ability also. [14, 17, 22]

Conclusion: the necessity of teaching creative thinking as an independent subject, modifying study programs away from traditional routine and the curriculum shall contain creative and intellectual skills without neglecting normative thinking. [*] As shown in Figure-2

21. Role of the architecture's teacher professor:

The teacher is the key of success and cornerstone of innovation processes in the study program. He assumes a major vital role in developing creative and innovative thinking. Innovative people are extraordinary class with special characteristics. The teacher should organize teaching process, education, technique and effective communication to develop innovative and creative thinking by escaping traditional methods and should encourage them to go forward with a creative method that is featured with caring for human, psychological, social the economic aspects of the innovative person. There is no doubt that teacher is a basic variable in the innovation process with its information revolution based on mind. He has to reward the creative innovator of a new idea that differs from others' and to encourage them develop innovation abstain from using a specific style in all subjects, issues and problems. He should provide an all fields' open minded model to his students, discover new solutions encourage maintain their thoughts.

We can see, for instance, free shaping and free drawing help innovative, creative thinking of the architect; a subject that has been decreased or even cancelled in some of our universities however it combines spirit, playing and creative thinking. It was taught via 2D and 3D drawing of tools and daily used life views in addition to interior and exterior perspectives. Now it has been updated by creative innovators to be continuous interstitial 3D drawings. Considering that innovative thinking is as different as ages and starts basically with children; it should start from the beginning of learning. Educational environment inside the

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university as well is one of the basic pillars to achieve innovative educational objectives. In architecture departments, we find it necessary to have (Caves □ Digital Studio) that students can make 3D designs □ live inside building with their thoughts interacting and get affected with □ within the building. [*]

Italian painter and photographer "**Alessandro Diddi**" has dazzled us with a collection of amazing 3D drawings which he drew by his pencil where he aimed at eye illusion to feel that you see the real shapes emerging out of the page. Actually, as the painter said: "it is not necessary to use many resources to achieve an impressive thing. All what we need is a pencil with little patience depending on ourselves to create a magical object". His drawings really indicated this. As shown in Figure-3

22. Creation □ innovation in universities, engineering faculties and architecture departments:

Developing innovation, creation □ intellectual and emotional capabilities generally and for architect, specially is included in learners' psychological education emphasizing four interactive basic features □ paths (starting with: innovator, innovation process, product and innovative field); which should be an universities' focus. Currently, their attention and a major focus is on teaching that sometimes is more than 60□ of faculty member 's time in spite that promotion criterion is scientific research without paying attention to criterion of teaching neither totally nor partially although it is a scientifically □ technically complicated activity. Transforming information is related to personal effort by faculty members.

So, scientific researches should emerge from applying teaching product. Promotion criterion should be the creative methodology of faculty member each, depending on their field. [*] This was confirmed by universities, international federation regarding professiona and training development of the faculty member.

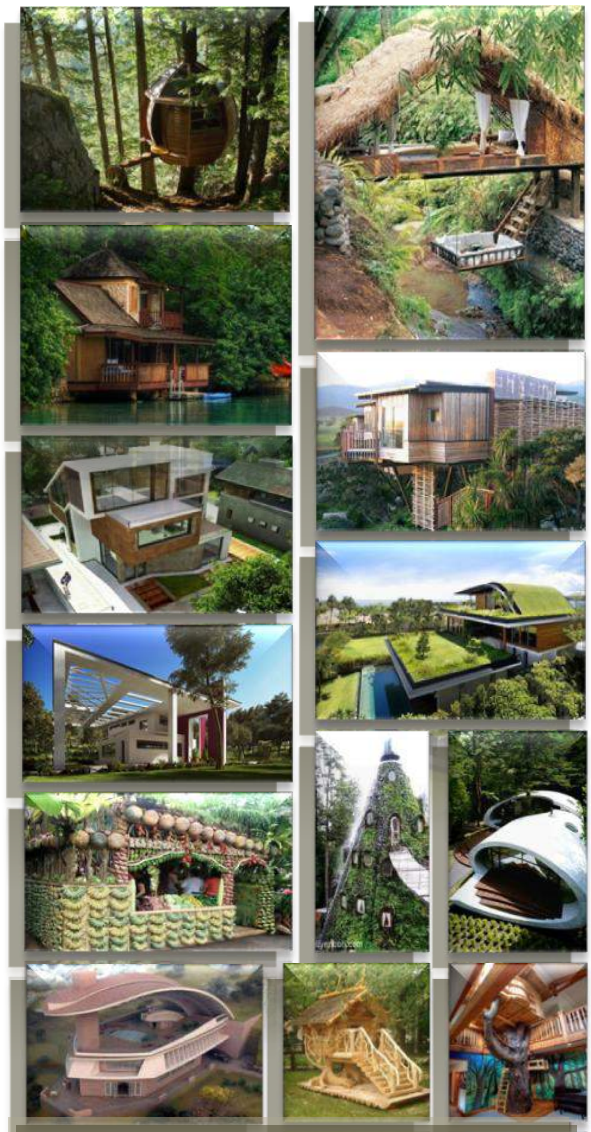

Fig.2. An example of the project of Dreams Villa. [The technique of creating innovative & creative architectural design product.]
Source:(internet)

Creative □ innovative excellence has become one of the most important objectives of educating future generation thus it became a prerequisite. The world has been divided into two unequal parts; illiterate world (knowledge importer and negative consumer) and knowledge and technology producing world. Developed countries compete to create and generate creative innovators in all fields. through concentrating on effective communication in between a student and his teacher educational process. American pioneers have developed **"Creativity Theory"** where they introduced researches to innovators' creative features and capabilities and the methodology and ways to discover them. Developing innovation process is a great extended work whose related programs are various especially teaching capabilities. [20, 29]

Fig.3. An example of 3D drawings innovative which "**Alessandro**" drew by his pencil. It is importat to teach in the visual design
Source:(internet)

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University is a symbol, origin and leadership of illuminated thinking, source of creativity, innovation and constructive critical dialogue inspiratory of originality and modernity. Creative educational teaching is a scientific dilemma in all fields. Knowing intellectual evolution of student is an important path to develop our universities' educational process through empowering professors with (skills of thinking, achievement, creativity, excellence and innovation in our educational environment commensurate with our curricula). Understanding the cornerstone of an educational process of its all different aspects. [30] So, university curricula should seek to develop a mind innovative skill, including thinking strategies skills to make innovative, creative technological evolution, especially in architectural curricula. [*] Emphasizing skills of innovation and creative thinking through two directions; first is the personal skills that help thinking, innovation the other is increasing informative and cognitive model.[18] To develop individual's capabilities and skills. University professors' creativity should be well prepared. It needs had worked to be able to shape and finalize thoughts of creative innovator students, especially in the architecture department. Where the social environment that appreciate and motivate creativity innovation. Societies either become weak or allow their members innovate and create. [1, 18]

In architecture, utopia and cosmopolitan cities…. Etc. are dreaming of reforming architects and a hope sought by architecture pioneers. Architect **"Hasan Fathy"** the dead sought The Poor Architecture (we prefer to call it Architecture for People as there is no architecture for the poor another for the rich) where we found he creates and found cosmopolitan space concept instead of materialistic one. We could see the associate professor **"Wafeek Ibrahim"** writing about residence, future of coming generations, re-forming facility distribution of houses and event and time architecture. Professor **"Farouq Al Abraqe**" wrote about the womb residence that stretches and shrinks…. Etc. of architectures who try to create and innovate. [*]

Changing numbers of faculty members and its relation to teaching institutions and educational authority that the architect, teacher should have features.[35] His personal characteristics include (understanding, acceptance, respect, strong personality, problem sensitivity, open ideas, feeling educational responsibility, developing his programs, flexibility, appreciating fiction and creativity and triggering intellectual processes and appreciates their differences). In globalization, information openness and cosmopolitan world, universities are a place to develop intellect, talent and innovation to cope with international development and form their future vision. In architect we can see the emergence of cosmopolitan city and converting materialistic space into cosmopolitan and how does it contribute to solving problems and crises of a materialistic city which is a creative idea that changed residual and architectural concepts in designing spaces. [*]

The cognitive solidarity of fields and liberty to take academic decision are one of the most important Islamic values. Developing university architectural education relates to how professors adopt develops innovative creativity of their students this effort is taken into account when promoting them, i.e. to be promoted as a professor, he should invent and innovative style of teaching and learning, each in his discipline that the student becomes more positive and creative.

It is not possible to live with ancient thoughts in a modern age. We should innovate and developments in the context of our ruling legal controls taken from Qur`an and prophet's traditions so that our university education become characterized by flexibility and information sufficiency and to confirm that most of our universities are places to produce innovators and creative persons along with providing proper finance to them. We emphasize that academic work should be the major attention of university professors by improving their financial positions the matter that requires changing scientific structures of departments and having the administrative head of department separate from the scientific head of the department by his department administration. Administrative role would be fulfilling the faculty member's requirements, whereas scientific role is to urge forming innovative programs [*]. Faculty member's hours should also be distributed among education, scientific supervision, entrepreneurship, consultant jobs, management and etc. along with providing a better life for them as mentioned above. Innovative teacher as per **"Torrance"** is [54, 55]***"Someone that is convinced with innovative thinking, believes in research and digging knowledge, interested in individual differences and liberty, doesn't deal cruelly with his student's and don't mock ideas they introduce"***

Actually, universities need educational, innovative programs and to provide a new form of educational process leadership. Constructive difference, directions should be supported, accepting showing shortage and mistakes aspects in starting work, avoiding tough criticism, developing skills, taking opportunities, accepting and respecting new ideas, providing culture media, developing emotional features which develop innovation and creativity and avoiding imposing a specific opinion or model should be encouraged as well as providing needed resources and possibilities to carry out innovative ideas.

23. Application Study of the vision emerges for the innovation of design theories development of the architectural subject:

We will review in the Applied study, how did the innovation creative learning teaching emerge for the subject of architectural design and development of the theories of architecture as a practical,

* Researcher criticism

illustrative and critic vision of conceptual thought of teaching, pointing out the importance of creative learning for each of the sender and the receiver to produce many of the ideas and translation of the creative. As an entry point for creativity in architectural teaching, as an effective means for teaching. It helps to save the creativity through its visual representation of the architectural thought with its formation features in an easy and clear manner without restricting the mind and creativity a stimulation for creative thinking in branched teaching, without which it is difficult to formulate creative perceptions of the conceptual design.

The study suggests an individual vision from researcher about topics in design subject includes some materials such as:

- The artistic innovation in the daily life. As shown in Figure-4.
- The thought of the optical (vision) illusion. As shown in Figure-5.
- The creator and visual perception and deception. As shown in Figure-6.
- The external formation thought for innovative projects, which compatible with nature.As shown in Figure-7
- The external formation thought of innovative projects for the dreams of the house or building and the bezel agreement elements form with nature. As shown in Figure-8.
- The thought of creativity and innovation of the architecture details and construction. As shown in Figure-9.
- How to build the creative thought tactics and methods of architectural teaching. As shown in Figure-10.
- The thought illustrates the creative, innovative agree form elements using the unit as a repetitive form using numerical ratios and the modular system to design the building. As shown in Figure-11,12
- The external formation thought of innovative projects to agree shaped elements.
- The thought illustrates the creative, innovative by using A blob as many things, really, Creativity.
- The thought illustrates the creative by using model made from paper cardboard. As shown in Figure-11

Fig.4. An example of the artistic innovation in the daily life.
Source:(internet)

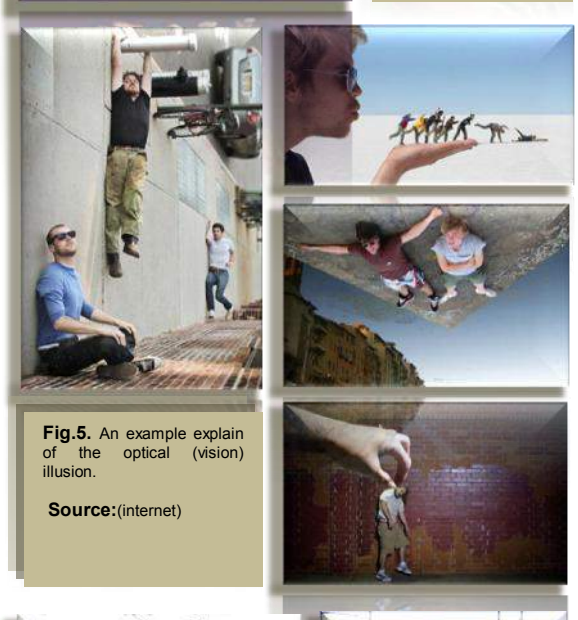

Fig.5. An example explain of the optical (vision) illusion.

Source:(internet)

Fig.6. An example of the project explain the creator and visual perception and deception.
Source:(internet)

Fig.7. An example explain of The external formation thought for innovative projects, which compatible with nature.
Source:(internet)

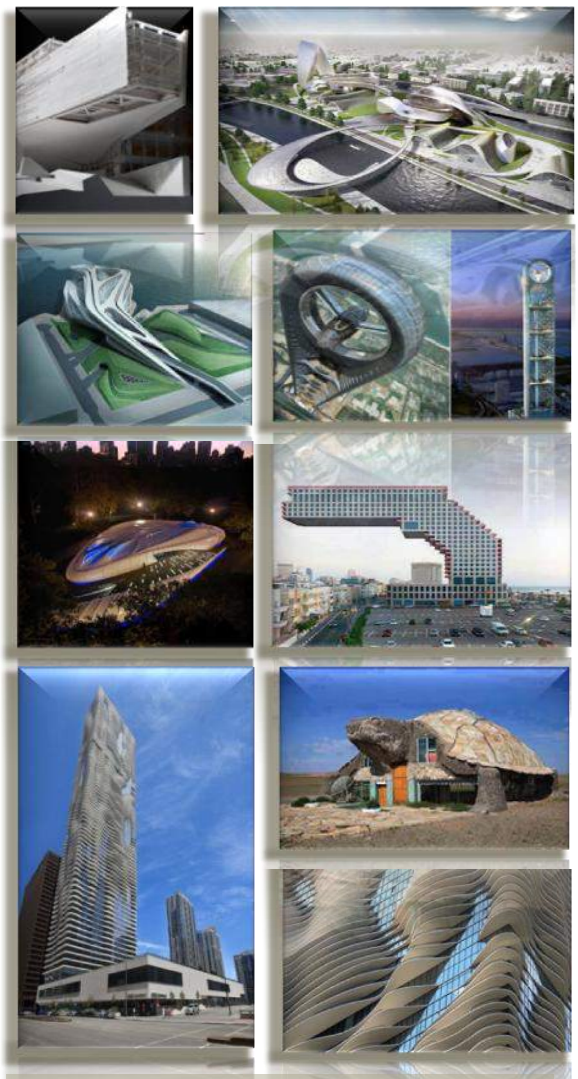

Fig.8. An example explain of The external formation thought of innovative projects for the dreams of house or building and the bezel agreement elements form with nature. **Source:**(internet)

Fig.9. An example of the creativity and innovation of the architecture details and construction.
Source:(internet)

Fig.10. An example explain of How to build the creative thought tactics methods of architectural teaching.
Source:(internet)

Fig.11. An example of the teaching of thought illustrates the creative innovative agree form elements using the unit as a repetitive form using numerical ratios and the modular system to design the building.
Source:(internet)

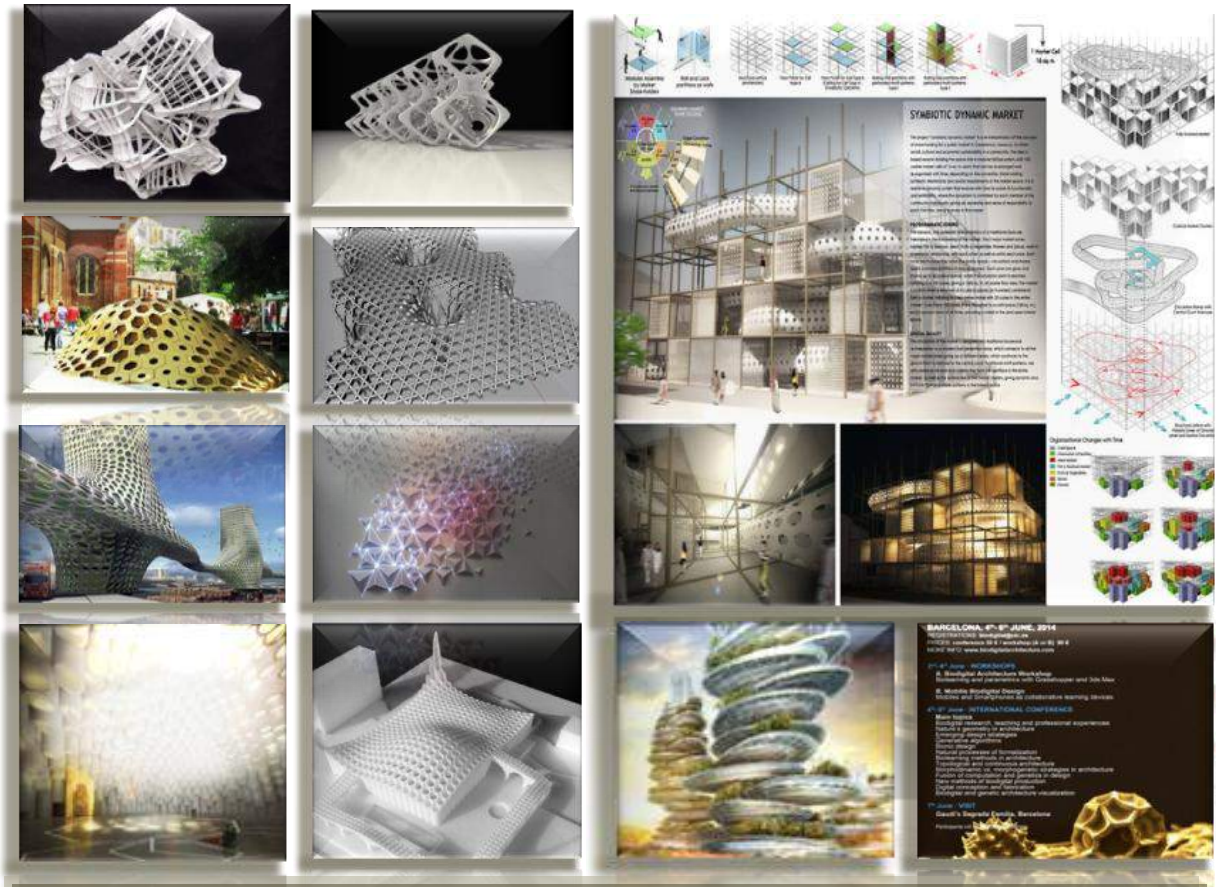

Fig.12. An example of the project of thought illustrates the creative innovative agree form elements using the unit as a repetitive form using numerical ratios and the modular system to design the building. **Source:**(internet)

23. 1. Example for How to teach make the innovation, creativity simulation in Dream house design:

For Making the innovation creativity in Dream house design, it requires many governing rules. We talk about the vision of the innovation creativity simulation in Dream house design as a example for architectural creativity innovation. Which could we return to tradition built environment with the using tools for architectural creativity Could we learn Tradition, creativity, innovation with new technologies (technique of design house) to mix between traditional and modern theory of architectural design house by using a dream house concept

The study raises a question regarding the future vision, is it possible to use method of learning teaching in the future to achieve the creativity and architectural invention, especially by using programs of learning In the era of informational openness, an era when knowledge is changing and moving quickly, to keep pace with this development more efficient and in a better form, you need a variety of strategies to identify, retrieve, clarify manage knowledge and information. A dream house is one of the best methods that have proved their usefulness. Simple in its way, strongly in its effectiveness and organizing ideas through which that leads to creativity. It is methods leading to the technical creativity architectural innovation of design house

Reality: dream house is extremely effective methods that helps us of architectural creativity. It is a creative technique that can play an important role in creative processes in the architectural creativity process.

Fig.13. An example Explain A blob is a many things, really, Creativity. **Source:**(internet)

23.1.1. The blob:

A blob is a many things, really, Creativity Starting with a monstrous creature and a thing everyone owns in their homes. If there are many blobs. It could be These bubbles are the work of Philippe Parreno. As shown in Figure-13

23.1.2. The creative house with whistles spectacular form:

The creative house exciting as a model designed by **"Amanda Levete"** is a unique-shaped formation of the referee whistles a house. It is a very unique model rarely seen in the form of existing homes in general. It is located in Dublin, Ireland, expressing ideas designed to centre the attention of passing in front of the front. Roof covering shows distinct aesthetic innovation and the evolution of his style patio creative attractor featured. As shown in Figure-14

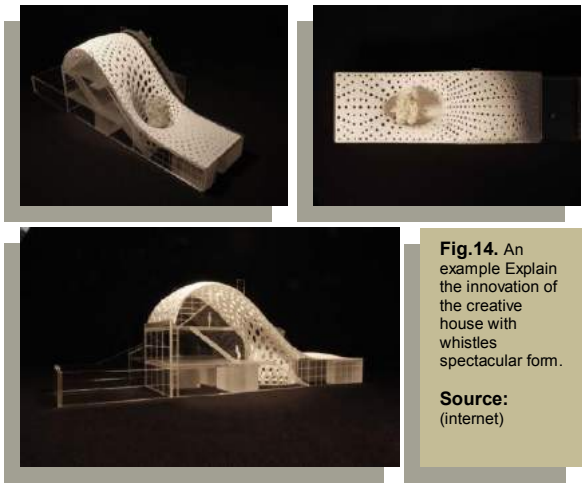

Fig.14. An example Explain the innovation of the creative house with whistles spectacular form.

Source: (internet)

23.1.3. Creative nature tree house private, relaxing gateway in backyard:

Natural tree house for relaxing in the backyard the gate was designed by "**Rockefeller Partners**" Architects. The house made from trees that blend with the nature. The walls and floors made of wood the basis of the house a bit higher and the bonding structure with a tree. The house has an internal space and a very comfortable room made of wood and a place to rest long enough distance to work rear courtyard. The house has an amazing landscape and design of nature is the basis concept of design house. As shown in Figure-15

Fig.15. An example Explain Creative nature tree house private relaxing gateway in backyard. **Source:**(internet)

23.1.4. Extreme home architecture with a fantastic reverse:

The shape of the house seems as that it is inverse upside down after a constructive. The form makes the viewer sees his creativity and wants to visit it. It may be in accordance with the purpose of the expression of things, facts inverse or deception in the optical image and concept and illustrates to the viewer that the figure does not mean that the real content of the way of life inside it. As shown in Figure-16

23.1.5. Bottle House:

Bottle house is creativity and innovation when creator [architect or people] come up with innovative ideas and then put them to life. It's not the first only bottle house, but there aren't many of them. It is a creative art work. As shown in Figure-17

Fig.16. An example explain the innovation of bottle house. **Source:**(internet)

Fig.16. An example explain the innovation of extreme home architecture with a fantastic reverse. **Source:**(internet)

23.1.6. Dome of house:

The Styrofoam dome home is the innovation home. "It is highly resistant for typhoons , earthquakes and the walls are treated with a flame retardant and no toxic fumes in a fire". As shown in Figure-18

23.1.7. Nautilus House:

The form looks like a shell. It's designed by **"Senosiain Arquitectos"** The snail house looks natural both inside and outside. The rooms are located in upward spiral…." As shown in Figure-19

23.1.8. Paper tea house:

Designed by the architect **"Shigeru Ban"**. It's an innovation house made from paper and cardboard and it's constructed mainly from square paper tubes and it looks pretty sturdy. It is a very good method to teach learning design of space, formation and study of construction. As shown in Figure-20

23.1.9. Mobile hotel for fun staying:

It is designed by architects "**Sabina Lang and Daniel Baumann**". It is consists of one room with a luxurious bath, double bed and a lounge. Realty it is explained how to use a simple unit of design. As shown in Figure-21

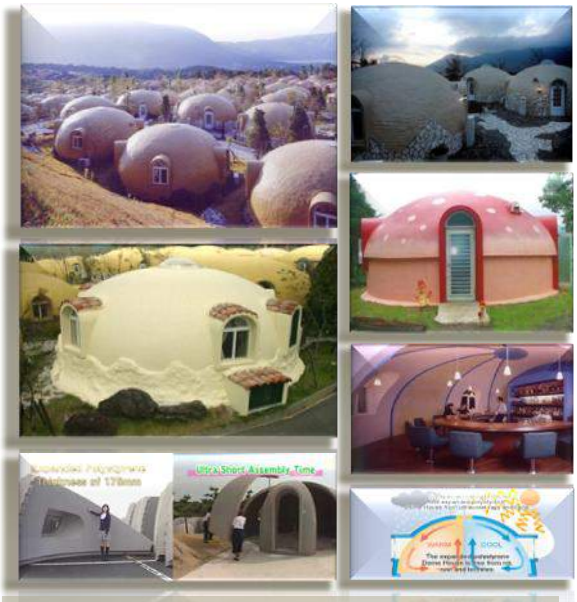

Fig.18. An example explain the innovation and creativity of dome house
Source:(internet)

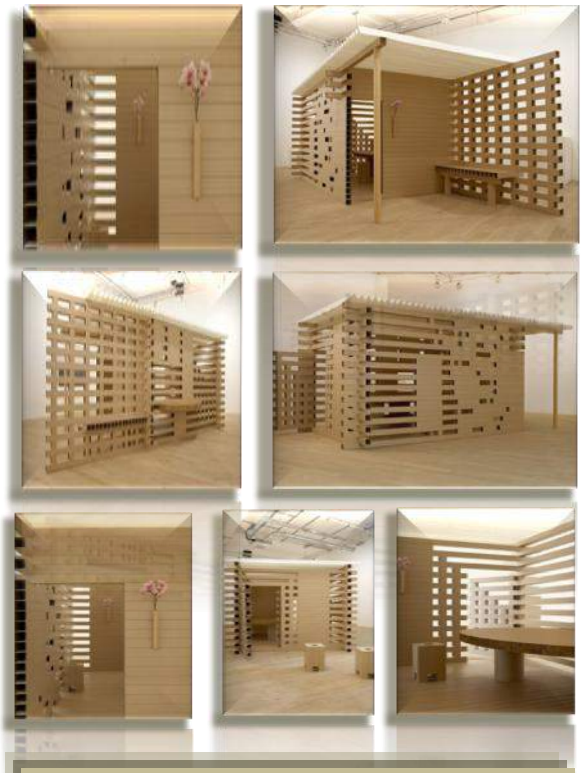

Fig.20. An example explain the innovation in paper tea house.
Source:(internet)

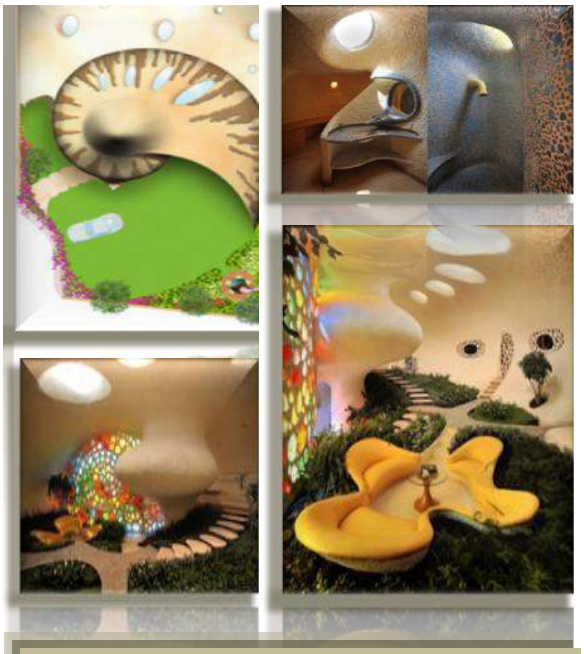

Fig.19. An example explain the innovation of nautilus house form looks like a shell. **Source:**(internet)

Fig.21. An example explain creativity mobile hotel for fun staying. **Source:**(internet)

24. Summary Conclusion, relation of innovation creativity to teaching learning:

It is possible now to answer the question asked in the introduction of research study whose major hubs constitutes: is it possible to produce an innovative and creative architect combines romanticism and intellectual or not Is innovation a talent, learning or a sophisticated talent and discovered by learning

- Possibility to learn and train on creativity, according to architect's readiness and what is imposed to him by different intellectual nature and culture.
- Innovation and creativity of architectural production can't be intellectual with no romanticism of feelings. It includes both of them. Architectural product is produced when both are mixed in one pot as there is no form with no essence and no essence with no expressive form. Romanticism and intellectually should be mixed which is a thing exists all over the ages and it differs over times, according to difference of thinking in different time (time dimension) and place (place dimension) and difference of effects, environment and self -nature of viewer of its different aspects; social, cultural, religious, economic, politic…. Etc.
- Innovation and creativity in architectural product express conformity of shape (aesthetically) to an essence that expresses the spirit (romanticism) to fulfil materialistic and spiritual needs of human in order to achieve an architectural shape expresses himself and conforms to its establishment time.
- Study cleared importance of having innovation and creativity as independent topics and subjects, teaching them within all subjects, modifying traditional routine programs and including hybrid creative thinking in curricula, whether for relation of the plan with its spaces and essence expressed by these spaces and external mass.
- A necessity that an architect should develop their romantic talent in their feelings and intellectual talent in engineering ratios to innovate new and developed architectural forms expressing an essence via their form and conforms to time spirit.
- Importance to make brainstorming sessions for students in the beginning of design projects, teaching theories and architectural thinking history and development and teaching them the basics of architectural criticism.
- Any architectural product includes contradictions and complexities. The architect should attempt to reach innovative new cosmopolitan value system that achieves objectivity, subjectivity aestheticism.
- The importance of free shaping and drawing as they help innovation and creative thinking.
- Study cleared importance of a university professor of architect for teaching and developing and encouraging innovative and creative thinking to students and the necessity to be given a wide area to express, uphold and evaluate their thoughts.
- All creative programs and creative styles should integrate to generate an innovative architect starting from educational, treatment, guiding aspect reaching practical and theoretical aspects.

25. Recommendations:

Study recommends the need and necessity to study and train innovation, creativity and different creative ideas; intuitive, intellectual or romantic along with combining them to legal controlling rules, customs, traditions and values of modern societies in the time of information openness, to achieve innovated and new architectural product to shape and form a modern built environment conforming to our traditional heritage, and our values to achieve innovative, neutral and un-disturbing architecture as we form our built buildings and environment and they, in turn, shape our souls which is reflected on our behaviors.

- Necessity to define and develop architecture programs to activate an ability of innovative, creative and hybrid thinking along with overcoming surrounding hindering effects.
- Necessity to focus on developing architecture planner's innovative, creative aspect that he can form and generate new modern ideas.
- Activating making, brainstorming sessions at the start of design projects to get modern, innovative and creative ideas and to give innovator liberty to imagine safely comfortably then he brings hybrid non-traditional ideas inside him out without being held accountable for what he says in this session.
- There should be constitutional immunity for creative and innovators so that they can generate innovative non-traditional ideas to solve issues. That grants them the ability to have thinking, diversity from originality to rareness, renovation and going beyond limits.
- Developing free shaping and drawing to become with interstitial dimension as mentioned before in research as they develop imagination, innovation and creativity.
- Preparing executive programs supporting innovators and creators within an architecture departments' educational program with the necessity to make architectural innovative and creative thinking, independent topics in addition to teaching it within subjects' programs and modifying their programs to conform to hybrid creative thinking.

26. Future Vision of innovation creativity in the learning of architecture design:

We must be making the creativity workshop to development education of architecture to be the all subjects which teaching in its programs included about innovation creativity as the basis thing because it will help us become more creative in our personal and professional life. The innovation creativity training

provide us and uses the tools of creative drawing, art, design, and guided visualization, and change the new way to look at our life.

What will we learn in architecture design creativity The creativity workshop, learn practical techniques to stimulate our imagination and innovative thinking. Explore the process of architectural design creativity innovation, rather than simply focusing on the architecture project as a product without new concept and innovation for solving the design problem and requirement for daily life in our contemporary art the age of globalization and information.

- Dream, mobile, dome of a home, bottle, paper of house, house with whistles, and the blob are an innovative technique of design learning teaching. Creating the teaching of thought the innovative agree form elements using the unit as a repetitive form using numerical ratios and the modular system to design the building in architectural creativity allows flow train of thoughts and facilitates adding new, creative ideas. Applying all this method for managing knowledge and information in architectural creativity by using programs of design is more flexible than the traditional method.
- The study produced the innovation and creativity of design for only one of the architectural education subjects and still there are many subjects that need to be applied to future studies.
- The study produced new addition, That is linked between the study of innovation creativity and architectural creativity in educational material for the architectural design.

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The rebirth of the urban life made by emptiness

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Abstract
"The city, the territory became immense collections of objects paratactically pushed together and silent (...) The space that is" between things ", between objects and subjects of their next, between my house and that of my neighbor, in my and their home, in their and my school, between them and my office (...) has become "void" because it lacks a recognizable role.” [1] The opportunity to develop our cities could be given by the " urban vacuum", that should be perceived as a public multifunctional space, as a place of aggregation and growth of social life. This is possible through the insertion into the urban fabric of landscape elements such as water and the green, though the use of recreational architectures that use the game to create new forms of relationship. Urbanistically talking voids are squares, parks, streets, the interstices unbuilt or any other open space, regardless of the space. The project of the vacuum is to project what lies between things, of what usually is in the background and does not emerge. Since vacuum is possible to grasp ad appreciate a new space made of discontinuity, of the prevalence of empty on full. Today the urban space is made of "landscape" as it builds with its materials: the unbuilt space. The cities must be viable, that is provided with public spaces that stimulate human relationships. At the center of the urban design will be then the person and the best units for the city is and will always remain a human scale.[1]

Keywords: Regeneration, emptiness, industrial spaces, urban life

1.Introduction
Abandoned buildings and areas no longer in use are offered as material to develop our cities and to reinvent the spaces that are related in order to interests and possibilities of a different nature. The urban voids project is related to interests and problems of different nature and is envisioned as an opportunity to rebuild the essential meaning the structure, the architecture of urban landscapes that are altered by the "negligent" urbanization of the last fifty years. Since the understanding of the new roles that they can play in the structure of our cities, from their position and relationships, we can build or rebuild among what is generally in the background and doesn't appear. The vacuum, which in historic cities in most cases coincides with the square and is created through an architecture of “take off”, can be seen as a “space of the collective representation", because the man represents himself through these spaces, and then they become a monument of the community history and collective memory.[2] In the contemporary city the abandonment of public space is an expression of the arrogance of a dominant individualism. Koolhaas confirms a supposed death of public space in the post-modern city, in which the relations are no longer measured by the physical space, but through connections. (...) "Public space is dead ... the road has become residual, something purely organizational, a simple network in a connected territory.”[3] The fragments that characterize the city, could be linked through a post-project rather than suggests one ex ante. In fact, the places of the contemporary

city show in filigree their potential and the "character" of their possible transformations, we can find consolidated voids, squares, roads, boulevards and parks, which over time have retained their conformation and that, thanks to their shape, are witnesses of the morphological history of the city.

2. From localization space to dislocation space

Starting from the medieval localization space that sees opposing mainly two types of emptiness, the one of dominant centrality and the one of the outer edge, we pass to the extension space in which the void of the project, the square and the shape of the road recompose the differences among the individual architectures and they don't make it a contained space but a space which extends himself towards the landscape turning it into an integral part of the composition. Until you get to the location area where the distance is considered as relationship. The modern city extends to infinity, and the territory which can participate is infinite. The linear city of Sorya Y Mata (1882), for example, is seen as a fixed widthed and lenghted road without limit. Architecture of the void as the road becomes the synthesis image of a new ideal city that grows, and the territory which can participate seems to be unlimited and is characterized by centralized entities where the distance is the element that separates them. **(Fig.1)** The main problem is to respond to changes due to industrialization processes through the reorganization of the city, hence the distance becomes a means to govern the area of extension of the city territory. The infrastructure becomes an architecture of distance and reorganizes the space as in Koolhaas's theory that sees infrastructure as a means to create relations on regional scale; Euralille is an example, a small French town, which became the center of great speed.[4] **(Fig.2)** In the modern city buildings are raised from the ground so the division between public and private space is definitive. With rationalism, the empty space among the buildings is measured according to what was said in the Charter of Athens, as a function of their height; the goal is to democratically ensure the best possible conditions and equality among users. The space of the city, first formed by blocks of streets and squares, is now regulated by zoning, by abstract relations among volumes communicating with each other and with the surrounding landscape. For the contemporary metropolis we can speak of dispersion of urban expansion. The inability to design the vacuum demonstrates a difficulty in creating relationships able to restore a meaning to the many signs spread all over a territory getting larger and larger. The distance has become generic, stripped of all the senses of conception, an abstract measure in an increasingly different space. But "the space of the dispersion is not homogeneous or isotropic but is made of a multitude of different materials among which new relations were requiredu.[5] In the contemporary space of the dislocation, the relationships are not just represented by relations of proximity, distance, continuity, but are generated by different kinds of associative relations.[6]

3. The contemporary space

In the contemporary space of dislocation, you could use the break as a relationship to understand and study to propose new solutions. The void is no longer just an unlimited resource of the space to be filled, characterized by a succession of pure volumes under the light, it's rather a generic space among "things" different. Bernardo Secchi and Paola Vigano with their "Landscape Urbanism" say that only the soil project can involve the city in its entirety: "the empty project is a project of what is among the things, that are in the background and does not emerge. " [7]

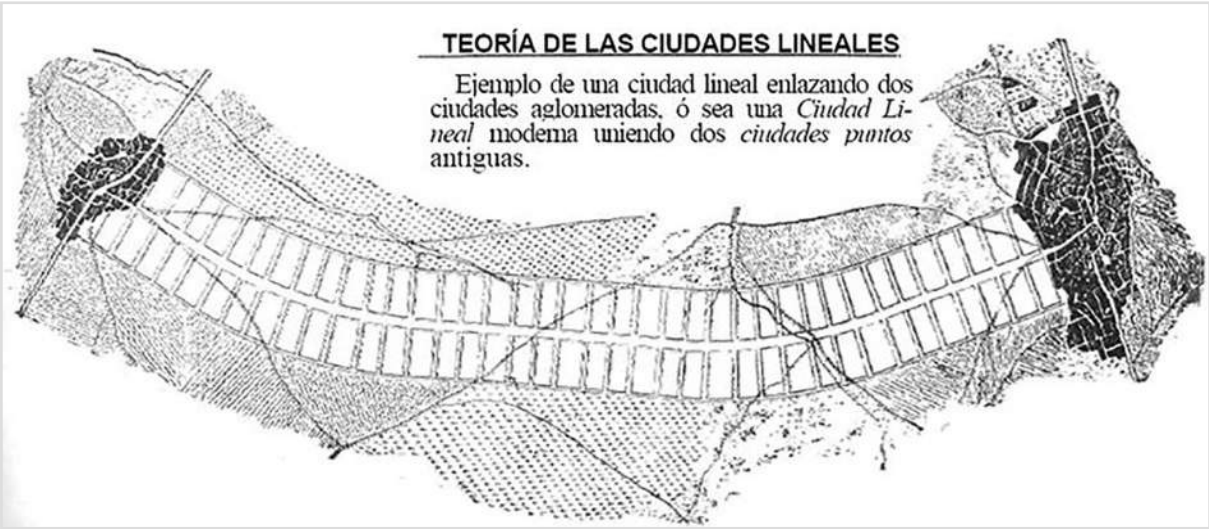

Fig.1: The linear city of Sorya Y Mata (1882)

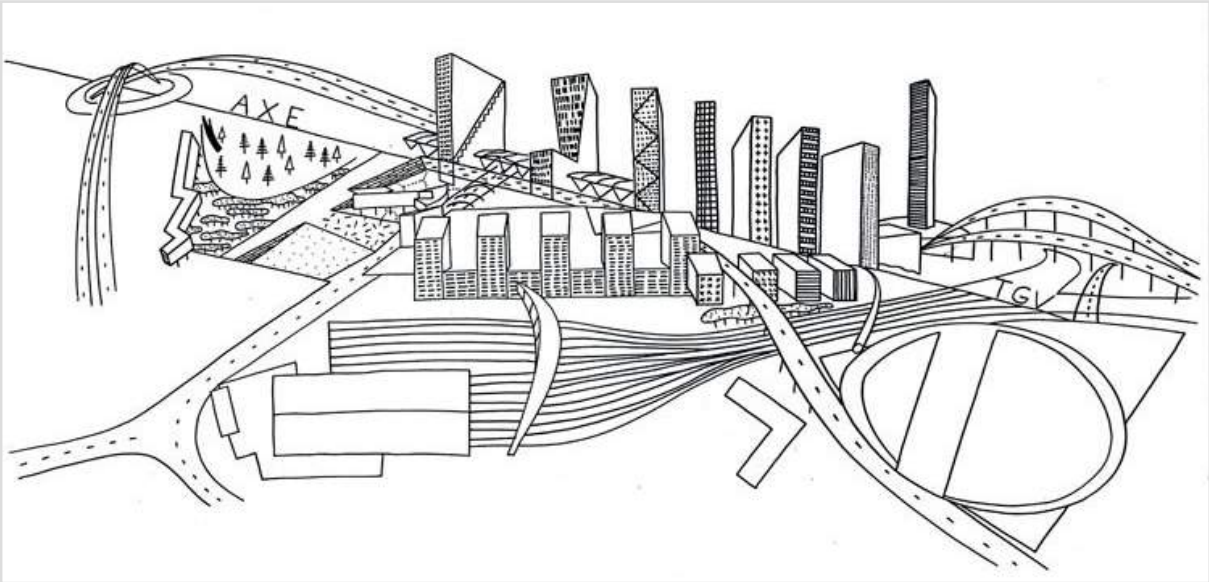

Fig.2: Sketch for Euralille, Rem Koolhaas

An example would be what is happening in the "Spanish Quarter" of Naples **(Fig.3)** where they try to pay attention especially to youth problems redeveloping small portions of the neighborhood hoping that later they will have an impact on their surroundings. There are palaces and historic houses of the late sixteenth and seventeenth century, including quite important religious buildings. Among these presences private some agencies are working together at the Accademia di Belle Arti in Naples to create new jobs thanks to the recovery of the old artisan shops and opening a large number of clubs of different natures reserved for entertainment and food culture, in addiction to enhance the green spaces for external interaction places still insufficient for the collective need. Another example of regeneration is what happened in the "Roman Quadrilateral of Turin"**(Fig.4)** that after being a religious district and hosting migration from southern Italy for centuries, it started suffering of a strong housing crisis later overcome through the conversion of the same neighborhood not only from a cultural point of view, but also the fun with old palaces, gardens and shops, besides the presence of private noble palaces who have become museums open to the public. Sometimes, the emptiness that characterizes a neighborhood and which is synonymous of rupture between different populations can become an urban park that would promote integration in one of the most multiethnic neighborhoods in Denmark. The winners of the competition Superkilen Park Copenhagen responded to the various issues highlighted by the announcement through the idea to situate stories and urban realities from around the world. The basic idea is to develop a large exhibition of the best urban practices. The project is the contemporary version of a universal garden that reflects the true character of the neighborhood, creating an urban design failure but through breaking tries to bind.**(Fig.5)**

4. From content space to containing space

Paola Vigano speaks of "Reverse City" because the space turns from limit to container and the distance simply becomes an instrument through which standardize the process of fusion between the city and the modern countryside. Bernardo Secchi denounces the difficulties of contemporary urban design of the city due to the inability to act on the empty space, now stripped of his identity and that certainly cannot be regarded as a finite space or as an infinite space and morphologically undefined. The space of the contemporary city is porous, we need to create fluid connection spaces, overlapping, contaminating. Need to activate the vacuum "among things", in an “architecture of distance “.[8] Through the vacuum we can understand and appreciate a new spatiality made of discontinuity, the prevalence of open spaces. Today, urban space made of landscape is constructed through its materials, especially the non-built space. You can use the existing built as a new material making it as resource to reuse and regenerate, but also to recall interior spaces of big blocks, empty spaces, and transforms them into public urban gardens, which allows the development of areas overlooking them . So you could pay attention to the facades and create new activities within the blocks, more suitable for cultural activities. A more densely built city through which they could redensify Urban Design at the facades scale and isolated neighborhoods to allow the existing buildings to be reused, such as industrial buildings within the city that are fragile elements in urban design, since the end of their productive activities they find themselves as simply empty spaces.

Fig.3: The Spanish Quarter Naples.

5. The effects of the development of mobility in big cities

The mobility networks are a decisive lever to act on the quality of life in urban and regional level. Moving over is a basic need, but the way in which we move is not neutral: it involves many values. Specifically, some infrastructure projects such as landfills of railway stations in urban areas, the reversal of fronts of stations, the construction of cycle paths on urban and regional scale, are connoted as measures of integration between mobility and urban and territorial transformations. In the district Les Marolles is one of the most degraded of the city but even characterized by a strong cultural identity and committed to combat the gentrification by the near district of “Le Sablon”, he started from the behind of the stop train La Chapelle, which is part of the railway line that crosses,

Fig.4: The Roman Quadrilateral, Turin

Fig.5: Superkilen Park, Copenaghen,

Fig.6: Square des Ursuline, Brussels.

from north to south, the historic city center. It was an empty urban space with a strong sense of insecurity and was used at its best by the kids. So the city of Brussels has decided to invest in this place to make it the starting point of the redevelopment of the entire neighborhood where, in addition to the skatepark, we also find the "Centre d'Art Contemporaine de la voix et du mouvement de la ville de Bruxelles "protagonist of a restoration with contemporary mark that tries to restore identity to the place starting from the historical memory and from what used to be the monument of the" Chapelle des Brigittines ".**(Fig.6)**

6.Industrial empty converted to urban parks.

In the design of cities, public parks have always been seen as the green spaces, born of an empty area, useless for the town. Natural or formal to all apparences, they were the places that encouraged recreational activities often offering romantic scenery. It is different for the new urban parks. In so-called post-industrial city, new dimensions of urban spaces show up, in which the relevance of the the landscape and green areas as a result of the shrinking process get really important. Urban planners and landscape designers have to find solutions to these "holes" left in the urban fabric, and new visions for open spaces are needed. *Die Kunst ist der Nächste Nachbar der Wildnis*. (Art is the nearest neighbor of uneducated (wild) spaces. This phrase exemplifies how the uncertainty of the "terrain vague" feature can be associated artfully. For wild or wildness (Wildnis in German) means not a virgin territory and intact, but it refers to the processes that take place beyond being human, procured by all the creatures that make up a healthy ecosystem. Nature tries to regain what has been taken away by providing the reuse of areas marked by industrial activities.

Fig.7: Landschaftpark, Duisburg North by Peter Latz.

In this context it is that the visitor through his eyes and his actions tries to create a place that does not have as intrinsic characteristic socialization among individuals; they then use spaces no longer suitable for industrial production but which are well placed to be new places of collective aggregation. The various parts of the industrial complexes are assembled in new ways to create environments and atmospheres suitable for recreational activities and sports. The ecology and eco-sustainability play an important role in this type of redevelopment developing a new idea of naturalness that not only takes into account the natural element but also the artificial one. The result is a symbiosis between elements of different nature with the aim of giving new life to a place otherwise left to itself: the city accepts its industrial heritage that has dramatically altered its natural conditions. The alliance between landscape and urbanism is recognized as the engine of a change of urbanism skin and a "slippage of its thematic center, imposing to renew his wealth of techniques and devices." These transverse movements allow you to watch the city starting from the questions and the widespread practice of re-appropriation of its space to rebuild the looks together and credible strategic visions. In this arrangement to the city and its "networked ecologies", this bricolage evokes the activities described by Kazys Varnelis: "This new kind of urbanist might very well resemble a hacker in the best sense, re-imagining how to appropriate the codes, rules and systems That make up the contemporary city and manipulate them so as to create not a plan but a new kind of urban intervention appropriate more for this century." The general idea of this new approach to landscape design, as with the Landschaftpark Duisburg North Peter Latz **(Fig.7)** , is to preserve the identity of the place, witness of a strong story for the company, looking at the project as a temporal and special process. In the North Duisburg landscape park was founded in the densely populated district of Ruhr, in the heart of Germany, along the Emscher River, on the site occupied by the former steel industrial area of the Thyssen. The 230 hectares of land have been transformed into a multi-functional park that is a combination of industrial and cultural heritage. It is offered a landscape by opposing and contrasting aspects. The idea of Peter Latz was to preserve the identity of this witness place a strong history, important for society: the goal is to preserve the most of the site and to interpret the various components of the place to give them life with features and different meanings. Many aspects testify to the ecology role in the transformation of the place. For Peter Latz, "is the time to connect ecology and the project to develop a new type of nature," according to the process, started in Duisburg, allowing nature to recover the pace compared to human changes. The preservation and re-use have an important role: the iron stairs of the maintenance paths are dismantled and reused, the rubble is crushed to form the background of new interventions. The

purification is carried out through the burial of contaminated soils through the clay pillows or through natural processes such as constructed wetlands. The vegetation consists mainly pioneering essence, able to grow on a difficult and polluted soil. The non-native vegetation, imported through the transport related to industry and steel, has been studied and classified for future uses. Water has an important role. The course Emscher has been gradually adjusted thanks to the rain water reserves through the watertight basins. An old oil tank has been recovered and pump water from the river to reclaim through its passage in the air channel before returning it into the river. Today, the vegetation plays back the paths along the banks, while the water is oxygenated aspirated through the garden. The vegetation, the water and the air have taken their place, in a context which, unfortunately, opposing them, had destroyed and contaminated. In this post-industrial park, where the industrial ruins mingle with nature, living very different structures: a museum of steel, the boulevards to stroll, suitable places to play and sports activities, other destined to parties and cultural events. Most of these stolen pieces to industry present themselves as places to discover, to experience and conquer through an approach which involves all the senses. The hiker moves in this diversity will have access to 5 levels of motion: walking, water plan, the rehabilitated track, the connecting elements, the water purification system and its windmill. The space of the high furnaces is suitable for theatrical, musical and film, which find some unusual spaces for their performances. To recall the initial activity, Peter Latz installed on "metal square", symbol of the park, a work depicting the metamorphosis of industrial structure: a square of 49 colored iron plates from rust and showing traces of their solidification. In the same vein, Peter Latz deals in Turin with a new conversion of a former industrial area. **(Fig.8)** "Spina 3" extends on a surface of 45 hectares which includes 5 different batches to the morphology and the presence of artifacts related to past industrial activities. Despite being dominated by the Dora River, from traffic arteries and new residential projects, the site maintains a strong industrial character, so to create a unity in the different areas and connect previously unconnected areas, in continuity with the surrounding neighborhoods. The intervention follows certain guidelines, the first of which is the enhancement of what remains of the industrial past of the area. The stripping sheds, cooling towers, mills and cement piping take on new functions without affecting the characteristics of the places. Even here the water, thanks to the presence of the Dora River, influences the perception of the park. A third important factor is the links among different parts of the park and between them and surrounding neighborhoods: the most visible element is a pedestrian walkway of 700 meters, suspended up to 6 meters in height that

Fig.8: Parco Dora “Spina 3”, Torino by Peter Latz.

Fig.9: Sudgeland Park, Berlin by Buros Oko Con, Ingo Kowarik and Odious

connects the three upper sections of the park changing the perception of space and offering new views of the park and the city. Returning to Germany, another example that makes the ambiguous "serene concept of natural place, and the comforting idea of archaeo-industrial park" is the Sudgeland Park in Berlin. **(Fig.9)** The Südgelände park is a representative experiment of urban landscape transformation in Berlin, the void left by the great infrastructure turned into a park corresponds to the identity of the specific landscape in the German capital.The park is spread over a rail yard for decades next to the former Tempelhof airport. Like other railroads abandoned in the Berlin area, the area that is now the park was a spontaneous nature reserve. Closed to the public for several decades after the war, this park, like other similar (Gleisdreieck in Kreuzberg), he has developed an outstanding urban ecology laboratory. No design is considered acceptable or necessary for this area, fragile and precious. Nature would continue its course without any kind of external intervention, making it the observation ground for experts. The countless trains that passed through the area and carrying deposited seeds and insects from outside, therefore the researchers, instead of finding the expected Urwald of Brandenburg, found themselves facing an ecological card of Europe. The combination of spontaneous nature with abandoned railroad tracks is anything but neutral, is a place with strong specificity and cannot be confused or misinterpreted as a normal exercise of urban ecology. This non-designed intervention has gradually gained strength and its own, distinct identity. In 1990 the Berlin Senate decided to open to the public this extraordinary ecological laboratory. Symbolically inaugurated in 1999, the project was officially presented during the EXPO 2000 in Hanover. The Civic will was clear from the beginning: need to preserve the extraordinary ecology that had developed in thirty years of neglect. The ecological constraints have determined and generated formal directives of spatial distribution and operation, such as all paths had to be lifted from the ground. The landscape architectural interventions are born from the collaboration between the study Buros Oko Con and landscape architect Ingo Kowarik, with the participation of a group artists from Berlin, Odious, who designed the raised walkways. They are minimalist bridges that rely on natural light soil. The juxtaposition of paths and nature return one of the most interesting landscapes designed of the last decade: Schöneberger Südgelände is a highly aesthetic place. Reference point of the park, which also marks the entrance, is the old water steel tank, high 50 m, 1927. Even the shed for locomotives with an area of 4000 square meters has survived until today . The large interior space where once locomotives were repaired, especially

experimental artists like them. Avant-garde theater of Berlin festivals, performances of dances and performances of young artists, display or backdrop for ambitious filmmakers: the shed of locomotives provides the space needed to become active in a creative way and experience something new.

7. Conclusions

The fragments of the city become the active parts of the project and the distance that separates them a possible element for the project. Working with the vacuum could give value to the absence, an absence made not built and not insignificant. The perception of emptiness is therefore not a value in and of itself, but relational characteristic. In mathematical terms, it would say: it is according to the full and that it clearly indicates the user who uses it. Varies both if the first is silent if it changes the second. What does the fact that space has relational features? First it gives centrality to the concrete man, to his perception, to your needs. In architecture, it makes no sense to speak of outside space of man who uses it. We have to give importance to the user since it is the one that fits and makes concrete space. The vacuum is the measuring element of the new dimension of the city, capable of feeding new figures and images, for example that of the porous city, in which is precisely the void between an object and the other to allow the movements and the creation of spaces that arise from the abolition of a rigid distinction between the park as an oasis and the city. There is a merger between the two to make the city livable and ensure that it is provided with public spaces that stimulate human relationships. At the heart of urban design will be the person and the best unit of measurement for the city it will always be the human scale. The cornerstone must be the creation of a global system that links the quality of the existing urban fabric with new design, which is no longer based only on specific interventions in the city center or through the infrastructure. The blanks may become attracted heart, characterized by extreme flexibility to better respond to the needs and daily changes, to improve the quality of urban landscapes.

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Le Vie dei Mercanti XIV International Forum
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Albaicìn: from degradation to inclusion in the NESCO heritage.

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Abstract
The theme of the recovery of the Albaicin district, in the historic part of Granada, is crucial not only for the characteristics of the building fabric and the particular conditions of degradation, but also because there have been many requests for assistance and redevelopment by the local community, in full compliance with the historical and cultural requirements, with economic and social roots, as well as spatial and traditional construction. In surveys that are the basis of restoration that have occurred over the years, it is interesting to understand how the attention has focused on the gaps in the quarter, due to continued abandonment and demolition. In fact, just trying to fill those holes were analyzed interventions related to: a) morphological and residential typologies, looking into the cases in which it was preferable to maintain continuity with the existing context and the circumstances in which it opted instead for transformative interventions, but always taking into consideration the principal generating lines, objective and subjective; b) the shortcomings and the inefficiency of public services and spaces, later integrated and reorganized; c) the productive activities and cultural identities; d) and finally the system of accessibility and mobility in order to make the neighborhood more permeable, to ensure that it's full crossable, to revitalize marginalized parts and to severely reduce the historical isolation from the general urban context.

Keywords: Unesco heritage_ arabic district_urban spaces_ continuity and innovation.

Fig. 1: The general view of the Albaicin's walls.

1. Introduction.

Albaicin different historical events have made it one of the most significant areas of the Spanish-Muslim culture, comparable, in the Arab world, only to Fez. The exuberance of his "*carmenes*" all closed and barely perceptible from the outside, the artistic richness of its minarets, churches, palaces, gates and city walls, as well as its vital rhythm, are the best legacy transmitted to the future generations. However, its position on the hills and its topography made it the subject, over the decades, of vandalism speculation, creating huge problems of accessibility, of urban quality and therefore of degradation, even if its shape is such to curb expansion of vehicular circulation, cancer of contemporary cities. In fact from the district it's possible to reach the center of Granada on foot in just ten minutes, so the almost total absence of vehicles is a strength from which to make the district a beautiful happy island. The typical single-family homes have two floors with garden, enriched, thanks to the popular inventiveness, by architectural variants, with balconies full of countless geraniums and with facades enriched by pottery and metal objects [1].

Fig. 2: Flowers and decorations on the facades.

Everything attaches to this district a unique and exemplary charm. Historically inhabited by artisans, artists and farmers, gradually it became a fully autonomous district, completely independent from the rest of the city of Granada, with its own administrative bodies, the best collective services and the best view in front of the Alhambra. Hence the desire of many wealthy to move themselves there. However, this sudden and strong expansion resulted entirely negative results, in fact moved there expecially professionals, executives and students, forcing the original inhabitants to involuntary displacement and turning the Albaycin from a socially opened and generous district to a shelter for privileged people [2]. So the old strengths have become infrastructural deficiencies for these new social classes. One particularly regrettable show was offered over the years mainly by the state in which they poured the squares, especially *Plaza Larga* and P*laza del Aliatar*.

2. Basic stages of its development.

Over the decades several urban plans have been approved, some reported only to the Albaycn, other extended to the entire city of Granada. Through them, the area was transformed and developed according to three main stages. The first one until 1951, in the second there was the Plan of 1951,and in the third the Special Protection Plan of 1975, that intervened on three important aspects: 1) the total renewal of infrastructure almost inexistent or in poor condition; 2) implementation and execution of what was expected in the previous General Plan; 3) recovery and revitalization of the entire housing estate.

2.1. From the origins to the Islamic evolution.

Before proceeding to the description of the architectural changes that involved the Albaycn, however, one should look on peoples, over the centuries, they conquered and inhabited there. The first traces of the primitive urban date back to the XVII century b.C, with a protoiberic footprint, as observed by the archaeological campaigns of 1983 and 1985 [3]. Following, iberian layers have been documented in the fifth and fourth century b.C. until the process of Romanization, but fortunately it didn't lead to the total destruction of the existing, but to a simple adaptation, where possible, of the Iberian cities to the Roman city. Proof of this are the studies of Gomez-Martinez Moreno, who published, in 1989, the

volume "*Monuments romanos y visigoticos de Granada*", where attention focuses mainly on residential and hydraulic works, typical of the Roman age. With its investigation also he showed the existence of a hole and a Basilica at calle Elvira. Later large urban changes occurred with the Visigoth invasion in the fifth century b.C. , when the Roman city lost its connotation of political and administrative center, to acquire a mainly defensive character. From the XI century a. C. began the process of urban transformation with Islamic imprint. In fact, starting from the center of *San Nicolas*, there was a systematic expansion of the district, well beyond the walls. It was created a small city within a city, with Arabic baths, mosques, souks and several blocks, each with its own front door and they were made winding and irregular paths, almost like a maze, breaking the orthogonal grid of the Roman mold [4].

Fig. 3: One of the entrance to the souk.

2.2. By the Catholic kings to the Age of Illuminism.

In the following centuries we have the urban reform by the Catholic kings. It was centered on the one hand urban safety, since the narrow roads made it difficult to plot the circulation and facilitated incidents of public disorder; the other on the sanitation of the various "*barrios*", with also a

reorganization of the adjacent land. However, changes of this period were not of great impact. In fact, the Catholic kings respected, for their charm and uniqueness, many of the most important Muslim buildings, changing only the function, as in the case of *Maristàn*, transformed into *Casa de la Moneda* [5]. In 1526 Charles V gave to the Albaycn a clear Renaissance style, particularly through the completion of the Royal Chapel and the execution of the works undertaken in the Royal Hospital. In the XVII and XVIII century, there was a Baroque urbanism [6]. But when in 1609 we had the definitive expulsion of the Moors, there was a situation of gradual decay, made worse by a progressive depopulation and by natural disasters that struck the city in the early decades of the century. Thus it began a process of remodeling with new types of lotting, in which the Arab and Moorish dwellings will be replaced by larger residences, with vast spaces dedicated to gardens and orchards. [7] You will need to demolish several Arab houses to build a Christian one. In this period were built many monasteries and churches, and were enlarged the streets that had a greater influx of people, as in the case of the "*Carrera del Darro*" [8]. The main squares, however, did not suffer big changes, *Plaza Larga* continued to be home of the main market and *Plaza Nueva* maintained its role as a center of political, legal and social life in the city, but important parts of the old walls were demolished, leaving few traces scattered.

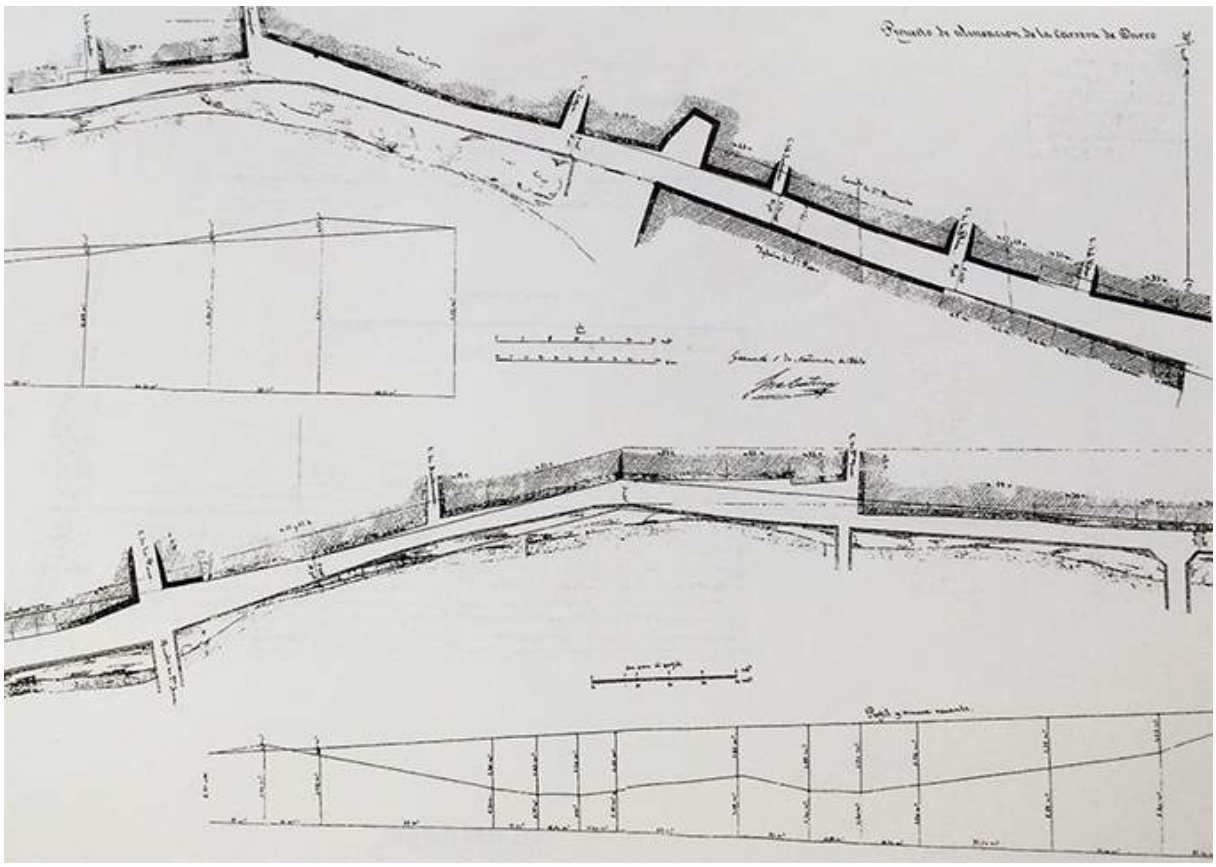

Fig. 4: Planned extension of *Carrera del Darro*.

2.3. The I and centuries.

At the beginning of the nineteenth century it was decided to break down geometrically the prevailing homogeneity and to start a process of revitalization through a program of rectifications and alignments. Many were the architects were called to submit project proposals for a new urban development, although the municipal planning was very slow, because the situation of the country, between the end of the dramatic Independence War and the age of Queen Isabel II in 1843, appeared very critical in the political, social and economic aspects [9]. In general, in fact, they proceeded only to repair the damage caused and to complete the works begun earlier. However, in the same years, was born the "*Comisin de Ornato Publico*" for the regulation and control of building. Were so elaborate new geometric plans to rectify the traditional paths and reformulate the urban plot, touching first public spaces, streets and squares. Unfortunately many solutions aggravated the current situation because they were traumatic urban surgery operations that did not take account of relations with

neighboring areas. Remarkable in this period were the alignment projects of *Plaza Larga*, *Plaza de San Nicolàs* and *Calle Elvira*, by urbanist José M. Mellado [10].

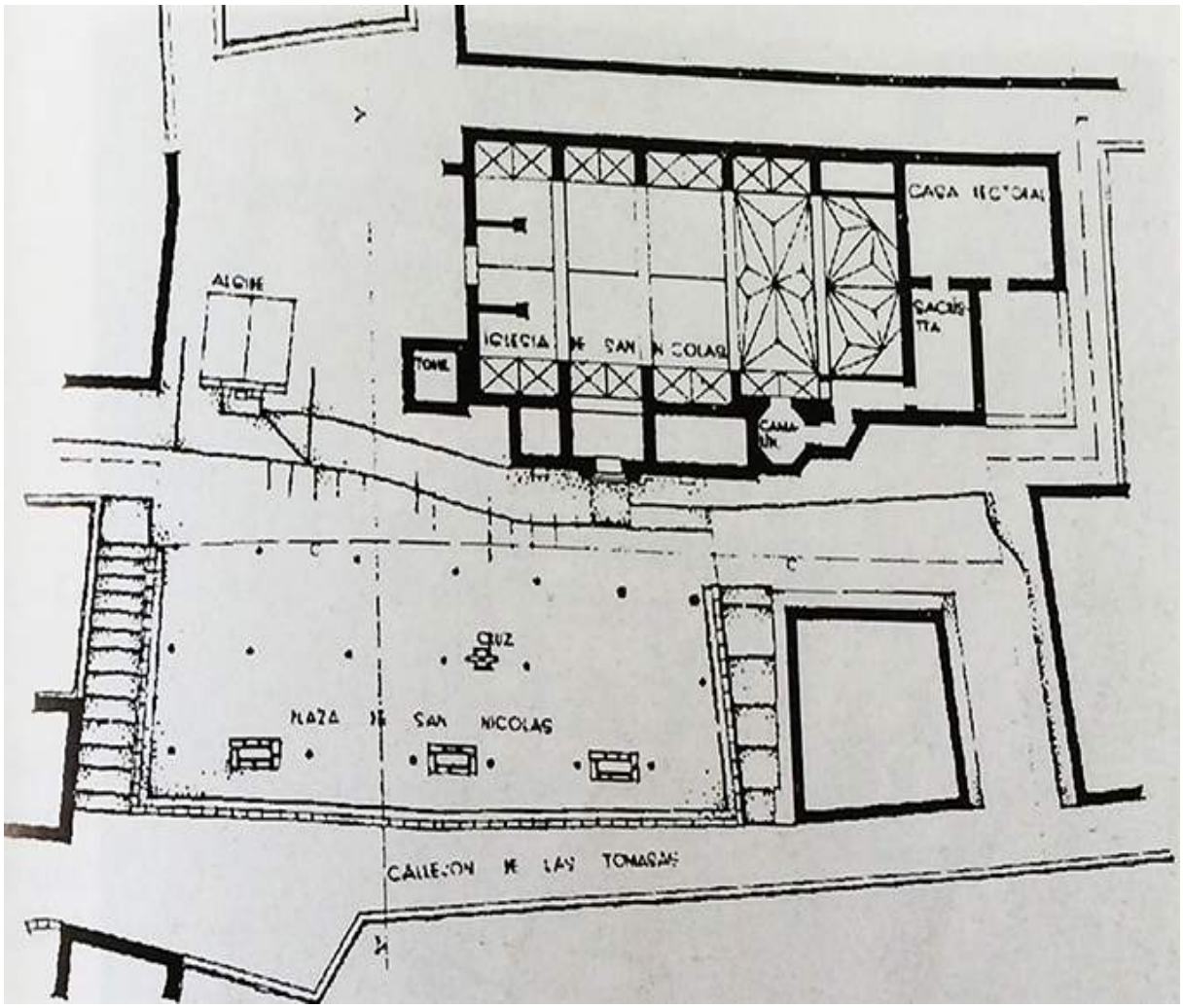

Fig. 5: Alignment of *Plaza San Nicolàs*, plan, cartography of 1933.

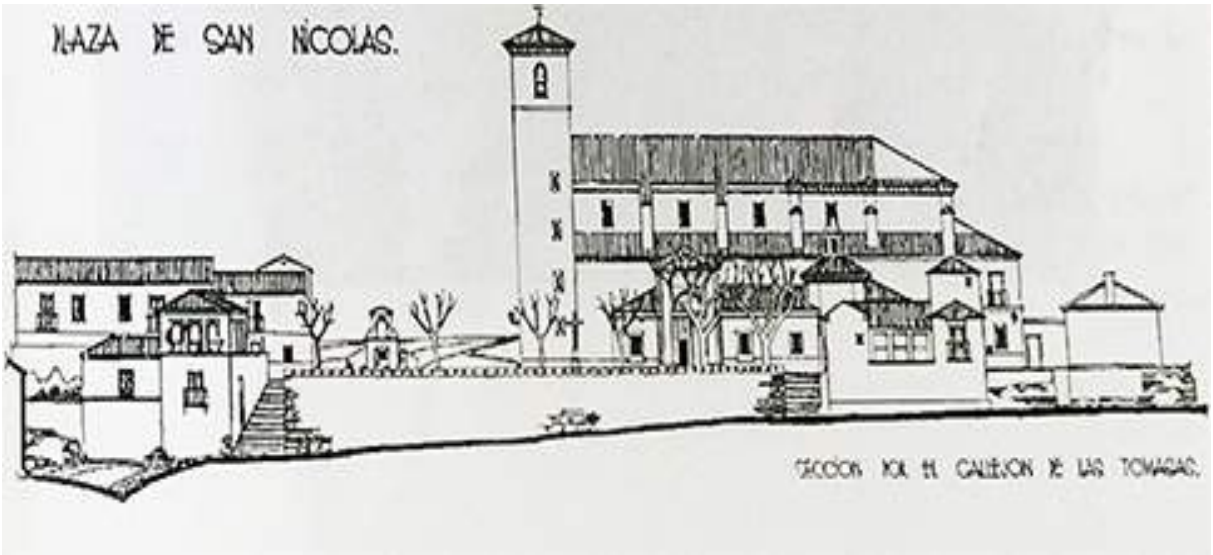

Fig. 6: Alignment of *Plaza San Nicolàs*, section.

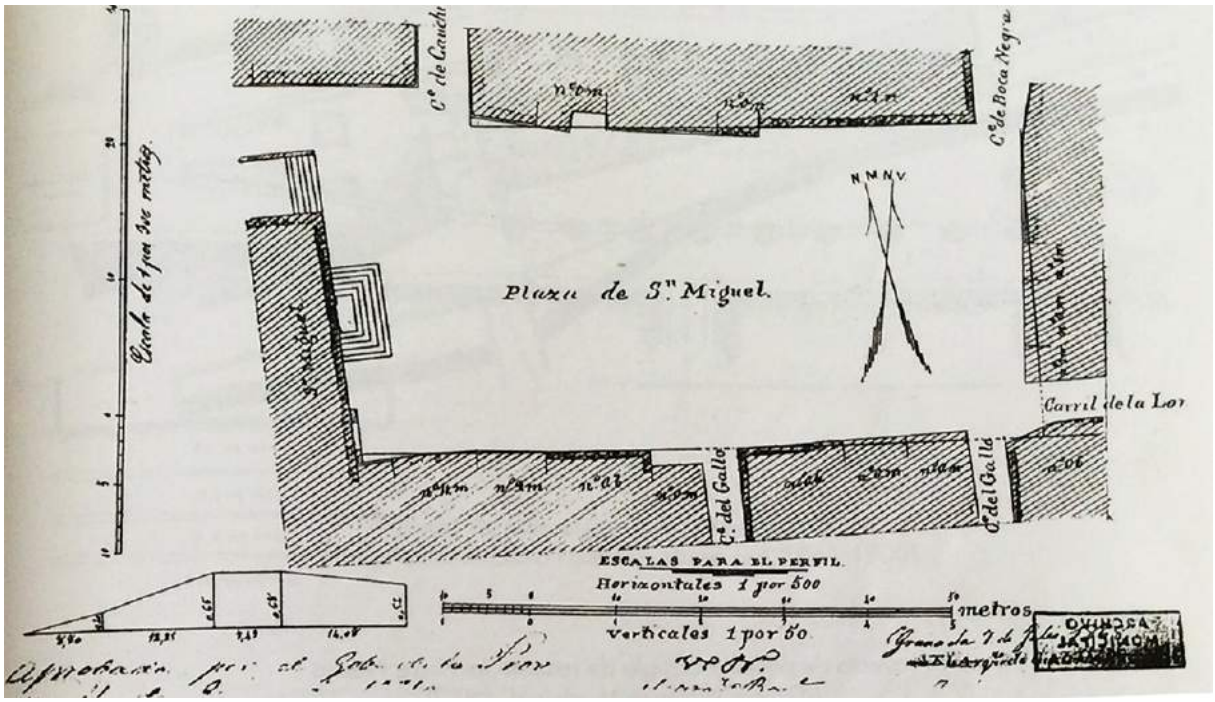

Fig. 7: Alignment of *Plaza de San Miguel*, plan.

Fig. 8: *Calle* and *Puerta Elvira*.

Equally important was the redesign by architect Jose Contreras of the *Plaza Nueva* and the right side of *Carrera del Darro*, important connection node between the Albaycin and the lower town. Were also added works for repaving and furnishing in the various public corners and was introduced a more modern house numbering system no longer for "*cuadras or manzanas*", but for homes. These were also the years when it was realized the vitally importance of the religious buildings, such as churches

and convents, heavily damaged by the war, by the phenomenon of "*spolia*", by the change of the use and by the demolition of several small parishes. So after a first attempt to catalog them, the government decided, in 1833, to declare, as National Historic and Artistic Monument, the church of *San Juan de los Reyes*, showing for the first time a clear intention to protection and conservation of immovable heritage . Later the same protection was extended to civilian property, the first example was the declaration of *Puerta Elvira* as Historic and Artistic Monument. The alignment and protection project continued even in the twentieth century, when the government is forced to the elaboration of Monumental and Artistic Catalog, with the intention to appoint within 1910 the Commissioner General of Fine Arts [8]. In the next 1935 was promulgated the National Artistic Heritage Law, which, together with the Executive Regulation, has been the basis for the subsequent Spanish Historical Heritage Law in 1985 [11]. In this succession of laws, a fundamental step for the Albaycin recovery was also the declaration of Granada as "artistic city". Unfortunately in the 50's and 60's this neighborhood renewal process slows down in favor of other parts of the city, there was in fact a greater interest in new quarters as *Zaidín*, *Chana* and *Cartuja*. Only in 1968 the attention returned on the Albaycin, with an advanced strategic plan called "*Operación Albaicín*", aimed at preserve the special character of the area. In this period there was the construction of the Public Library, thanks to the architect Louis Navarro Montoya. The biggest change, however, occurred in the private sector, where was planted a particular residential typology, that some authors defined it as "*regionalist carmen* " , that allowed the urbanization and the reorganization of many parts of soil unbuilt, in ruins or in state of abandonment. In 1971 were born, for a further protection and enhancement of the neighborhood, the "*Associación de amigos del Albaicín*" and a Patronage for Tourism Promotion. Later on these basis we came to the Special Plan of 1975.

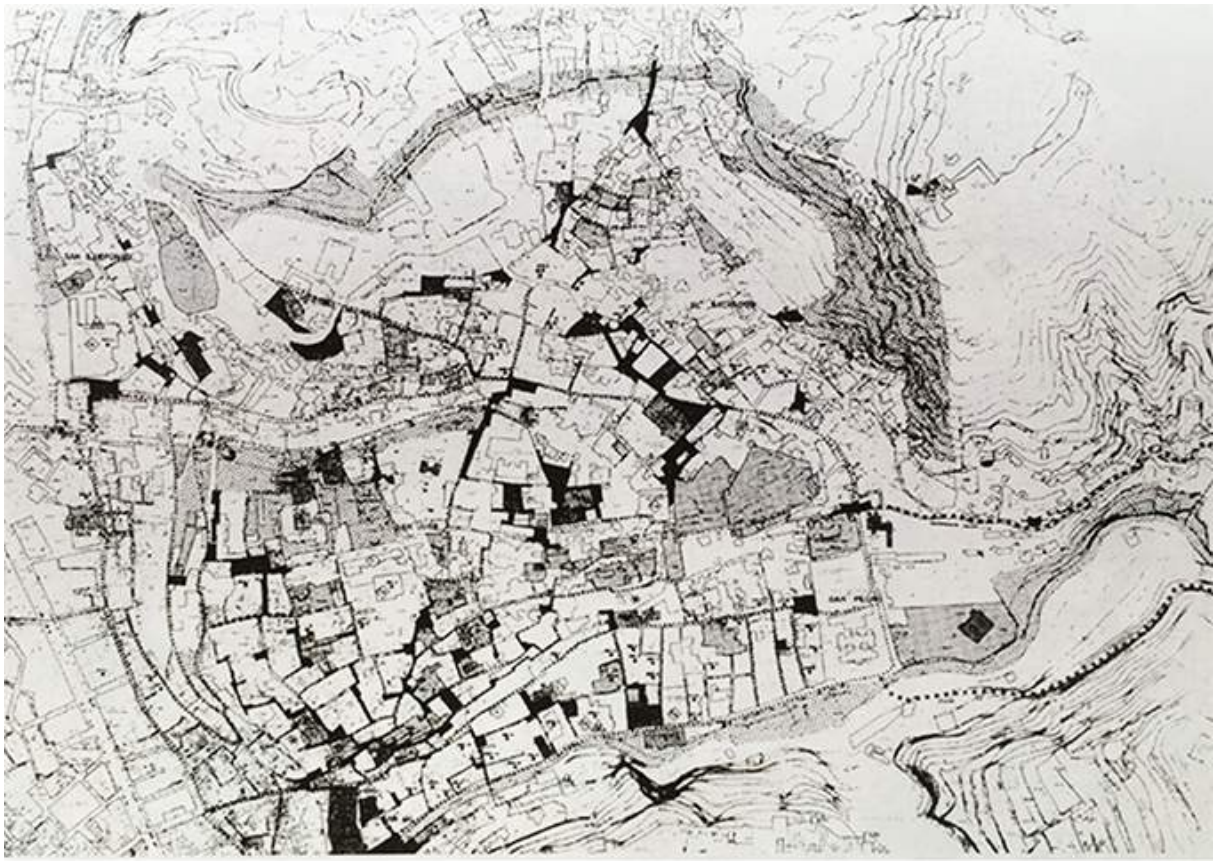

Fig. 9: Special protection plan: public spaces.

This plan was centered on: 1) social issues with the aim of increasing the quality of life of the inhabitants and decreasing the illiteracy rate, for example by creating more jobs in the crafts sector and facilitating the cooperative movement through schools and training centers; 2) urban deficits to create more domestic and collective services, such as commercial, educational, social and welfare services and to achieve adequate infrastructures; 3) the aesthetic and historical issues related to national and local value of monuments and urban landscape, strengthening the overall conservation policy, for example by avoiding that the new buildings were going to obscuring the view of them.

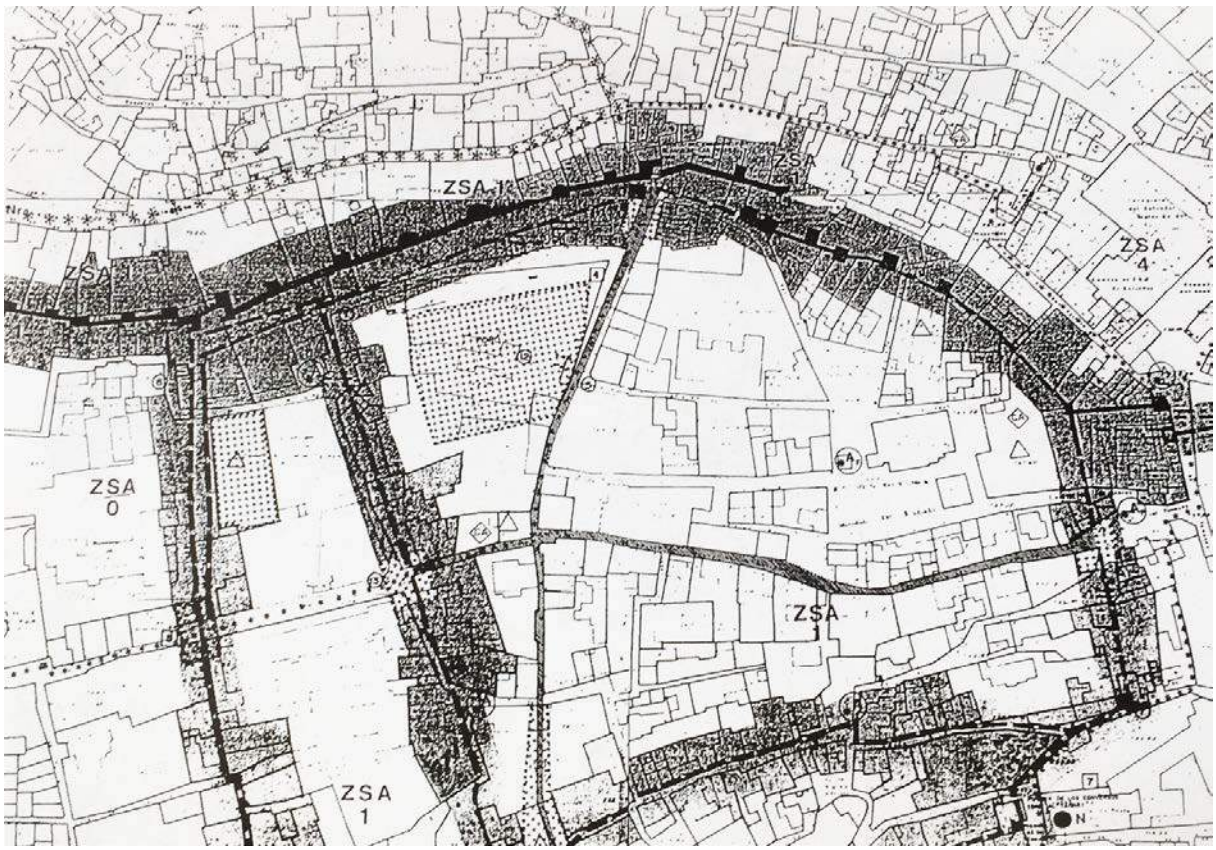

Fig. 9: Special protection plan: archaeological heritage.

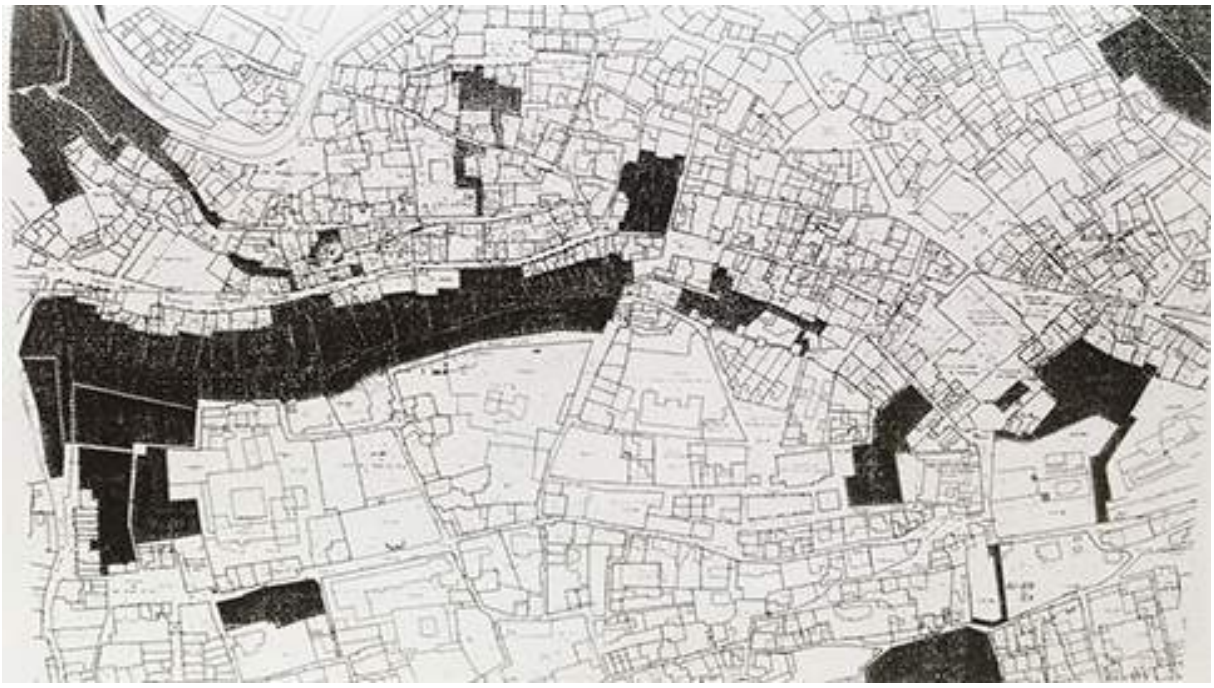

Fig. 1□: Special protection plan: main interventions.

3. *El' Albaicin* as □ orld Heritage.

Finally in 1979, at the initiative of Antonio Jara Andreu, the UNESCO was stressed, with a depth dossier, to include the Albaycin in the World Heritage List, in order to have the right international assistance both technical and financial. Started from that moment a series of consultations by the UNESCO, also considering the proposals of the Italian consultant Leonardo Benevolo [12], who in particular suggested to revise the Special Plan of 1975 to adapt it to the General Plan of Urban Reorganisation of 1983. In fact this Plan included the Albaycin, together with the Alhambra,

Sacromonte and Realejo, in the category of Historic City, object of special protection. The General Plan divided this category into four types of buildings (monumental, traditional, unique and environmental) with four levels of protection (total, integral, structural and typological). Finally, after a long process, in 1994, the UNESCO, with the help of consultants Bolla and Lemaire, decided to insert definitely the Albaycin, with the Alhambra and the Generalife, among the assets that are part of the World Heritage Site, recognizing all the protection and international supervision.

Fig. 11: View of the Alhambra from *El Albaicín*.

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Le Vie dei Mercanti XIV International Forum
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Securing Traditional Materials and Techniques on Architectual Heritage in Japan

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Abstract
The author focuses on Japanese traditional techniques and materials that are the keys for supporting constant preservation of historic timber structures and highlights that saving such traditional knowledge could deliver a paradigm shift from the conservation of heritage to promoting heritage by introducing a recent program called, "Furusato-no-Mori" which means 'Forest for Heritage including all organic resources necessary for the preservation of timber historic structures, promoted by the Japanese Agency for Cultural Affairs.
One of the most important characteristics in Japanese culture is based on handicrafts using diverse materials drawn from organic materials. For instance, more than 90% of the architecture classified as cultural property on a national level has timber structures; it obviously needs specific conservation and restoration techniques, which are not applied in modern construction. However, it takes a long time to get competent techniques, as well as growing plants so that they could be used as good building materials.
So far, the Japanese Agency for Cultural Affairs has struggled to secure enough protections for timber structures of cultural property, for specific conservation techniques and materials. Already as far back as 1975, it has started to support the holders or the maintenance bodies of such traditional techniques to keep them against rapid mechanization. Although many people have long recognized the supplying system of traditional materials in conservation and restoration, the Agency for Cultural Affairs has finally started the programme 'Forest for Heritage' to secure the resource of traditional materials by supporting the owners or the maintenance bodies of such specific materials in 2001.
Those techniques and materials obviously depend on the ecology of the Japanese environment while at the same time, it is necessary to have the support of all stakeholders who are helpful to understand and who support the sustainability along conservation approaches.

Keywords: Timber Buildings, Traditional Techniques, Traditional Materials, Forest for Heritage

1. Materials and Techniques
One of the most important characteristics in the Japanese culture is based on handicrafts using diverse materials drawn from organic materials. For instance, more than 90% of the architecture classified as cultural property on a national level has timber structures. The reason why such timber culture has grown in Japan as well is basically a result of its topography and climate. The islands of Japan are covered with mountains spreading over a territory of roughly 80%. And the islands face the Pacific Ocean where the warm current flows northward. In the suburban areas, the forests cover the islands of Japan while synchronizing nature and settlements. Four seasons and the rich nature always provide good materials available for timber culture by using the ecological cycle which also make Japanese familiar with the natural materials. Eventually, the skills and techniques to use such materials have been developed.

Thanks to those rich plant based organic materials, Japanese timber buildings have been further developed. The Golden Hall in Horyu-ji Buddhist Temple, Nara Prefecture, is the oldest Timber Building in the world, thus indicating how the skills and techniques for making up timber structure have been brought from China or the Korean peninsula in the 7th century. Subsequently, such competent skills and techniques gradually increased and were finally applied to the simple farmer's houses and

their settlements as far back as the 17th century. Furthermore, the Oura church, a Catholic church designed by French priests was completed in 1865; its structure is made up of natural materials including the vault which was made by local Japanese carpenters of lime mortar with bamboo. The materials and techniques are still applied to build a timber building in modern architecture even if nowadays it seems to be difficult to find such authentic timber buildings due to the recent reflection on the other materials such as glass, steel or concrete, however, apparently 60% of the houses still use timber structure according to the Japan Statistical Year Book 2013[1].

Fig. 1: Main Hall, Horryuji temple, Nara Prefecture

The forest was once clothed with good quality of woods; in particular, the Japanese cypress played a significant role in the building materials due to its high quality for long structural parts. In addition, the surface of the Japanese cypress is barked by special techniques which prevent harming the trunk of the cypress. It is necessary to bark natural cypresses that are 80-100 years old and the surface of cypress is regenerated after 10 years. Cypress barks are cut and stuck together carefully as the roofs of the temples and shrines are covered with layers of cypress bark that make for a beautiful roofline. The other roofing materials are shingle as thin wood boards and grasses for historical buildings; shingles or grass are cut and stocked and used as the roofing materials and have a durability of 30-40 years.

Some Shinto Shrines and Buddhist Temples are also painted using the Japanese lacquer, Urushi which is made by drawing sap from lacquer trees. It is used to paint the surface of buildings to protect and decorate. The Golden Hall, Chusoun-ji temple, build in the first half of 11th century in Iwate prefecture, or Nikko Tosho-gu shrines, build in early 17th century in Tochigi prefecture, shows Urushi has been used as decoration with gold or coloring inside of temple so that it could show its incomparable glossy color. However, Urushi is gathered by competent technicians and used as the painting material even for surfacing on buildings which only have a durability of 10-20 years due to the weak Ultraviolet rays.

To keep a timber building in an ideal state, it is necessary to perform constant daily maintenance, along with dismantling and reassembling the building part by part every 300-400 years to try and prevent its condition from worsening. The conservation and restoration projects need such traditional techniques as well as traditional materials to do daily and constant maintenance for timber buildings.

However, it takes a long time to obtain competent techniques, also to grow plants so that they could be used as good materials as well. On the other hand, it is thought that daily and constant maintenance provides opportunities for maintaining traditional craftsmanship and training for future generations; at the same time, it is an important part of the system to allow the survival of authentic timber buildings to the present day.

2. International Recognition for Traditional Materials and Techniques

The Notion of securing for Traditional Materials and Techniques on preservation of timber structures has developed since 1970s. This might be illustrated by focusing on the International Charters or Principles on preservation of timber structures. The Charter of Venice, International adaption of the Charter for the Conservation and Restoration of Monuments and Sites in 1964 was dealing with Traditional Techniques as what was possible to deny if it proved inadequate in accordance with the article 10 [2];

> *Article 10. Where traditional techniques prove inadequate, the consolidation of a monument can be achieved by the use of any modern technique for conservation and construction, the efficacy of which has been shown by scientific data and proved by experience.*

The ICOMOS (International Council on Monuments and Sites), international organization for specialist of conservation on historic buildings and sites, was founded in 1965, as a result of the Venice Charter [3]. The Wood Committee, one of the sixteen ICOMOS International Scientific Committees established in 1975. Since then, the Wood Committee has held several meetings and activities to discuss about Conservation on Wooden buildings, particularly establishing general Guidelines for the preservation of historic timber buildings [4]. Meanwhile, the movement of conservation of Historic Center in Europe was focusing on the importance of Traditional Materials and Techniques in the 1970s.

The Council of Europe that “1975” was declared “European Architectural Heritage Year”, and the Congress on the European Architectural Heritage adapted “Declaration of Amsterdam” in 1975, as the final resolution [5]. The declaration emphasized that the conservation of architectural heritage should become an integral part of urban and regional planning, as “Integrated Conservation”. In terms of traditional techniques, the declaration pointed out that; *“Integrated conservation requires the promotion of methods, techniques and skills for restoration and rehabilitation.”* Furthermore, the declaration first emphasized that; *“Steps should be taken to ensure that traditional building materials remain available and that traditional crafts and techniques continue to be used.”*

In 1987, ICOMOS 8th General Assembly adapted a resolution on Historic Woodlands and Forest Reserves called for studies, pilot projects, public education programs and careful management of woodlands and forest reserves including the harvesting of trees for the restoration of important cultural properties [6]. In 1994, ICOMOS adapted Nara Document on Authenticity addressing "The diversity of cultures and heritage in our world is an irreplaceable source of spiritual and intellectual richness for all humankind"[7]. And then, it emphasized authenticity judgments linked to materials and substance as one of variety of sources of information in the paragraph 13 [8];

> *13. Depending on the nature of the cultural heritage, its cultural context, and its evolution through time, authenticity judgments may be linked to the worth of a great variety of sources of information. Aspects of the sources may include form and design, materials and substance, use and function, traditions and techniques, location and setting, and spirit and feeling, and other internal and external factors. The use of these sources permits elaboration of the specific artistic, historic, social and scientific dimensions of the cultural heritage being examined.*

In 1999, the ICOMOS finally adapted the Principles for the preservation of historic timber structures. In Article 12 of the Principles the establishment and protection of forest or woodland reserves, as “Historic Forest Reserves” from which appropriate timber can be obtained for the preservation and repair of cultural heritage made of wood [9];.

> *12. The establishment and protection of forest or woodland reserves where appropriate timber can be obtained for the preservation and repair of historic timber structures should be encouraged. Institutions responsible for the preservation and conservation of historic structures and sites should establish or encourage the establishment of stores of timber appropriate for such work. "*

3. Legal protection for Traditional Materials and Techniques

The Japanese Agency for Cultural Affairs has struggled to secure enough protections for cultural property, for specific conservation techniques and materials. And it has started to support the holders or the maintenance bodies of such traditional techniques as “Selected Preservation Techniques” in 1975, to keep them against rapid mechanization. According to “The Law for the Protection of Cultural Properties” [10], the definition of ‘Selected Preservation Techniques’ is ‘preservation techniques as are traditional techniques or craftsmanship that are indispensable to the preservation of cultural property and for which preservation measures shall be taken’ (Article 147 Clause 1). To Protect ‘Selected Preservation Techniques’, it should be recognize as a bearer or a preservation body (Article 147 Clause 2), i.e. It intends to ensure that there are technicians and craftsmen who can restore Tangible Cultural Properties and produce tools and raw materials for use in connection with Intangible Cultural Properties.

Since 1975, the Japanese Agency for Cultural Affairs designated holders or maintenance bodies: the traditional carpentry design techniques, a master carpenter showing his technique, a technician working on the plastering technique, the technicians working on traditional coloring, a master craftsman applying the roof tile technique, a technician of barking cypress and a technician roofing cypress barks, a team of specific conservation architects. Nowadays, the Japanese Agency for Cultural Affairs has selected 71 specific conservation techniques including other manufacturing ones and it supports the 57 holders and the 33 bodies that teach the new holders (2016) [11]. To protect the Selected Conservation Techniques, the Japanese Agency for Cultural Affairs, selects various projects by compiling documentary records or training to make new holders. It also provides the financial assistance for projects conducted by holders or bodies, to improve traditional techniques or skills.

Fig. 2: a technician roofing cypress barks

The importance of continuity for the supply system of traditional materials in conservation and restoration has long been recognized by many experts of built heritage. For instance, it might be necessary to use a cypress tree that is over 80 years old for repairing a historical building because it is

a thick tree that has taken a long time to grow. However, nowadays it is too expensive to buy such a thick specimen from a lumber market. Therefore, it has become increasingly important to involve many stakeholders who can support not only cultural heritage but also natural heritage, in order to secure the continuity of traditional materials outside the normal market economy.

In 2006, the government finally launched the program “Forest for Heritage” to secure the resources for traditional materials and to advocate the conservation of historic timber structures by supporting the owners or bodies that maintain specific organic materials; this program means that even resources for traditional materials would become heritage and could result in cooperation in the conservation of both cultural heritage and the natural environment.

The Japanese Agency for Cultural Affairs selects forests or organic resources that are owned by individuals, universities, research institutions, and private companies, and then asks them to continue to maintain such resources for restoration projects of historic timber structures. For instance, the forests of Japanese cypress, Sawara cypress, Hiba cypress, Cryptomeria japonica, chestnut trees, pine trees, and Japanese lacquer trees, as well as rush fields, were selected as “Heritage Forests”; so far, the Japanese agency has selected 68 such locations (2016). The quality of the materials obviously depends on the ecology of the Japanese environment, and at the same time, it is necessary to have the support of the local community, which is helpful for maintaining sustainable conservation approaches.

Fig. 3: Forest of Japanese cypress and a technician of barking cypress

4. Conclusion

In conclusion, to keep timber buildings in their ideal state, it is necessary to do constant daily maintenance, as this plays a significant role in passing on traditional techniques and materials to the next generation. At the same time, securing traditional techniques and materials could become one of the approaches for involving local communities in not only cultural conservation but also natural conservation. Therefore, continuing to pass on traditional techniques and materials is the key to driving the dynamics of continuity of community-based approaches. Recently, the management for heritage including both natural and cultural aspects became a key topic on the WH capacity building strategy [12]. There was already such a point of view that it was important to incorporate both types of heritages since 1972 when the WH convention started. WH committee first put the complex heritage

on the WH list in 1970s. Since then, the number of complex heritage was growing larger and larger however it seems that there were few corporations among both heritage experts and professionals as well. In addition, the management plan needs point of views from which natural and cultural values can exist. Therefore, the challenge of `Forest for heritage" lead by the Japanese Agency for Cultural Affairs might show one of the ways for cooperation between natural and cultural conservation, in order to promote heritage [13].

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Structures of IX century in rasola 1 of Castello del Monte in Montella*

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Abstract
Archaeological researches in Montella's castle placed between 1980 and 2008 revealed a multi-layered context with deployment phases from the VI to the XX century. In relation to the border position in which the castle found itself after the division in Benevento and Salerno's principalities (849 a.D.), it became an administrative and military centre. The excavations conducted in rasola 1 carried out some evidences of the structural rearrangement in the IX century, when a wall was realized in *opus caementicium* and *opus incertum,* which annulled the buildings of the VII-VIII century in the SW area, as were created new in NE area. Here was build an oval iron forge, with a hole on the south side to load/unload fuel and raw materials and also a rectangular structure probably intended to semifinished materials. The analyses of excavation's trenches carried out in rasola 1 started since the VII-VIII century broaden the knowledge of the area which in the IX century lived profound building transformations in accord to Lombard gastaldate.

Keywords: Medieval archaeology, Archaeological Excavation, Castles and Fortifications, Archaeology of Architecture

1. Introduction
Between VIII and IX century in Campania is recorded the foundation of numerous centres whose nature of *civitates, oppida, castra* or *castella* is not easily identifiable because of their difference and specificity [1]. Nevertheless, written sources and material [2] testify the coexistence of rural villages, sometimes risen on Roman farms dating from the VII century [3], and numerous strengthened installations [4] that deeply modified the structure of the ancient territory. The birth of this settlement model is related to the development of local powers arising following the institution of gastaldates, territorial districts checked by regal officials to which was guaranteed a discreet autonomy towards the government apparatus. The root of the gastaldale's power on the territory is testified by a series of strengthened structures arose in strategic points. Rota, centre of a gastaldate that checked the access from the Tyrrhenian coast to Avellino and Benevento, and the agro nocerino-sarnese [5] is an example of this; a contract dated 892 testifies the existence, in Ariano Irpino, of a small fortress risen in defence of the territory of Benevento against the Byzantines and the Saracens from Puglia [6]; a similar dynamics has been in relief about the castle Candriano in Torella dei Lombardi [7] in the gastaldate of Conza [8]. Along the road that from Battipaglia conducted to the valley of Calore and Benevento is developing the site of Montella, where the archaeological searches headed by the prof. Marcello Rotili between 1983 and 1992 [9] they have allowed to reconstruct the life's phases of the inhabited area, from its formation in the VI-VII century until the definitive abandonment determined after the consignment of Lautrec in 1528. In the southwest area of the installation, on a surface of around three hectares structured between XII and XIV century for the stately's recreation and leisure [10], were realized rasole [11], large terraces equipped with substraction's walls and divided by two aqueducts, already suitable in the eighteenth-century *Dichiarazione della* […] *Pianta di tutto il Monistero de P. Riformati sotto il titolo di S. Maria del Monte*. Likewise to how much in relief speaking of other centers of the hinterland they live (*supra*), with the institution of the gastaldate attested in the 849 by the *Radelgisi et Siginulfi principum divisio ducatus Beneventani* [12], the installation assumed the

characters of administrative and military center, so that to the rural aristocracy a territorial dominion replaced him that enacted own power through the erection of a new surrounded building, realized in some points above the houses in masonry of the curtis of VII-VIII century and the adaptation of the evidences survivors in housing or handicraft structures of service (fig. 1).

2. From *curtis* to castle: archaelogical evidences of IX century from rasola 1

Symbolic of these transformations is the rasola 1 (around to 2265 mq) [13], area of service variedly articulated in reason of its continuity of employment from the VII to the XX century, situated to west of castle's walls and just defined to south by the external perimeter 8050 in calcareous stones, to east from the substraction's wall 8052 and to north from a wall alligned with the entry of the small fortress.

2.1 Fortifications

The defensive consolidation of the area is testified by the surrounded building in *emplecton* [14] 8004-8005 (trenches F/83-85, 3/85, 9/89, G/85, 14/89; fig. 2, S11-S12), 8004-8070 ('sector I' trench 86/89; fig. 2, S13), 8002-8060-8007 (trench 1/88-91; fig. 2, S14), 8206-8245-8222 (trench 2/88-92; fig. 2, S16), realized exploiting in some points the appearing on the surface calcareous bench (us 21, trench F/83 -85), according to a modality already attested in other points of the installation [15].
Constituted by a thick wall in hewn and semi-finished limestones with staggered joints (h. 9-5 cm) individualized by a mortar whitish, in this sector of the installation the wall has appeared on the surface around for a length of 25,8 m in direction east-west and around to 34,8 m along the north-south line. According to the anomalous trapezoidal shape highlighted in the trenches G/83-85 and 14/89 (fig. 2, S12), it is likely that in this point the fortification angle out and that it was leaning an architectural structure which should be reported densification of collapse stones that filled her space among 8005 and 8050, substructions realized between the XII and XIV century in relation to the structuring of the area as norman castle and then as pleasure park [16]. In this sector, particularly from the filling 17 that fills the space among the two structures, the edge turned outwards of fire achromatic pottery, datable between the IX and the XII century (fig. 5, n. 1). If in the trenches F/83-85, 3/85, 9/89 (fig. 2, S11) the fortification 8004-8005 is articulated alongside the wall of the Angevin age, the excavations conducted in the trench 14/89 (fig. 3, S12) have highlighted the partial foundation of 8050 on the medievals walls 8005-8004. The installation of the fence in the southeast covered the rests of a building individualized by the environment C of the 'sector I' the trench 86/89 (fig. 2, S13) [17] and in the south side the floors of the shafts of the VII-VIII century individualized in the trench 9/89, where on the obsolete environments some fillings were formed. To turn the area into a strengthened complex some skilled workers were probably engaged to build defensive buildings of a new typology, likewise to what was attested in Montarrenti, where the top area was surrounded with big squared stones mixed to others smaller than them, not worked and linked to each other by yellow mortar, according to a technique that remembers the model of city-fortitude [18]. The realization of defensive circuits stonework in the Middle Ages, among which we remember those of Scarlino [19] and of Donoratico [20], it is indicative of the possession of precise notions from the builders, perhaps influenced by the increase of the translations of the classical texts of surveying and architecture happened during the IX century, to whose realization and diffusion had contributed the monastic institutions [21].

2.2 Housing

To the installation of the gastaldate refers to two adjoining environments, A and B, erect behind the enclosure 8206-8245-8222 (trench 2/88-92; fig. 2, S16), reused as oriental perimeter, wherever the remaining sides are defined by masonries in *opus incertum* (uussmm 8236-8238 in the environment A; uussmm 8203, 8209, 8224 in the environment B), realized through calcareous stones linked by mortar very thin granulometry and with a compact consistence arranged on sub-horizontal rows. The two quadrangular shafts north-south oriented are almost characterized for the presence of thresholds on axis (uussmm 8237 8205), whose different ampleness [22] suggests a different functional destination that recognizes in the north opening (environment A) the principal entry and in the south one the passage of access that introduced in a secondary environment (environment B). According to the attestation of the clay levels (uuss 35, 40 northwestern; 68 southeast), It is perfectly possible that the perimeter walls acted as basement for elevated in perishable material, whose evidences are difficult to be individualized because of the conditions of the ground. On the layers of geologic levelled sedimentation was realized the floor only visible in the environment B, which it remains a yellowish mortar very compact sloping eastward mixed with big calcareous fragments. In the middle of the floor with a cut in the rock a functional hole of quadrangular form was derived for the support of the roof. In respect of the coverages, the absence of clear material evidences suggests a realization in perishable material (straw, branches, soil, manure or shale). A inverted dome fireplace, obtained from the stone, suggests some kind of household service, delimited by calcareous stones of great dimensions arranged in semicircle, within which grey-black ground ash mixture and clay were present. In the vain A and B of the environment C of the 'sector I' trench 86/89 (fig. 2, S13) as a result of the

abandonment, the fillings were formed on which a plan of mortar was stretched (usr 23) that with the floor (usr 29) was covered by the wall 8004-8070. In the northwest angle of the area, the soil layer 15, mixed with stones and different coal fragments, returns the edge turned outwards of an achromatic olla of small dimensions (fig. 5, n. 2); from the coarsen texture soil 10, in dark grey with inclused, have emerged the edge of an achromatic olla (fig. 5, n. 3), an harpoon edge in achromatic engraved pottery (fig. 5, n. 4) and a bottom with side and edge in achromatic pottery (fig. 5, n. 5), together to red banded ware, enameled, nails, fragments of glass and coal; a fragment of fire achromatic pottery, individualized by a basin-cover (fig. 5, n. 7), has come to the light from the charred ground 14, together with red banded ware. The articulation for single housing unities put in place in rasola 1 of Montella reminds the operation realized among the half of the VIII and the beginnings of the IX century in Poggibonsi [23] or that occurred around the first halves of the IX century in Miranduolo, when the hilly morphology was modified for the renewal of the village in relation to a precise demand of hierarchy of the spaces [24]. An achromatic olla (fig. 5, n. 3), an harpoon edge in achromatic engraved pottery (fig. 5, n. 4), a bottom with side and edge in achromatic pottery (fig. 5, n. 5), red banded ware, glazed pottery, nails, glass, coal and scraps of achromatic bowl-lid (fig. 5, n. 7) have come to light from the ground 14.

2.3 Manufacturing facilities

In the northeast side of the rasola (trench 5/87, fig. 2, S17) the installation for the manufacture of iron 8 has been individualized (⌀ inside 320-300 cm; ⌀ outside 430-370 cm), from a large elliptic tank realized in stones and mortar within which the collapse has emerged 9, as well as scorched earth mixed with ferrous wastes and ceramic. The structure has been installed on the mortar and pozzolan floor 37 relevant to the frequentation phase of VII-VIII century and on the natural rock (uuss 2, 16, 22 and 34) appearing on the West surface, filling the gradient of the ground toward southwest through different fills. With the exception of the superficial layer 1, which has returned a fragmentary edge decorated of an achromatic basin (fig. 5, n. 9), they have emerged from the ground 8 an harpoon edge with fumigation signs, a fund with a wall in achromatic ware (fig. 5, nn. 8, 11) and basin's edge in decorated achromatic ware (fig. 5, n. 6); from the ground 12 a turned outwards of fire achromatic pottery (fig. 5, n 12); from the layer 35 an edge with handle and side belonging to a painted amphora (fig. 5, n. 10); and then from the layer 16 a basin's edge in painted engraved ware (fig. 5, n. 14), similar to the one emerged by the layer 41 (fig. 5, n. 13). The forge had a south opening (width around to 40 cm) for the load and the unload of the fuel and of the material to heat up. The rectangular lodging cut from the opening was probably destined to the bellow'grafting, while a small rectangular masonry structure was used for the metal to rework. According to the spongy cap slags accumulated on the fund of the furnace (50 gs - 5 kg), we can suppose that it dealt with a low fire, or rather of a hole dug in the ground, generally realized with walls dressed of stones and refractory clay, in which coal and ferrous mineral were loaded. The combustion was activated with bellows by hand and the gotten product was impure and a little carburized because it was essentially constituted by iron. The attribution of the forge waste results to a specific phase of processing (purification of the raw metal, putting into shape of objects), especially if it is considered the fact that we don't have any traces of a beating area, that was probably placed close to the forge fire [25]. These indicators don't seem to highlight the reduction of the mineral on the ground, but only the presence of one prolonged activity of second manufacture of the processed metal, in view of the production and repairing utensils related to the conduct of the daily activities. The metallurgical production of the forge had to be able to satisfy the requests of self-consumption of a small community, therefore we can suppose that to make forehead to a more binding iron production shops were appointed risen in the proximities of the residence of the gastald, therefore it is reasonable to assume that to cope with a more demanding steel production they were deputed fate workshops near the residence of the gastald. In the activity area of the iron manufacture continued until the XI century, when the disuse of the structure started, completely abandoned during the following century, as shown by the fillings and the collapses that obliterate it. Similar applications in which we can find the same type of deposit - layers of earth, stones, carbons, ash and waste - are documented in Rocca San Silvestro [26], Rocchette Pannocchieschi, Rocca Campiglia, Poggibonsi and Montarrenti [27] with chronologies collocated between the IX and XI century.

3. Conclusions

The Middle Ages represents a period of great dynamism of the countries subjected to continuous variations and developments in the economic and social plots. The archaeological survey conducted in the site of Montella has revealed how the settlement articulation of IX century was added in a progressive process of formation of a real dominion, whose analysis, supported by the data furnished by the material culture, contributes to shade light on the formalities of hierarchy of the installed order, in which the power's structures enter in a context of 'urban village' [28].

Fig. 1: Montella, walled area of Monte [Rotili 2011 (edited by), fig. 2b].

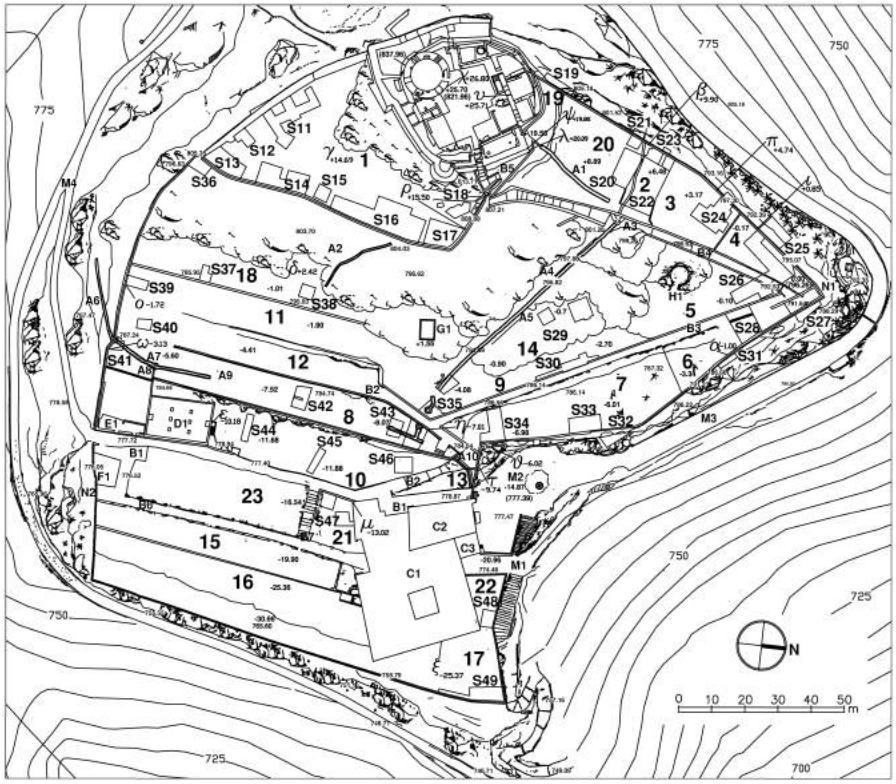

Fig. 2: Montella, plan of the fortified complex [Rotili 2011 (edited by), fig. 3a].

Fig. 3: Rasola 1, trench 2/88-92 (S16).

Fig. 4: Rasola 1, trench 5/87 (S17).

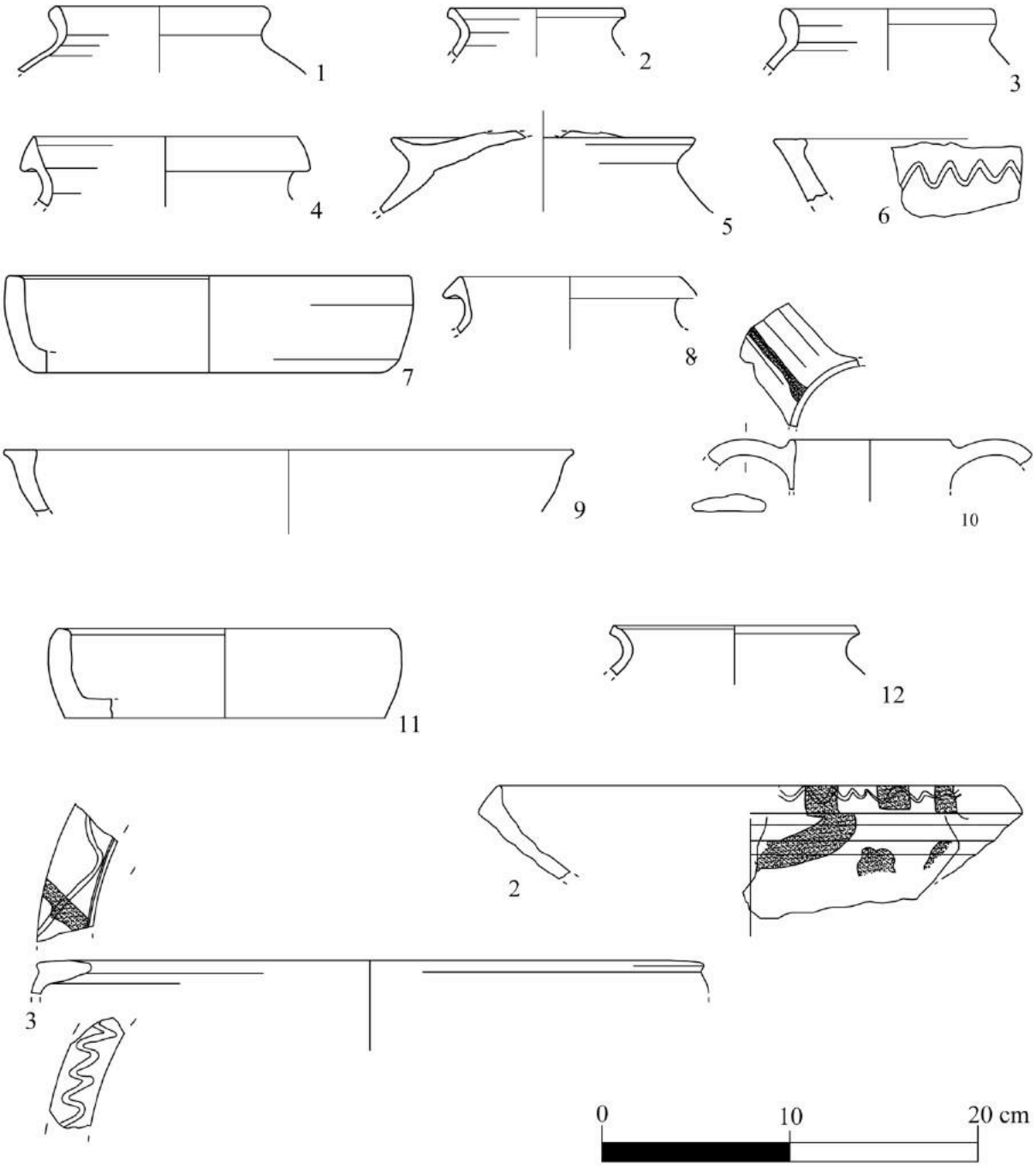

Fig. 5: Pottery of the IX century from rasola 1.

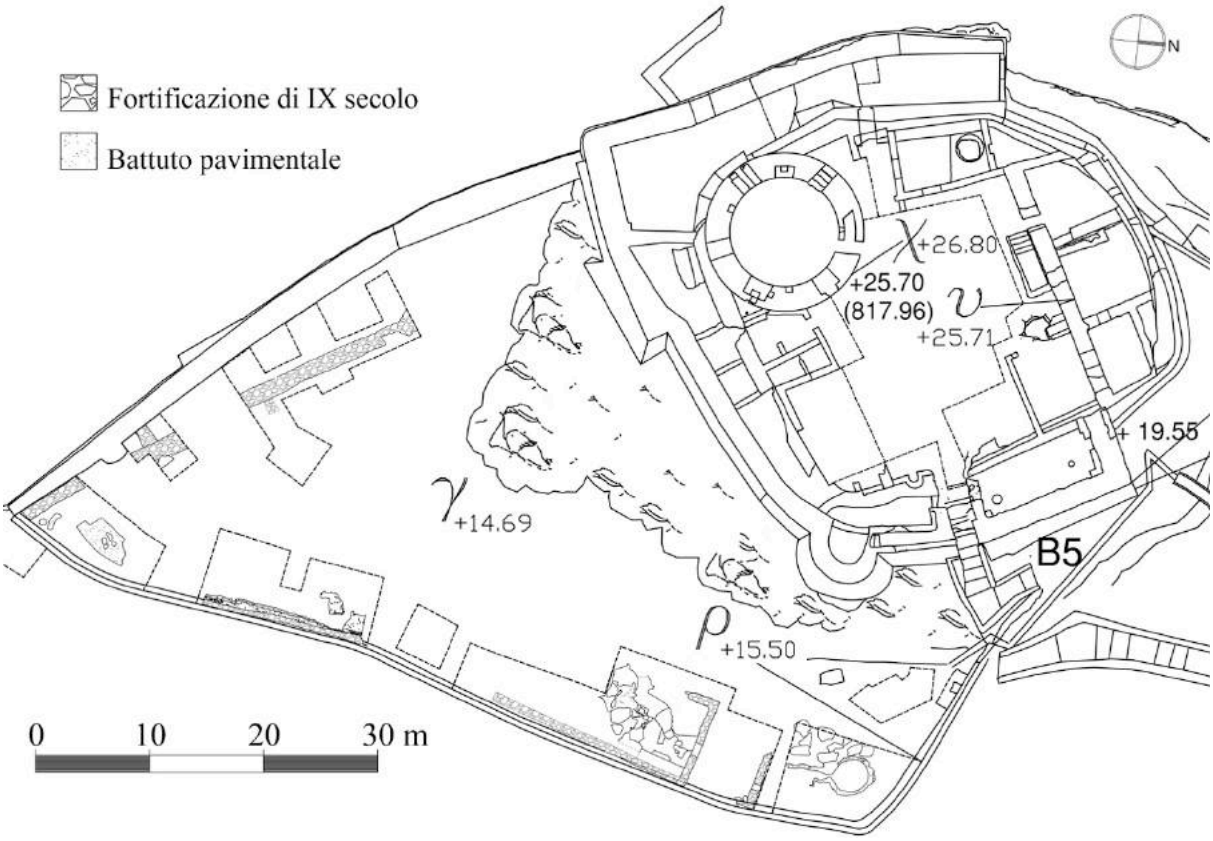

Fig. 6: Archaeological evidences of the IX century from rasola 1.

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From House Of The Mother And Child Onmi To Youth House

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Abstract
The rationalist architecture in Italy, born in the Fascist period, represents an important experience in urban design. Urban areas, new residential buildings and specialistic architectures, characterize the cities and the buildings of the fifties. The applied research to teaching, studies these architectures and aims to encourage the recovery of actual architectural types, today do not conform to actual seismic and energy standards. The project of the ex House of the Mother and Child in Potenza, (built by ONMI in the fifties), is an example of sustainable rehabilitation of the disused building, not safeguarded by superintendents, but with existing potential. This work comes from a graduation thesis and consists in a sustainable "reactualization" of the building. The study, based on knowledge and survey, is aimed at urban regeneration and at reinterpretation of the architectural language. The hypothesis of reuse resumes the "original" destination but updated: a □outh House.

Keywords: rationalism, reuse, reactualization, sustainability, urban regeneration

1. Introdution
The experience that is documented in this paper is the result of research activities which look towards the city built and, therefore, towards the redevelopment and the regeneration of urban areas. For years, it's shifting the focus on modern architecture, with particular attention to the architecture of the thirties and the post-war. In fact, the rationalist architecture in Italy, although it has roots in the fascist period, represents an important experience in the design of cities since the fifties and sixties, as well as thirty years have been characterized by important urban planning that have reshaped the city and redefined the perimeters of the same. Entire urban areas, new housing estates, specialized architectures, characterize the recent past which has its manifestations in construction nor recent to be current and not too old to be protected.
It's on this heritage, of which cities are rich, that the research applied to teaching focuses, to sensitize the recovery of artifacts that are modern and functional typologically, but technically and technologically outdated compared to current seismic and energetic regulations.
It is a heritage which, however, has its strong identification and historical connotation and it implies, in most cases, architectural and urban quality. Therefore, attention to this heritage is more current than ever in the new logic of urban regeneration .
Taking a small historical digression, the city of Potenza abandons its medieval walls at the beginning of '900, when contemporary construction starts up new decentralized neighborhoods that become, over time, functional urban areas and self-sufficient, well-organized and designed according a precise drawing of city.

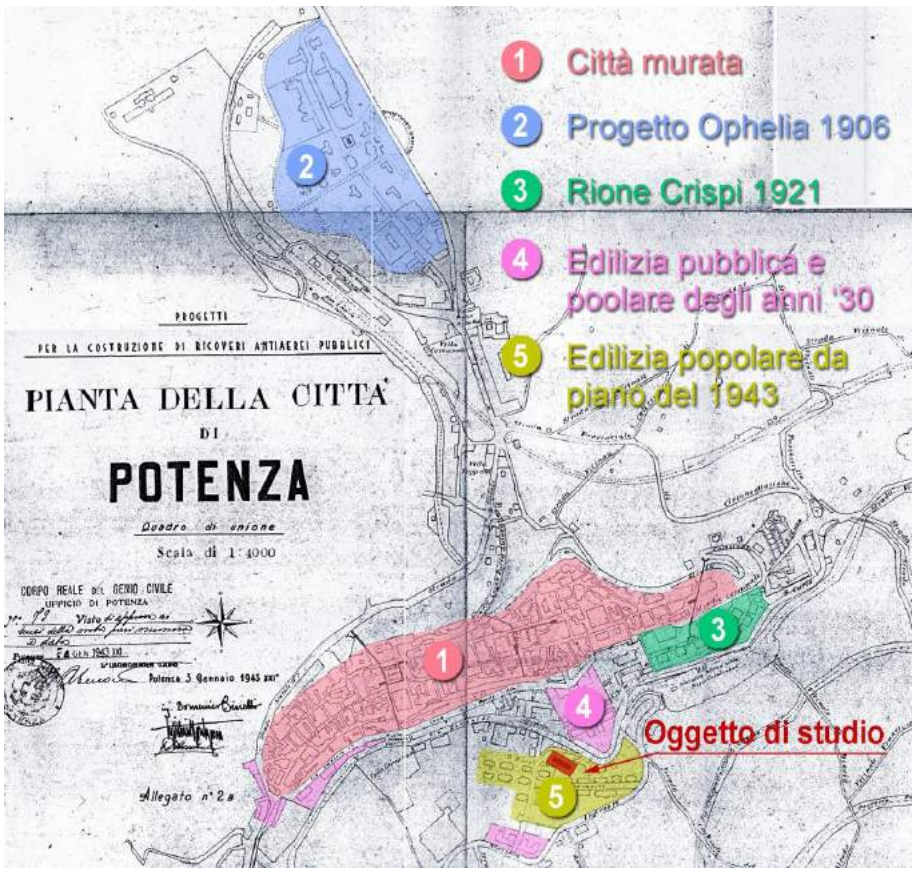

Fig 1. Map of the city of Potenza (Royal Corps of Civil Engineers, 1943), for the construction of public air-raid shelters. This mapping represents the historical evolution of the city from the early '900 up to the social housing plan that will be built in the postwar period

In this period, for example, Santa Maria district was born around Ophelia project by Giuseppe Quaroni and Marcello Piacentini in 1906 (Fig.2). The popular districts of the twenties and thirties as Crispi district or the construction on extramural streets, break through definitely the walls of the historic city; these districts are organized in a new city design as a logical expansion outside which corresponds to a rapid population growth. Starts, then, an exodus to the "new places" of the city or to new neighborhoods that ensure a better quality of living than that of "cuntane" [1] and Potenza's alleys.

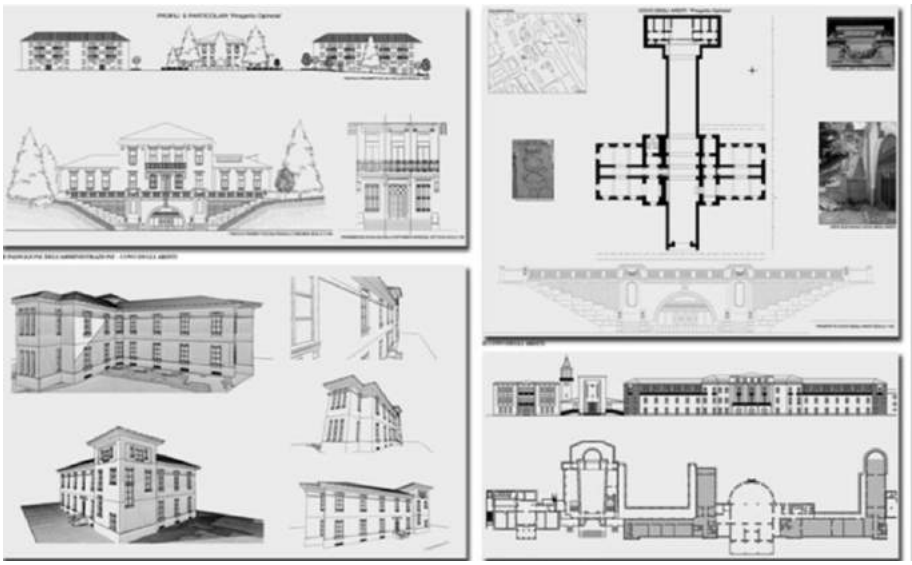

Fig 2. Drawing of the District of Santa Maria in Potenza, born as Ophelia Project of Eng. Giuseppe Quaroni and arch. Marcello Piacentini, 1906

This process of expansion, corresponding to a revolutionary concept of the city, continues still in the fifties and sixties when new popular neighborhoods like Verderuolo, Italia district, Risorgimento district etc., correspond to an idea of city-planned, well thought out, that has, even today, its strong consensus in the demanding citizen.
The object of study presented here is part of this historical and urban context: the ex House of the Mother and Child in Potenza, built by ONMI in the 50s. It's a specialist building situated in a popular area of new expansion, characterized by residential buildings, schools, churches, markets, in view of the periphery self-sufficient.
Beyond the "noble" social use of the building, it's interesting to find in the same a clear and typical architectural reference of the time, widely seen in the experience of Italian rationalist architecture in the specific intended use.
The project experience documented in this paper is part of a research aimed at the sustainable recovery of the disused building, not protected by the superintendents, but with current potential. The work on the ex House of the Mother and Child (ONMI) in Potenza, consist in the sustainable "reactualization" of the artifact, in a careful path of knowledge based on historical and archival research and on the architectural survey, aimed at urban, functional, technical and technology recovery with the reinterpretation of the architectural language. The hypothesis of reuse, in line with market requirements, resumes "original" target but actualized: a □outh House.
On the mapping shown in Figure.1, there is the popular neighborhood near Paladino avenue (called Ciano district) which is provided in the pre-war plan. The creation of the district will be a reality in the '50s. In this plan mapping is already planned the construction of the object of study, namely the House of the Mother and Child ONMI.

2. Ex House of the Mother and Child

The first step towards the regeneration project is definitely the stage of knowledge. It starts from the archival research of the building in question to the analysis of works of architecture built in Basilicata and in Italy during the rationalism, showing the similarities and differences. The construction of the House of the Mother and Child in Potenza, dates from around 1950 on the initiative of the National Maternity Childhood Organization (ONMI). The original function is the combination of different activities such as obstetric clinic, pediatric clinic, maternal refectory and nursery.

Fig 3. Photo survey of the state of the places

Currently the property is totally abandoned and unused and is part of the list of municipal property to be disposed of, therefore it's the object of sale to private entities. This can be, for the building, a new life, a new future based on the recovery and reuse.
In the path of knowledge and analysis, fundamental was the architectural survey phase that, through the measurement, analysis and representation allows to graphically reconstruct the study documentation that redefines the formal, structural and functional features of building object.
The building plan is almost rectangular, while the stairwell, located on the southwest side, is detached from the rest of the building with a body which rises to a height of 12.80 m from the street level. The building consists of two floors with a surface area of about 440 mq and a basement level that is developed for a limited area of the plan, approximately 200 mq.
The only structural intervention, documented by archival research and reported in the survey operation, has involved the building following the earthquake of 1980, with the construction of a pitched roof that covers the entire building except for the stairwell that remains with the flat roof.

Fig 4. Drawings of architectural survey

The resisting structure is made of non-square and irregular stone masonry; the floors are a brick and cement combo high 30 cm with curbs 50x25 cm size; finally, the foundations are made of reinforced concrete curbs on bored piles.
The knowledge of the material and its conservation status is a prerequisite for designing and evaluating the different possibilities of intervention. It has been done a thorough pathological survey, able to identify the causes and effects of degradation of their components, as well as performance and energetic verification and the seismic vulnerability verify. The building, from the energy point of view, is totally inefficient, in fact, it is part of class G, the last among the categories. In the proposed project is supposed to work in order to significantly increase its performance and minimize its consumption, limiting in this way the environmental impact and pursuing the goals of sustainability and energy saving, as well as the reactualization of the building.

3. The redevelopment project: Youth House

When we talk about urban and architectural recovery, it is often thought to return to the original state of a building that deletes its state of degradation. It has the desire, for example, to give back the plaster fallen over time to the walls, to clean up the signs that time has left. However the desire to "recover" is not born of mere intention to restore the old walls as a matter of decorum, but also by the desire to bring life back to a place: the building wants to be recovered both in its physical form as in its valence of place falling in the "city" system.
The "place" object of study, in the proposal, based its regeneration and reuse in the choise of the new function that is a return to the past: a “Accommodation Community”. This reuse plan to host minors who need to be removed from their families for short or long periods. This choice is based on real needs identified in a market research and on the real interest of local entrepreneurs that work in the social field.
The functional design goes hand in hand with that of recovery. As well as it has recovered its original function, adapting it to modern times, the project aims to rediscover the historical and material identity of the building, integrating in it contemporary solutions consistent with the character of the work that not prevail over it. The basic idea of the project is to preserve and valorize the Rationalist building, proceeding according to modern methods of recovery and urban regeneration.
The choice of the new function, in agreement with what just said, allows to maintain the internal and external features of the building; furthermore it is the answer to the need for a structure of this type in the regional capital. In any case, the building and its new feature will join over time in the imagination of its inhabitants creating a new center and a new reference for the community.
The project is divided into several phases:
- philological recovery of the building, preserving and valorizing the typological and formal characteristics of the original project, respecting and proposing, therefore, the rationalist project and making it visible in its entirety;
- static and seismic improvement, with measures to make the structure appropriate to contemporary regulatory standards and to laws antiseismic;
- renovation of the systems for adaptation to the intended function and to contemporary normative standards of energy saving;
- Interior design;

- Outside design.
The project idea, born in order to preserve as much as possible the existing building volumes and spaces, aims to make a controlled modification strategy of formal external image that is conjugated to technological and functional optimization.

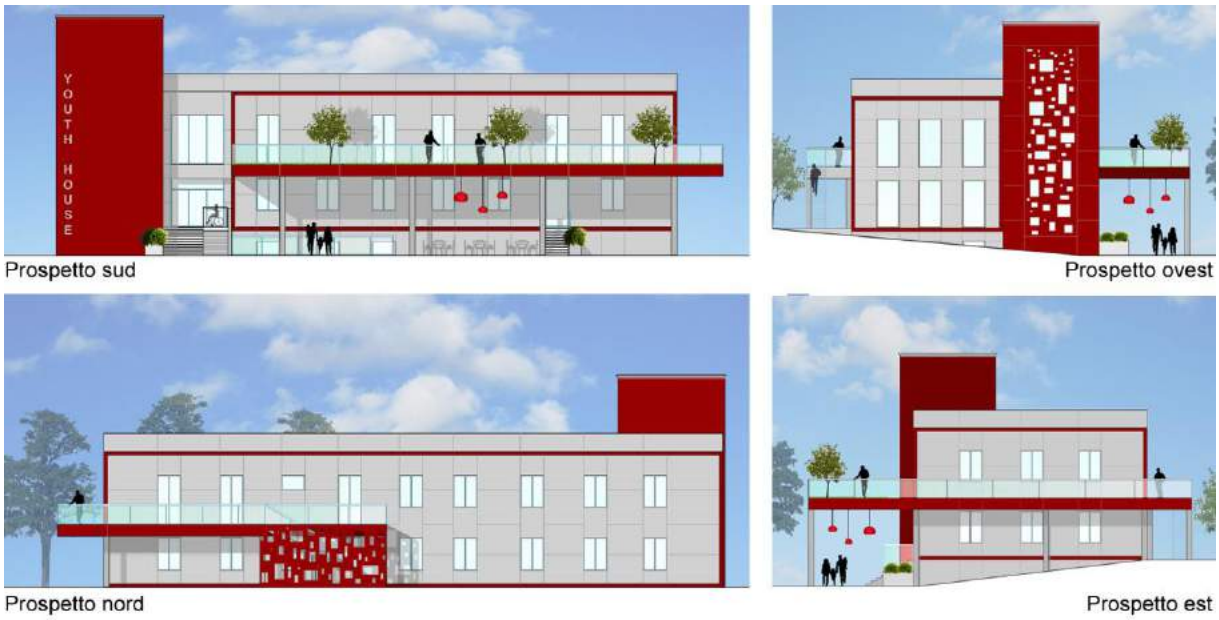

Fig 5. Project elevations

In the project we wanted to maintain the separation between the stairwell and the "horizontal" body, making it clear through the contrast of colors and the irregular punching of the coating, and also with the demolition of the pitched roof, for a return to the original condition as well as for the decay of the roof structure. The windows have remained almost unchanged. The original rationalist architectural language was therefore respected, proposing simple and net volumes, the preponderance of the line and right angles and the use of prefabricated elements such as Corian□ sheets for the ventilated facade cladding. The terrace is a recurring motif in buildings made by the ONMI, and the project propose it such a characteristic element. In fact, on the first floor, the little balcony was replaced by a large roof garden that is a meeting place for young guests.

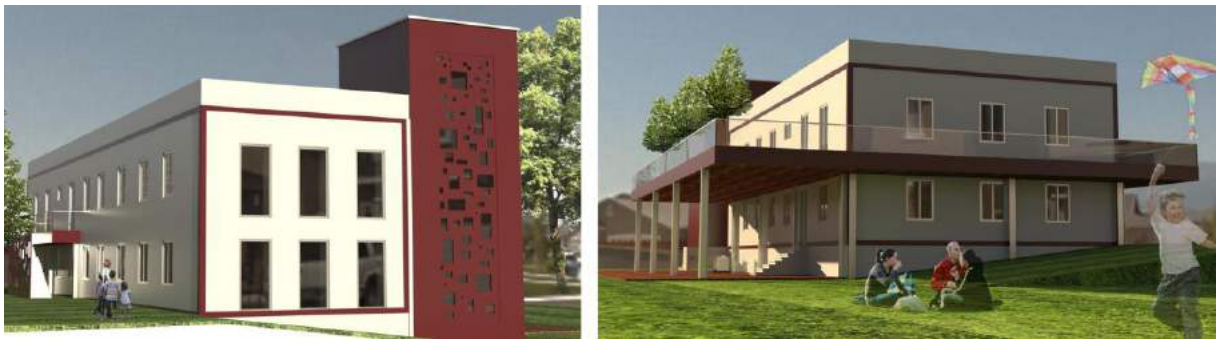

Fig 6. Project Rendering

Other interventions on the structure concern the horizontal and vertical closures, in order to improve the energy performance of the building.
The existing pitched roof has been removed and, considering the altitude of the Potenza area, it has been replaced by a sloping roof hidden by the parapet in Corian□. The real roof is the flat hot roof. The pitched roof, in reality, constitutes the photovoltaic and thermal system having a steel structure.
It's also provided for a rainwater recovery system that occurs thanks to the downpipes, incorporated into the ventilated wall, and thanks to a tank of 30,000 liter capacity.
After the interventions proposed, it was carried out the energy verify of the new building casing, which, from the class G of the status quo, passed in class A □, the maximum attainable, so it meets the

standards of passive buildings. This result transforms the structure in a strongly "attractive" building on the property market, as it is competitive with today's standards of new constructed building.

4. Conclusions

The experience of study, briefly documented in this paper, responds to the diffused problem in our cities, namely to the problem of abandoned buildings in the city limits. The abandonment of this properties often comes from "management" problems that, with high energy costs associated with the inevitable costs of structural improvement, can make the use impractical and not cost-effective. But, nowadays, an investment aiming at the performance improvement of a building can be convenient since the capital to invest could rebuild itself in a reasonable period. In addition, the recovery of a building that is part of the city areas, it can trigger the re-stitching of spaces and functions, today interrupted by these urban "empty".

The abandonment of the obsolete "boxes" interested, more, recent construction that, in his fifty, sixty years of history, hasn't a value to be subject to protection. The research applied to this realities constructed, gives back to recent history and to its architectural expression, the value it deserves. The whole process of knowledge that revolves around the "survey" is certainly at the center of a development path that is, in the adopted model, a good and efficient tool that is expandable to similar situations.

Notes

1. The cuntane are the characteristic alleys of Potenza that had the only outlet to the main street and were closing on the outside perimeter of the city

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The Structural Redundancy in the Pombalino System

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Abstract
In 1755 a violent earthquake in Lisbon destroyed completely down town city and caused the death of about 10000 people. After the earthquake the prime minister of the king Don José, Marquês de Pombal, called the architects and engineers of the kingdom to invent a constructive system that can resist seismic activities. They created a system that nowadays is known as the "Gaiola Pombalina" the Pombalino Cage.
The knowledge of the functioning and the structural behaviour of the system are still today very little studied. Down town Lisbon is for the city and the country of cultural and economical importance. This fact encourages deepening the study of the functioning and characterizing the seismic behaviour of the system.
The vertical timber truss between the exterior walls (Frontal) has a determinant function in the seismic resistance of the construction system. Therefore, the role of the exterior walls of the façade cannot be neglected. Their presence marks an important role in the seismic resistance, which should be studied. We intend to postulate the existence of redundancy in the structural behaviour of this constructive system.
In this paper we present a research that proves the existence of redundancy in the constructive system of the Pombalino Cage.

Keywords: pombalino system, pombalino cage, structural masonry, wood structures, structural and seismic reinforcement

1. Introduction
The Pombalina Cage is a building system developed in Portugal after the earthquake of 1755 and its main aim to equip the future buildings constructed in the city's reconstruction process, with the ability to withstand future earthquakes.
The knowledge of the operational and structural behavior of the Pombalino system has still today unknown aspects and is little studied, which of course matter to investigate. One aspect still poorly understood is the role of the masonry facade walls in the seismic response of the Pombaline building. The scientific and technical literature produced on the Pombaline building is vast, but the bearing capacity of the Pombaline building is always essentially attributable to the presence of his famous three-dimensional timber cage.
In structural terms, the Pombaline cage is a spatial truss that because of its three dimensional character it is well known for its efficiency and power to provide strength and stability to the building, including its seismic resistant capacity. We understood it as soon as the military engineers in 1755, in charge of producing a building system resistant to earthquakes, hade made use of this structural three dimensional system - the famous Pombalino cage. It is even the system that now modern engineering uses in structures to provide nuclear plants seismic resistance capacity (Fig.2 Fukushima). But this assertion on the function of the spatial cage poses the problem to understand why in the Pombaline building, the military engineers in addition to the space truss also adopted peripheral resistant walls of masonry with a relatively high thickness of 1.20 meters. Have these walls some contribution to the seismic resistance of the building? This is the question we seek to answer with the research undertaken. The presence of peripheral masonry walls with relatively high thickness about a meter,

introduces redundancy in the structural functioning of the Pombaline building. In addition to the three-dimensional truss, the building has also an additional structural subsystem propitiated by the facade masonry walls with the box effect.
In this paper we present the main conclusions, including on their seismic performance and its structural phenomenology.

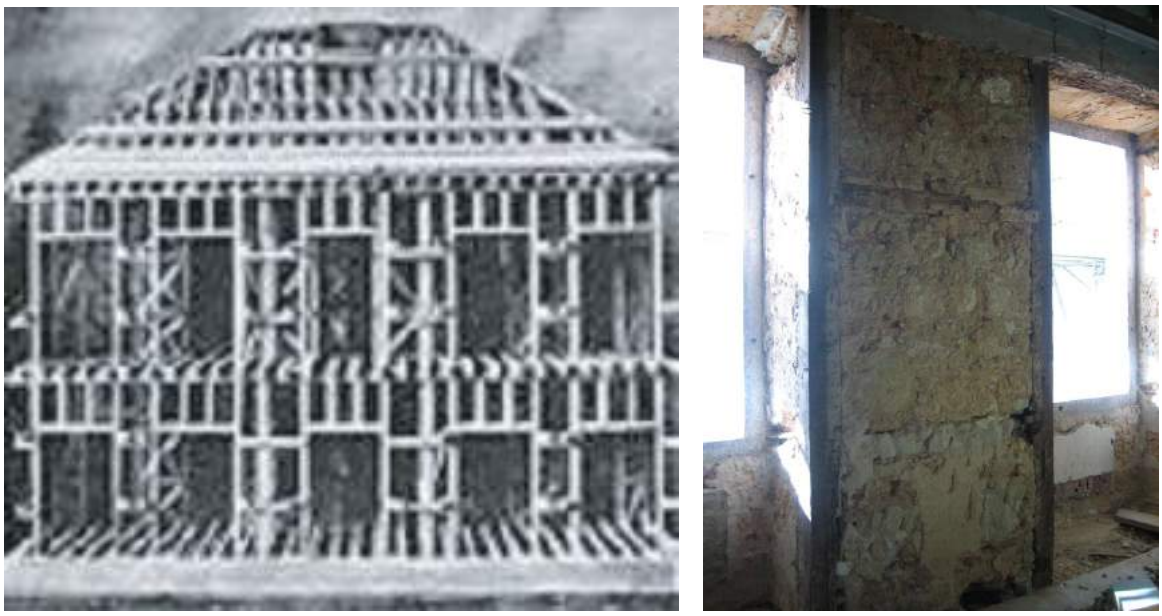

Fig. 1: The Pombalino structure

Fig. 2: The structure of the nuclear central of Fukushima, http://www3.nhk.or.jp/nhkworld/en/news/japan/

2. Origin and constitution of the Pombalino System

A vast reconstruction program of the city with a new urban infrastructure followed the 1755 earthquake. As a result of concerns of the Marquis of Pombal (Prime Minister) and the Eng. of the kingdom, Manuel da Maia, about the seismic safety, the engineers in charge of rebuilding the city tested and developed a set of constructive provisions, formal and material, aiming to improve the seismic performance of buildings.
The formal plan consists of the geometric regularity in plan and height of the new Pombalino buildings, which results in a symmetric presentation of the buildings regarding their main axis. The design of the material constructive provisions features essentially two characteristic elements:

I. The walls named Pombalino Frontal (name, no translation) rule in the two orthogonal directions of the building plan - vertical timber trusses with crosses involved and filled with ceramic and clay mortar;
II. Outer peripheral facade walls of stone masonry, in the entire building perimeter, forming a box, consisting solid walls and wooden structure embedded within the walls.

Fig. 3: Timber trusses of the Pombalino system with crosses

The set formed by the internal Frontal and trusses embedded in the peripheral facade masonry wall is usually named the Pombalino Cage, considering the large amount of timber involved and the three-dimensional arrangement of timber elements. This three-dimensional structure of wood, forming a cage, is considered in the literature as the great innovation of the Pombaline building system. The system authorship is attributed to architect Carlos Mardel, who even conducted a seismic test of a model of Pombalino system built in full scale in the “Terreiro do Paço”, the large square in downtown Lisbon.
The existence of vertical timber trusses inside buildings, arranged in the two orthogonal directions of the plant, carefully attached to peripheral facade masonry walls, nominated master walls, and equally firmly attached to the timber floor, clearly demonstrates the intention to equip buildings with the capacity to resist horizontal forces.

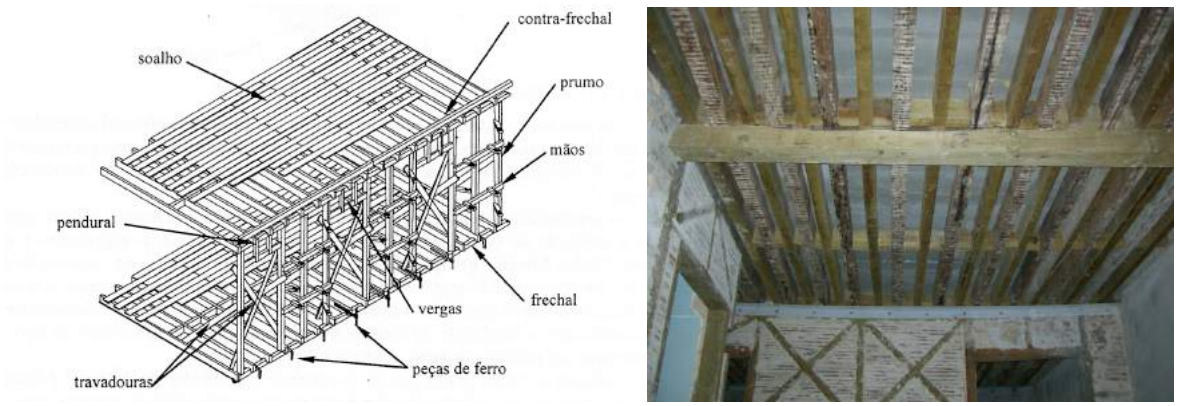

Fig. 4: The “Pombalino Cage”, 3D truss with crosses and stiffness bars [6]

3. Structural modeling

Today's knowledge is still sparing about the functioning and structural behavior of the Pombaline buildings. The role of the wooden Frontal Pombalino is by many historians and researchers considered determining for the structural performance of the building. Further study is necessary in order to clarify the real and effective role that each of these two types of walls plays in the seismic resistance of the Pombaline building (the Frontal timber and the four peripheral walls in the form of a stone masonry box). Sometimes the Pombalino Frontal due to its ductility, the main task of balancing action and energy dissipation transmitted to the building during the action of an earthquake, and even considered negligible the contribution of the exterior walls of stone masonry shaped as a box.

In order to respond not only to this issue (role of masonry walls), but also to understand the functioning of the phenomenology of Pombalino system, we initiated a study of structural analysis of this construction system, which main conclusions are presented in this paper. The conducted study focused on a model based on the method of discrete elements, which considers the nonlinear behavior transmitted through the joints present in the masonry (between masonry blocks). We defined a computational model of a building-type, characteristic for Pombalino system with five floors, a total height of 16 meters and a plant area of 16 x 12 meters. It is intended to check the influence of the existence of the Front walls in the global response of the three dimensional structure of the building-type when subject to seismic action, and, moreover, to evaluate the influence of peripheral masonry wall thickness in the building stability and resistance.

As mentioned we used the method of discrete elements, or "method of the blocks." This is a numerical modeling method that allows the study of surfaces with discontinuity structures, or structures consisting of particles or blocks. This method was initially developed under the rock mechanics for the study of works in massive fractured rocks, such as tunnels, embankments and dam foundations. Subsequently, the application of this method has been generalized to other engineering fields where analysis of the mechanical behavior of discrete structures or formed of blocks is required, as is the case for masonry structures. The elements or blocks can be admitted either as rigid or as deformable, in which case each block is discrete in an internal finite element mesh. During the analysis, models of discrete elements allow slippage and separation between blocks, entering into account the change of the structural geometry arising from the large displacements. These models are particularly suitable for the study of non-linear behavior and for the simulation of the rapture processes.

The solving method habitually used in the method of discrete elements is based on a step-by-step solution on time of the equations of motion of blocks. It is, therefore, a dynamic algorithm, which is based on an explicit method that does not require the formation of a stiffness matrix or the solution of equations. However, it has the disadvantage of requiring very small calculation steps. The analysis of the static problems is based on the same dynamic algorithm solution, but in this case, it uses a very high damping that eliminates vibrations in the structure. Thus, one obtains a convergence process step by step to the static solution in the case of balance, or otherwise develops a fracture mechanism. This way of static troubleshooting method is referred to as "dynamic relaxation". The mechanical analysis of the functioning of masonry is suitable for application of this method, since deformation and failure of these structures strongly depends on the behavior of the joints. An important aspect of this method is that it allows large displacements and rotations of blocks. Furthermore, the numerical model used detects and permits a reformation of new contacts between blocks, depending on the displacements are processed and integrates them in the subsequent calculation.

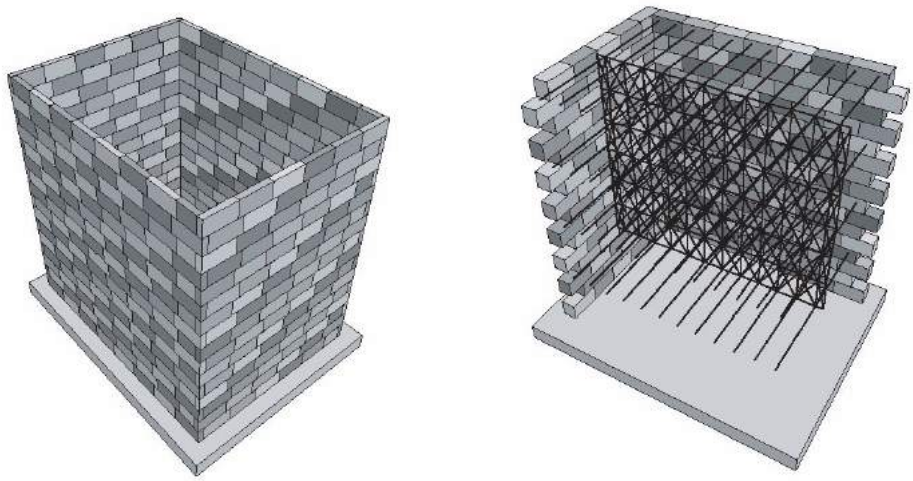

Fig. 5: The two models, left only peripheral walls, right with Frontal and slabs

4. Analysis

In order to analyze the joint operation between the exterior masonry walls and interior Frontal walls, we proceeded the analysis of two distinct three-dimensional structural models separately:

I. Ideal building consisting only of the peripheral walls of masonry (box-shaped);
II. The previous model with the addition of floors and two Frontals, both in timber.

The comparison of the results of the analysis of the two models permits to discover the impact of the interior Frontal on the building resistance performance.

The geometrical properties considered are 16x12 m in plant and 16 m height. The peripheral walls have 90 cm width at the ground floor and 35 cm on the top.

The material properties are considered as follows:

Blocks

Resistance: Compression: 5 MPa; Traction: 0,1 MPa; Cohesion: 0,25 MPa; Friction angle: 25º; Density: 700 kg/m^3; Young's Modulus: 1 GPa

Behavior model: non linear, Mohr-Coulomb

TIMBER

Resistance longitudinal to fibres: Compression 25 MPa; Traction 18 MPa; Density 550 kg/m^3; Young Modulus 10 GPa

Behavior model: elastic

In order to simulate an asymmetrical structural behavior of the building, to analyze torsion, an asymmetric mass distribution was considered in the superior left front corner of the building.

A numerical model of blocks represents masonry walls where it is assumed that fracture of material can occur only in the joints between blocks. The model verifies fracture under tensile stress and shear based on the Mohr-Coulomb model, where the shear is defined by the parameters of cohesion and angle of friction. The tensile rupture is verified by comparing, for each calculation step, the normal stress at the joint with tensile strength. In case of a tensile rupture at a point of the joint, the stresses (normal and shear) are canceled, allowing the opening of the joint. In the case where the joint returns to close and be again under compressive stress, it is considered that it works only under friction (i.e. does not retrieve the tensile strength and cohesion). The numerical model reconsiders cases of the reclosing process of the joint, while maintaining zero the tensile strength.

The fracture shear is verified by comparing the shear stress at the joint with the cutting resistance defined by the Mohr-Coulomb criterion, where the strength parameters are those of cohesion and friction, at each calculation step. In case of fracture in a point of the joint, it is considered that the joint loses its tensile strength and fails to have cohesion to resist, passing only to resist by friction. The shear stress is corrected to the allowable stress given by the Mohr-Coulomb criterion without cohesion, which allows the occurrence of slippage at the joint. In the developed numerical model, the horizontal joints are spaced each meter. The vertical joints are alternated with spacing up to 2 m. Thus there are 16 horizontal joints and a large number of vertical joints where it allows both the occurrence of nonlinear behavior and fracture. The deformability of the block system is calculated to obtain a given modulus of elasticity equivalent to continuous medium which in this case was estimated to E = 1 GPa.

The seismic force acting on the building type defined was simulated as closes as an earthquake defined in Portuguese Safety Regulations. The main features adopted were a peak acceleration of 0,17g and an actuation time of 10 seconds.

5. The influence of the Frontal in the global performance of the building and analysis of the results

The procedure is to compare the behavior of the models for the building type one with Frontal and the other with no Frontal and pavements. The results show that the Frontal has an impact on the seismic behavior, but surprisingly that the impact is not that important as historians attribute, despite its ductility capacity, which permits great deformability. Thus, it can be concluded that the seismic resistance of the Pombalino building is essentially secured by the width of the exterior walls. The weight and the box effect of the masonry walls are determinant elements for the resistance.

The model without Frontal and pavement with exterior walls of 90 cm shows stability without the risk of collapse. This fact permits to conclude that the Frontal has no determinant role in the resistance of the Pombalino building. Nevertheless, the Frontal has a specific function to play. Its role is to unite the movement of the peripheral walls of the opposite and parallel facades. This effect harmonizes the movement of the parallel exterior walls by reducing mutually their displacement in the extremities and coordinates their remaining displacement in the same perpendicular direction of the wall. It also results in less displacement of masonry blocks after the fractures in the joints due to traction. All together, the peripheral facade masonry walls connected to Frontals and slabs strengthens the box effect, which improves the torsional stiffness of the building, which originates the excellent seismic resistance. Furthermore, the interior Frontal limits the appearance of local vibrations in the exterior walls,

preventing them to vibrate independently of the rest of the structure. This arises the stiffness of the structure and the frequency of vibration, which improves the performance of the building. The exterior walls in the model without Frontal show a certain independent vibration due to existence of openings for windows especially on the upper zone of the walls where the width is strongly reduced. The existence of Frontals increases all in all the frequency of the vibrations about 30%.
Another surprising conclusion that emerges from the research carried out is the seismic resistant capacity of the Pombalino building features. The building-type considered in the calculation, representative of Pombalino system of downtown Lisbon, with a wall thickness of 0.90 meters, does not collapse by standardized seismic action. The analysis of the results obtained with the model-building type, constituted only by the outer walls of masonry, without inner Frontal and slabs, appears stable in earthquake simulation. After 200 years of its invention, we see buildings can be built with the Pombalino system as they comply the current anti-seismic regulations. Amazingly this demonstrates the strength and power of the Pombalino cage.

6. Conclusions

The study permits to obtain the following conclusions:

- The Pombalino building, called Pombalino cage, is a building system designed to ensure anti-seismic resistance;
- Pombalino building still meets current seismic regulations;
- The system has redundancy provided by the three-dimensional cage of wood and the peripheral masonry facade walls;
- The exterior walls are determent in the seismic resistance of the building by the weight provided by their thickness which acts as a pre-stress on the walls, which reduces the traction and increases the building capacity to withstand horizontal forces originated by the earthquake.

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Cultural landscape, industrial heritage and architecture. Energie□Park. Reading a former mining identity and rediscovering the "energy landscapes" of Emilia Romagna.

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Abstract

"In Emilia Romagna, you may explore the Energy". With this slogan begins the project Energie-Park: a strategic process of regeneration, establishing new relationships between men and the landscape. It aims at staging an ancient mining identity, creating a sense of place and new opportunities of local development, through the architectural design of new centralities within the landscape and a smart network. The recovering of some Apennines areas, exploited as oilfields in the 20th and today degraded, may begin from a design process at several scales; from the landscape asset to the architectural scale, and from the exhibition design scale, to the virtual dimension. A new collective infrastructure, mending the existing paths within the landscape, and linking them with a new digital network, will encourage a innovative touristic development and promote the local economy. The research by the lab AMR, University of Parma, is supported by municipalities and private partners. The design process, the use of innovative technologies and methodologies, the local government best practices, will reactivate a landscape representing today a negative value, but if properly grafted on a wider network, may create a system of cultural and natural tourism, "slow" but not too much.

Keywords: architecture, cultural landscape, centrality, identity, design process

1. Introduction.
The role of the □niversity and the innovation process of the landscape.

The main task of the University of Architecture, is the transmission of technical, scientific, theoretical and poetic knowledge, in the field of the design process. Its purpose is also the research about the discipline innovation features, while the repertoire of cultural, practical and intellectual models - taken from the past and interpreted in the contemporary - becomes an effective tool both in designing the new architecture, and in developing the project as a complex process. As well the design process is more effective if more rich in interdisciplinary contributions, references to conceptual models, technical and cultural skills, relationships with the international debate.
The Faculty of Architecture, at the Parma University, was born just over a decade ago, with the task to be an intermediary between the world of the scientific research applied to the design disciplines (composition, history, technology, relief etc.), and the needs of the local communities. The strategic task of this University model is the use of scientific expertise as a strategic tool for rethinking the development of deprived cities and landscapes, creating opportunities for new growth models, and for the landscape "policy" in the higher etymological meaning: , or "concerning the citizenship". The main vocation of the University is the interpretation of the past cultural identities in disadvantaged or degraded places, through the tools of the contemporary project.

The research laboratory Architecture Museums Networks (AMR [1]), works within the Department of Civil Engineering and Architecture DICAteA, at the University of Parma, since the year 2005. It is an observatory on the local development, it coordinates conferences, study days and scientific publications about the topics of the public building and the cultural landscape. The research group, led by professor Aldo De Poli, with a coordinated activity of scientific comparison and dialogue with the institutions, aim at outlining the best conditions for the implementation of best governance practices within the relationships between the communities and the place identity.

2. The mining industry of Vallezza and the Mu.PE Design Process. Designing a new landscape centrality.

Since the 2011, the research lab AMR, has established agreements with some local government in the Province of Parma. Firstly, the municipality of Fornovo di Taro and the private company Gas Plus Italiana Ltd; and lately the city of Salsomaggiore Terme and the Company Terme ST Ltd.
The agreements aim at developing studies and regional analyses to propose new destinies for a part of the territory, very rich in collective expressions. The design process within the Apennine landscape is the result of notions and concepts that have crossed the theoretical architectural debate, focusing on few poetic visions of the future, and acknowledging a composite background of places, people, thoughts, equipment, technical machinery and craftsman skills.
The project aims at staging an ancient mining identity, to create new opportunities of local development. The smart recovering of some Apennines areas, exploited as oilfields in the 20th, and today degraded, may begin from a design process at several scales; from the landscape asset to the architectural scale, and from the exhibition design scale, to the virtual dimension. The project aims at creating a new collective infrastructure, mending the existing streets and paths within the landscape, and linking them with a new digital network, to encourage an innovative touristic development and to promote the local economy. That is a strategic project of “wide area” where the ancient mining identity in a part of the Apennines, is able to promote smart development opportunities for a rural area now degraded.

2.1 Vallezza and Salsomaggiore. Oilfields since the ancient age.

Few people know that, at the beginning of the 20th, some Emilian Apennines sites, particularly between the provinces of Parma and Piacenza, were characterized by the activity of pioneering research and extraction of petroleum and gas. The outcrop of hydrocarbons in oily puddles and their use as fuel oil or medicinal remedy, is well known in Emilia since ancient times. The Diderot and D'Alembert Encyclopédie, in 1760, reports the area producing the most quantity of petroleum for medical purposes in the duchies of Parma and Piacenza. Salsomaggiore Terme and Vallezza nearby Fornovo di Taro were two most known oilfields in the ancient age.
In the former industrial sites, we still appreciate the remains of an archaic industry that brings us at the beginning of the 20th, at the dawn of the oil industry. It’s a material and immaterial heritage composed by buildings, equipment, documents and memories of an identity production, today almost lost, but still evident in the industrial archaeology, disseminated within a beautiful, hilly landscape, and still rooted in the collective memory of the population. The oilfields of Vallezza and Salsomaggiore lead back to a humanistic view of the ancient oil and gas production, suspended between science, technology and craftsmanship, which reaffirms a recognized characteristic of the Italian people.

2.2 The first pilot projects on Vallezza.

In 2013 the first project “A museum park of Petroleum and Energies”, has obtained funds by the Italian Ministry of Education, and some innovative pilot projects were made. The research project aimed at staging new smart communication strategies, begins a dissemination process on the historical and scientific contents of the Vallezza oilfield, in order to test the touristic, cultural and educational interests about the place.
An interdisciplinary conference [2] brought around a table, in June 2014, experts from several disciplines. "Cultural landscapes and project" was the title of the conference which established a first opportunity for dialogue between designers, landscape architects, museum curators and experts in conservation of scientific and technological heritage, from Italy, France and Romania.
The conference was also a good presentation for the first projects.
The logo Mu.PE (acronyms for Museum Park of Petroleum and Energies) inspired by the old Italian drilling towers become a symbol of the relationship between ancient mining identity and the nowadays interpretation of the place.
The website www.museodelpetrolio.it is a tool for an educational dissemination of the know-how about the ancient petroleum techniques and the history of the former Italian oilfields, also the social networks Facebook and Twitter aim at creating a community; as well as the web site is a good interface for a

wider network between the energy museums in Europe.
A proposal of interactive billboards within the wood and the ancient fields, aims at increasing the narrative power of the most evocative places in the ancient oilfield.
Lastly a multimedia interactive table-top, allows visitors (particularly young visitors and scholars) to appreciate, through images, video interviews and documents, the places and the techniques of the oilfield, but also the story of the men who worked at the mine.
The first balance of this project is positive. In the first year of scientific dissemination process, there were over 500 visit requests, while the website has about 80 visits a week and a total number of about 20,000 visits.

3. Energie Park. A new brand identity for the Emilian Appenines landscape.

The slogan "In Emilia Romagna you may explore the Energy" is the first step of the Energie Park design process. The project aim at interpreting the qualities of the place, its natural and geographical values, pointing on the identity of the energy productions in the past and for the future.
Energie-Park has three significant goals. The educational issue, and the diffusion of a technical and scientific knowledge referring to the past. The touristic rediscover of the landscape and the regeneration of former industrial sites in contexts of high naturalistic value. The promotion of a scientific and educational reflection about the energy for the future, as a planetary emergency.
The design, the use of innovative technologies and methodologies, the local government best practices, will reactivate a landscape representing today a negative value, but if properly recovered and grafted on a wider network, may create a system of cultural and natural tourism, "slow (but not too much)", linked with other existing Emilian brand identities, such the "Food valley", the "Motor valley", and cultural routes such as the "Via Francigena".
As well the project aims at encouraging the rediscovery of the Apennines landscape by interpreting this little known identities, in order both to disclose and not to waste an invaluable local heritage, material and immaterial, and to generate an open and interdisciplinary reflection about the topics of the energies and the environmental education: a significant theme for the planet, that requires new educational centres.
The main objective is to establish the conditions for a cultural and political debate about a new Emilian brand identity, based on the connections between the landscape and the energy, aiming at enhancing a network of places characterized, in the past, by the underground exploitation, and today, after a rehabilitation, have regained a high naturalistic potential. The "energy landscape" may be a polycentric network consisting of natural attractors, cultural and sports centres, places for education, research, tourism and life within the nature.

3.1. Ancient paths, new patterns and cultural landscape.
Connecting the Taro Valley and the Stirone Valley with a slow mobility.

The slow mobility: bike paths, horse trails, trails for trekking and hiking, is a new smart infrastructure for Energy Park. The project aim at creating a network linking the strategic attractors of this landscape with the urban centres and with the naturalistic, historical and touristic poles. Slow mobility is a contemporary way of discovering the landscape, adequate to convey the contact between the places, the nature and the local people, enjoying the history, the local cultures and heterogeneous identities.
This mobility model, will set up a system of biking and hiking trails connecting the existing cultural and natural infrastructure, and it will accompany visitors to discover the new tourism attractor.
The route begins in the very small municipality of Terenzo, discovering the ophiolite rocks of the Prinzera Natural Reserve, and it ends at the gates of the Stirone and Piacenziano Natural Park, between the City of Salsomaggiore and the Province of Piacenza, involving the four municipalities of Terenzo, Fornovo di Taro, Medesano, Salsomaggiore Terme. The pathway is divided into different sectors, which can be activated at different times, creating ring circuits connected with many cultural and natural features of the territory, along a route of about 50 km. In this way it's possible to visit three regional cycleways (Taro, Boschi di Carrega and Stirone), the European cycle route Euro Velo 5 (via Romea), a section of the Via Francigena cultural route, and the new centrality attractor: the former oilfield of Vallezza, and the old salt mine and gas field in Salsominore, where recovery architectural projects have already been activated. The project include the installation, along the way, of a smart system of road signals and a virtual guide. Narrative panels and simple guidance signals with NFC technology and QR codes, may allow visitors with smartphones, to deepen the visit with narrative contents. As well, an app based on simple geo - referencing GIS software, will guide visitors through the smart slow routes, and allow them to enrich the visit with multimedia cards about the main natural and historical attractions, and discover the identity of the landscape itself.

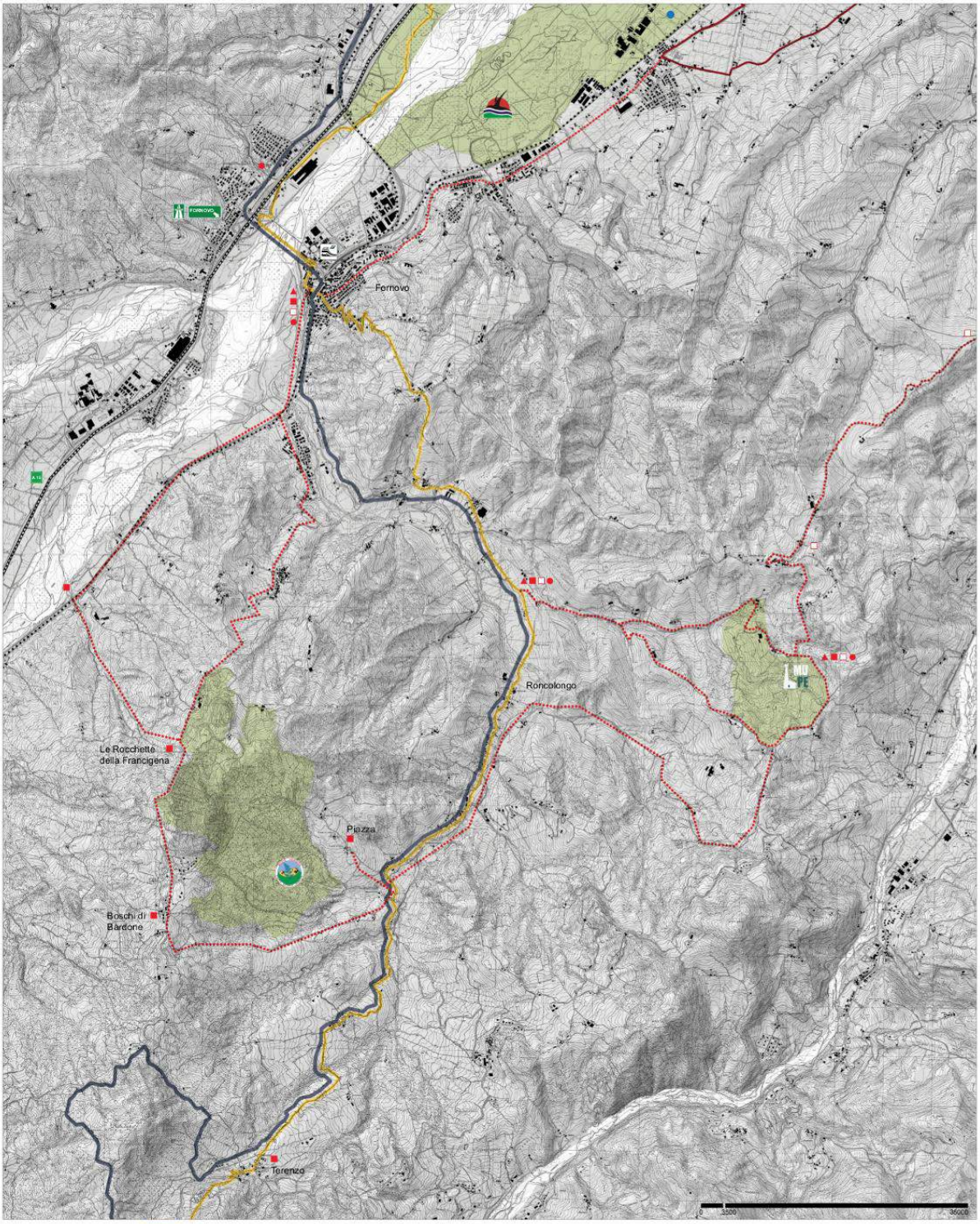

Fig. 1 The Energie Park pathways map. From the Taro Valley to the Stirone Valley.

4. The first section of the project. Mu.PE the Petroleum and Energies museum park.

Fig. 2 – An evocative image of the Vallezza Cultural Center

The first section of the project involves the creation of a new cultural centrality, a receptive pole and immersive experiences in the ancient Vallezza oilfield in Fornovo di Taro.
The research team has already developed a Urban Implementation Plan (PUA) in order to activate new land policies, promoting a touristic destination of the area.
The project includes an exhibition centre for enhancing the ancient petroleum techniques, but also to promote the renewable energies for the future; a centre for environmental education, with spaces for researchers, for the scientific dissemination and for educational laboratories. The centre will also provide a visitor access point to encourage the enjoyment of the park, and a local restaurant “kilometre zero”, promoting the "Food Valley" and enriching the collective place with another strong local identity.

The project will also recover the village of Vallezza, the old miner's residence now degraded, with receptive functions. A hotel on the Italian model “albergo diffuso” will be designed in the most degraded buildings of the village, made available by the property. Purpose of the operation is to promote a new touristic use of the area, providing a receptivity based on high standards of efficiency. A low-emissivity settlement to accommodate small groups (schools, researchers, etc.), but also adequate to a more refined tourism, with rooms at 3 and 4 stars.
Finally, the project wants to enhance the two extraction plants still preserved in the wood called Selva Smeralda. They are unique documents in Europe of a mining centralized activity. The project aim at creating a smart educational workshop and immersive experiences to engage visitors and to encourage a creative learning.

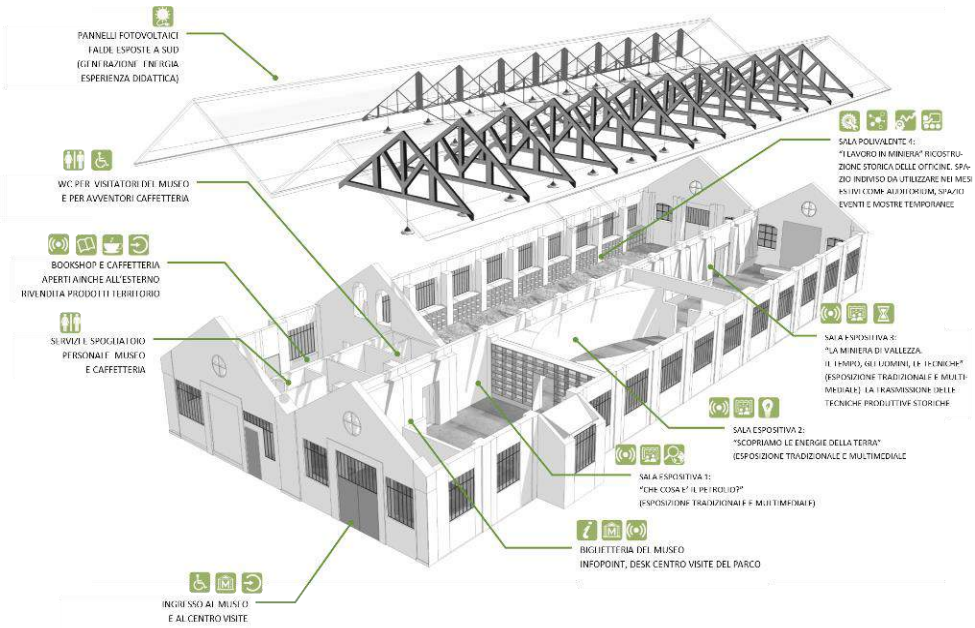

Fig. 3 – The scheme of the museum and visitors center in Vallezza

The first phase of this project, which includes the museum, the coffee, and the visitor centre, is currently at the stage of preliminary design study, and it's active a fund raising process to find the necessary resources for recovering the first building for a collective use.

5. The second section of the project. A new pathway in Salsominore and the New Museum of Millepioppi.

Fig. 4 - a simulation of the new Fossil Museum in Millepioppi

The second project involves the recovery of a paths system among the small village of Salsominore, nearby the best known thermal city of Salsomaggiore. It is an area characterized by the extraction of salt since ancient times, where we have significant historical remains that testify this ancient industrial activity: The Scipione Castle, as a millenary place for the defence of the salt mines, and the Salt Porch or Saline farnesiane, built by Maria Luisa of Austria during the period of domination by the Farnese's (Century XVII) and still well-preserved. The landscape, which is a gateway to the Regional Natural Park Stirone and Piacenziano, culminating in the new collective centrality of the farm Millepioppi. The latter is an exemple of heritage confiscated to the mafia, and made available for the City of Salsomaggiore to create a new collective centre. Today in this centre we have the CRAL (Shelter Center for Wild Animals), the Natural History museum and the Park Offices. The project includes the creation of a smart pathway enriched with episodes of virtual reality, and an expansion of the museum with a new smart building, for the Fossils Collection of Salsomaggiore Terme. The AMR lab has already produced a preliminary feasibility study, and recently it is activated a fundraising campaign promoted by the municipality of Salsomaggiore.

6. Conclusions. Open issues for the landscape.

The Energie Park design process involves the University of Parma in a recovery project of wide area, and in creating an open and flexible network model that, starting from the relationships between university centres, public administrations, local governments, private companies, and local communities, may propose a contemporary model of smart economic development for depressed rural areas.

The project may promote a current definition of cultural landscape, as a "privileged and circumscribed place" and as "common heritage". As well the landscape is the expression of interactions between the place and the community and a well-defined fragment of land recognizable for its unique cultural asset. This definition, from the World Heritage Convention (Unesco 2005), represents the landscape as the joint work of the man and the nature, illustrating the evolution of the human society. The definition evolves into the Italian Code of Cultural Heritage and Landscape, where landscape it is compared to a natural monument: a territory that expresses historical, cultural, natural, morphological and aesthetic values, a common heritage, a private space for the community.

Working on such a landscape, we may find a fragile territory, both from a geological and a cultural

point of view, but potentially rich, thanks to the natural and cultural heritage, tangible and intangible that it preserves.
The University research lab can redesign the spatial planning issues through the reconsideration of the educational activity, while the design process is a methodological tool that works simultaneously on the analytical phase and on the practical phase.
So the landscape design process, starting from the different dimensions of the interventions and from the adoption of innovative communication and learning methodologies, may promote the cultural accessibility, going beyond the intellectual speculations and the urbanistic rules, and using the common practice of the strategies for the area promotion, aiming at a wider perspective of growth and sustainable development. This demonstrates that the development of a rural area can also be measured through qualitative parameters: the employment offer, the service resources, the planning of the land use, the energy conservation, and the education to a responsible citizenship. A good design process should be able to prefigure these social objectives and encourage the good governance practices, that may become guarantee of life quality, as well as they give substance to intangible values.

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Sintra: Ruins and Sustainability twenty years after

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Abstract
The idea of aesthetics related to architectural ruin can be considered an 18th century concept. From the Venice charter on (1964), a ruin is something that ought to be rebuilt according to some precepts and following some of the consequences of the historic period, in conformity with the 2nd World War aftermath. The initiatives had then an extraordinary economic development but were not proportional to the cultural necessities.
Due not only to the progression of the increasing territories that are considered world heritage and to the compromises that are being undertaken by the governments of the countries involved in these operations of classification, the local political authorities, sometimes dealing with limited budgets cannot face up to the requirements of the management of the built environment.
Unfortunately there are many difficulties that are being faced by the inhabitants, real estate owners along with the local political and managing authorities or entities, when dealing with all the conditionings of the case of Sintra, classified as Cultural Landscape in categories II, IV and V of paragraph 24, established by UNESCO, more than twenty years ago.
Establishing a strategy as well as managing the resources may result very difficult to target the priorities when some of the valuable properties are in a critical state in what concerns either their physical stability or the functional dotation that allows them to be sustainable in economic terms.

Keywords: classified heritage, cultural landscape, sublime, economic management, sustainability.

Fig. 1: Cristino da Silva,*Five artists in Sintra*. Oil on canvas. Museu do Chiado, Lisbon.

1. Introduction

The most relevant objectives of the study we have been involved are those implied in going through a reflection set on different cases, where the significance of ruins, either on their symbolical, philosophical or aesthetic valences is explored. We ought to see the issue, exploring the field of the relation of the ruin with the "existentialist approach" of the human condition, with the identity of architectural and cultural heritage projected on the communities.
We also tend to take interest on studying the manifestations of the sublime implicit not only in landscape itself but in the artistic representation of the ruin. Another aspect on which we have tried to focus has been the relevance of the representations of the philosophical and aesthetic categories through architectural ruins among other qualities of landscape.
As a philosophical category, *Sublime* was developed in the eighteenth century by the works of Sir Uvedale Price, Sir Edmund Burke and by the philosophical thought of Immanuel Kant. Previously, the concept had already been developed, in a different sense, under a literary scope, through the work of Pseudo Longinus.
Sublime, under the romantic movement point of view, was an aesthetics category that was created to enrich the duality "beautiful/ugly" presented by the *mimesis matri*□of platonic thought.

Fig. 2: Caspar David Friedrich, Wanderer above the Sea of Fog , 1818. Oil on canvas. Kunsthalle Hamburg.

The concept referred to the qualities of transcendence, of something that overwhelms the mere existence of the individual, in all his limitations and that sometimes, through the majestic virtues of the scale of nature itself, may indicate the existence of God.Therefore, through different pictorial representations that confront humans with the immensity suggested by the vastness of landscape, through the presence of sceneries that imply natural catastrophes or distant, unachievable horizons, one can sense and experience the *Sublime.*
Throughout different epochs, the idea of Sublime could be appreciated, even before the term was recognized as the expression for the category. Humankind could experience aesthetically natural phenomena (*natura naturans*) themselves, even though the aesthetical experience was only defined by Alexander Baumgarten, in the 18th century. The architectural ruin was a depicted subject throughout the history of art and it was set integrated with landscape. It was always a pictorial motif but also implied a nostalgic element in the wholeness of compositions themselves.
So, ruins have always been a subject of reflection in the sense that they implied something that has ceased to be useful but still stands and conforms as a statement of existence, leading to an intermediate state between the time where new structures exist and the time where either they will

simply vanish, be tore down or be dissolved by the forces of natural erosion or human civilizational development.

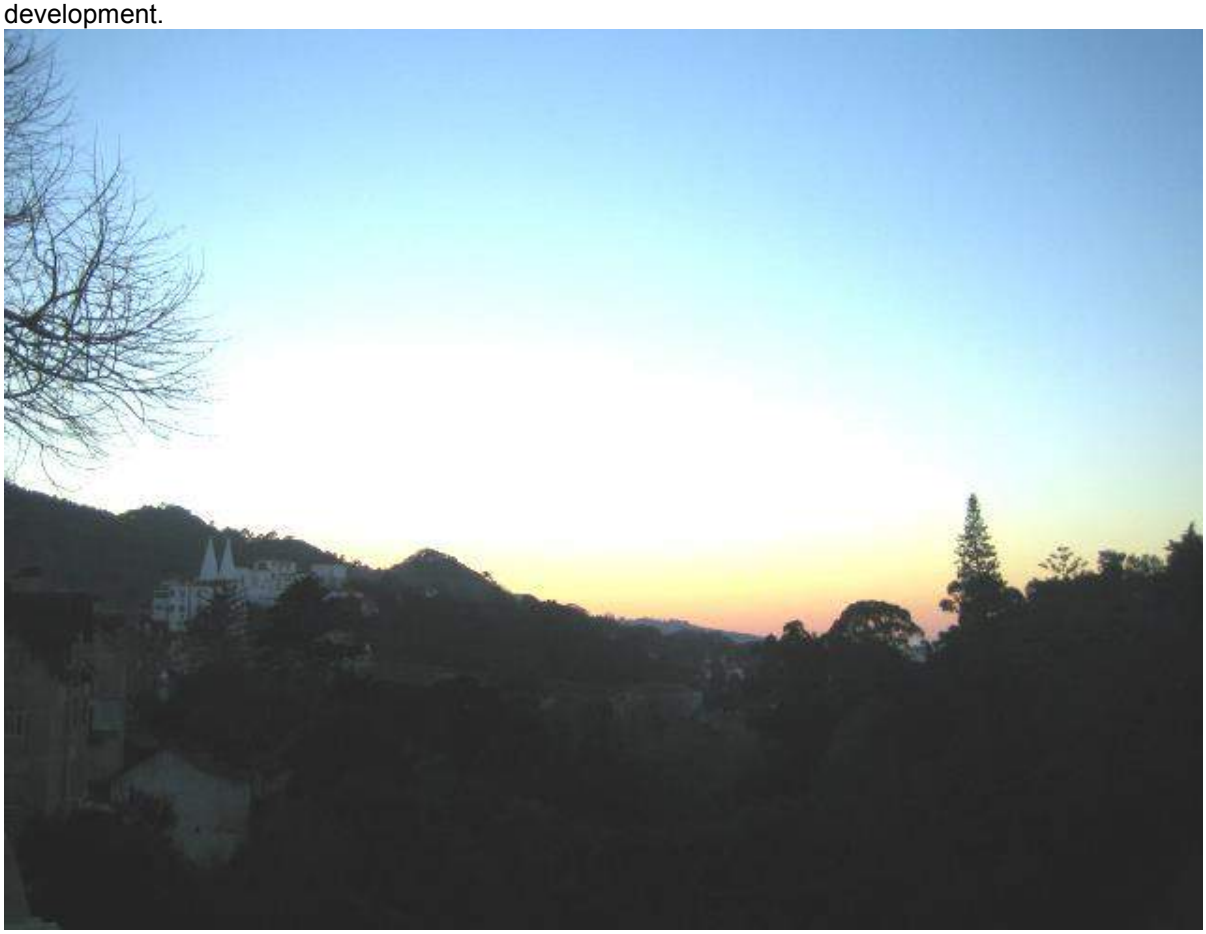

Fig. 3: Aspect from the valley showing Sintra's National Palace.

Natural landscape does not exist since immemorial times it has been occupied by humans under different circumstances and throughout different eras.
Therefore, when baroque, neo-classical or romantic movement painters depicted them they may have tended to idealize them, thus representing something that only existed in remote parts of the territory (David Caspar Friedrich or Otto Runge). We may notice a metaphysical trend in some depictions of architectural remains and also in representations of landscape.
The hermeneutics of ruins and landscape is based in symbolical aspects implied in cultural, traditional, psychoanalytical and archetypal trends, history of art, among other, viewing points. The scopes are always inserted in the discipline of representation of virtual or real spatial conceptions.
Furthermore, there is no such thing as a clear frontier between both styles, in the temporal phase of the ending of the one and the beginning of the other. There are in the Romanesque and the Gothic common tectonic elements, used in those times of transition between both periods. This fact demonstrates *de per se* that the knowledge related to the Gothic did not take place at a determined temporal moment through a precise discovery or due to the development of a new concept or theory that would have radically transform the structural knowledge. This did not take place in fact. It did not exist such as a new rational and logical theory that allowed the medieval builder directly to risk the conceptual leap from Romanesque form to the Gothic. Such an attitude of supposing that some detained the constructive secret that allowed them to withdraw dividends regarding the rest of the builders, would be contaminated of lyricism. The whole process was slow, based on the method of attempt and subsequent error and finally the adoption of the measure to overcome the error. The simple acknowledgement of the error constituted the lever that allowed innovation.
Sintra gathers, in his landscape, all the above referred conditions to be a subject for our understanding of the romantic scenery and the *locus* for the existence of Sublime, due to the variety of *palimpsestic* juxtaposition of *monumenta* and of natural elements in harmonious conviviality, like the planted forests of the Pen Park (planted by the action and intervention of D. Fernando II and his advisor Wenceslau Cifka).

Fig. 4: Caspar David Friedrich. *Ruine im Resengebirge*. Landesmuseum.

2. Taking in charge the management of Cultural Landscape Heritage

Sintra is an example of classification where the compromises that have been celebrated between the national Government and the International Agency UNESCO, more than twenty years ago, could not be by far respected due to a whole range of issues.
The classification was had the full merit and benefitted from some particular political circumstances and the intervention of many personalities that were fully concerned about this urgency of classification at the time. Nevertheless, the contracts were celebrated by that time between the highest political instances of the country and the questions that we have been detecting in the last years until very recently, and pertaining to the present situation do compromise the results that should have been expected by now, according to the conditions of celebration.
The question is the development of the territory that is related to the Municipality and the economic development that would sustain the way to keep this classified landscape, along with its buffer zone. The core of the classified cultural landscape has from many years now benefited from a public/private partnership called *Par□ues de Sintra Monte da Lu*a in terms of "consolidation" of the monumental landmarks of this particular context.
Sintra has been a territory that has already been described in the 11th century by the Arab geographer Al-Bacr. Later on, in the 18th century, it has been characterized as that "Glorious Eden", according to the strophes of Byron, in his *Childe Harold's Pilgrimage.*
In one of the hills of this territory surrounding the *bourg*, was built in the 16th century,- being the first works attributed to Diogo de Boitac (1507),- the monastery of hieronymite monks of N□Senhora da Pena. Also other properties were, in the Renaissance period, established like the Quinta da Pena Verde that was first occupied by the sun of Viceroy from India, D. Afonso de Albuquerque.
There were numerous historical facts that preceded the construction of the romantic context of Sintra. Monserre«ate, had two projects the first one which was a revival of gothic style went down due to a fire and the second one combines and gathers Indian and Moorish influences as well as exotic and vegetalist motifs that pass from the interior onto the exterior of the little pavilion.
Foreign travelers from all over Europe such as Princess Rattazzi and Count Lichnowksky have given account of their traveling experiences through rich and vivid descriptions of Sintra and its surrounding landscape and territory.

In the nineteenth century, there were five artists of the romantic period that painted the landscape with sinuous paths and some punctuated by some highlights or monuments.
There has been a personality that has much influenced Portuguese Society in its habits and has much contributed to the restoring some of the monuments after the extinction of the religious orders, and this being D. Fernando von Saxe-Coburg Gotha, Prince Consort that has married Queen D, Maria II. The Prince, of German ascendance, born in the Principality of Thuringia, had eleven children.
He was responsible for the revival of the urban area of the Chiado Square, transforming it into a trendy area of the city, where the good Cafés and Restaurants flourished. As José-Augusto França describes so thoroughly in his historiographical works, where nobility and the haute bourgeoisie started to attend mass, on Sundays with the Queen and D. Fernando and the Infants to the Crown, at the Church of Loreto, known as *Chiesa degli Italiani*; where the good French Maisons de Couture for the society ladies and of the established German tailors for the gentlemen. There was also the Teatro Nacional de S. Carlos where constantly performed excellent Companies, offering good programs of concerts of lyrical music and the performance of Opera theatre pieces.
D. Fernando II subsidized out of his own budget some works of restoration in the monuments of the Batalha and Alcobaça Monasteries. Later on, in the thirties of the nineteenth century, as the Royal family used to spend Summer in the Palace of the Vila, in Sintra, a palace which had his most ancient nucleus origins in the 16th century he kept that tradition but started to invest in the rebuilding of the ruins left by the community of hieronymites in the Monastery of N□S□da Pena, at the top of the mountain, that had suffered from abandonment, huge neglect, and decay after the extinction of the religious orders and having suffered much from the seismic consequences of the earthquake of 1755.
Having acquired the Monastery, D. Fernando invited a Military Engineer Wilhelm Ludwig von Eschewege (1777-1855), who had come to Portugal to explore the mining potential, namely that of iron, taking the role of Director of Mining to make some drawings integrating the existing structures such as the cloister, the chapel and some other fragments of the ruins. He had published in 1933 the study under the title *Portugal eis Stat-und Sittengemalde* (*Portugal, Statistical Frame – Moral, Scenes and s□etches).*
His early drawings did not immediately please to D. Fernando and he was encouraged to go on a travel throughout some of the south of Spain, including, Andaluzia, and some of the Maghrebian regions. When he returned from those traveling, he took under his direction the works of the building of the future summer residence for the Royal family. On the second or third campaign of works, D. Fernando introduced some new features, always based on a certain *mud□□ar* influence and historical references, much close to the spirit of the Romantic movement that was spreading throughout Europe, including countries of northern part of the European Continent.
It seemed to result from a certain awareness of *l' air du temps*, or what we might call the *zeitgeist*, the similarities that one can establish between the castles that were later on built by Ludwig of Bavaria Neuschwanstein Schloss.

Fig. 5: 19th century print of the Neuschwanstein, Romanesque revival castle built by Ludwig of Bavaria under drawings by Christian Jank, 1869.

D. Fernando, a real enthusiastic for the opera, was sometimes seen singing arias of Lucia of Lammermoor, and dressed in tirolese outfit he came down to the village riding a *cal□che,* he was an eccentric character, incarnating the real romantic spirit *par e□cellence,* considering the conservative Portuguese society of that period.

The generation of national writers of the end of the nineteenth century, such as the great novelist of Realism, Eça de Queiroz (1845-1900) describes his coetaneous Society, giving a particular emphasis to the importance of Sintra as a holiday region for the bourgeoisie from the time of D. Fernando II on. Then the first forms of hotels were making their appearance such as the *Lawrence's* and the *otel Netto.*

In the time of D. Lu s, Cascais, a village of fishermen, became the preference destination for the bourgeoisie and the well-off in society.

Sintra is surrounded on the eastern part by residential areas that belong to the great metropolitan area of Lisbon and that are the result of the urbanization processes of the last four decades and that correspond to the

Fig. 6: Aerial vue of the Pena Palace. Credits due to the site of the Parques de Sintra Monte da Lua.

3. Economic growth sustaining the Classification of Sintra as Cultural Landscape

Tipologias	**2011**	**2012**	**2013**	**2014**	**2015**
Hotéis	20.372	21.158	22.758	23.832	24.621
5	4.460	4.200	5.559	5.624	5.752
4	9.760	10.276	10.532	11.193	11.618
3	4.447	4.519	4.345	4.678	4.860
2 e 1	1.705	2.163	2.322	2.337	2.391
Hotéis-Apartamentos	1.636	1.894	1.576	1.871	1.871
Pousadas	70	70	196	196	270
Aldeamentos Tur sticos	433	445	380	358	…
Apartamentos Tur sticos	172	218	191	161	199
Outros	3.102	2.615	2.225	2.131	…
Total Global	**25.785**	**26.400**	**27.326**	**28.549**	**29.198**

Fig .7: General data on Tourism in Portugal. Fonte INE; dados provis rios (informaç o referente ao m s de Julho) 16.02.2016.

Par□ues de Sintra – Monte da Lua (PSML) was constituted in 2000 (by Law Decree n□215/2012 from 2nd September) being an anonymous society of almost exclusively public capitals. By Law Decree n□ 292/2007 from 21st August, there was modified the composition of the Board of Administration and the Pena Palace was put under its jurisdiction. It has undergone other modifications by Law Decree n□ 205 / 2012 from 31st August, among which, the Portuguese Equestrian Art that used to pertain to the Alter Real Foundation.

It has, among others, the mission of managing the most important natural and cultural values that are related to the area of Cultural Landscape of Sintra and Queluz: the Pena Park and, The Gardens and Palace of Monserrate, the Moorish Castle, the Capuchin Convent, the Gardens and the Chalet of the Countess d'Edla. Moreover, and since the year of 2012, the National Palaces of Sintra and Queluz and the Portuguese School of Equestrian Art, established in the Historical Gardens of Queluz, with presentation in the *Manege* Henrique Calado (Belém).

So, since September 2012 that the *PSML (Par□ues de Sintra Monte da Lua)* is charged with the management, besides the Pena Park and Palace, the Moorish Castle, the Palace and gardens of Monserrate, and the Convent of Capuchin Friars order, the National Palaces of Sintra and Queluz, as well as the Portuguese School of Equestrian Art.

Only in the year of 1913, the parks and monuments of the PSML have received the visit of more than 1.700.000 visits

After the distinction attributed in 2013 by the UNTWO Tourism World Tourism Organization, to the economic partnership *Par□ues de Sintra Monte da Lua* with notable prizes (that are more or less considered the *tourism Oscars)* being normally attributed to the best enterprises of the world in the area of tourism and represent one of the most important distinguished awards that they may receive. The election was based on the public in general and by thousands of professionals from the travel agencies throughout the world, from 160 countries.

The above referred prize came to join the several ones already awarded to the enterprise partnership *Par□ues de Sintra Monte da Lua* (PSML) recognizing the quality of service developed, not only at the level of the welcoming of visitors, but also the rehabilitation of the parks and monuments under its jurisdiction, under care and management. Other recent prizes were the *European Garden Award*, related to recuperation of Monserrate as a historical garden. Also in 2013 the same Partnership received the award *Europa Nostra* for the work of rehabilitation of the *Chalet of the Countess d'Edla,* which had already been the pretext for the guarantee of the Portugal Tourism Prize and another from the *Gr□mio Liter□rio*.

The UNTWO (Tourism World Tourism) is a specialized agency on the United Nations and the main international organization of the Tourism area. It works as a global forum for questions of tourism politics and as a source of practical knowledge about that field. With its headquarters in Madrid, in 2009 it had 154 countries, seven territories as members and 300 affiliated members, representing the private sector, educational institutions, associations and local authorities of tourism.

Its somewhat remote origin is founded on the International Congress of Associations of Touristic Traffic (1925) that took place in the city of Den Haag. After the Second World War it has been baptized as International Union of Official Travel Organizations, having been transferred to Geneva. It was then a non-governmental organization that congregated around 109 National, Tourism Organizations, along with 88 associated members from public to private sectors. In 1974, according to a resolution of the General Assembly of the United Nations, it was transformed into an intergovernmental. In 2003 it became integrated into a specialized Agency of the United Nations.

Sintra has a considerable deficiency of growth in hotel accommodation, since the Municipality of Cascais and Lisboa have grown in the last years in that sense.

Tourists just go on a single day tour and leave financial revenues from the restoration business. There should be, according to our point of view, implemented the number of hotels, or hostels or other forms of increasing the revenues, so that the Municipality would gain from this type of economic growth, not letting those advantages flow onto the other adjoining municipalities.

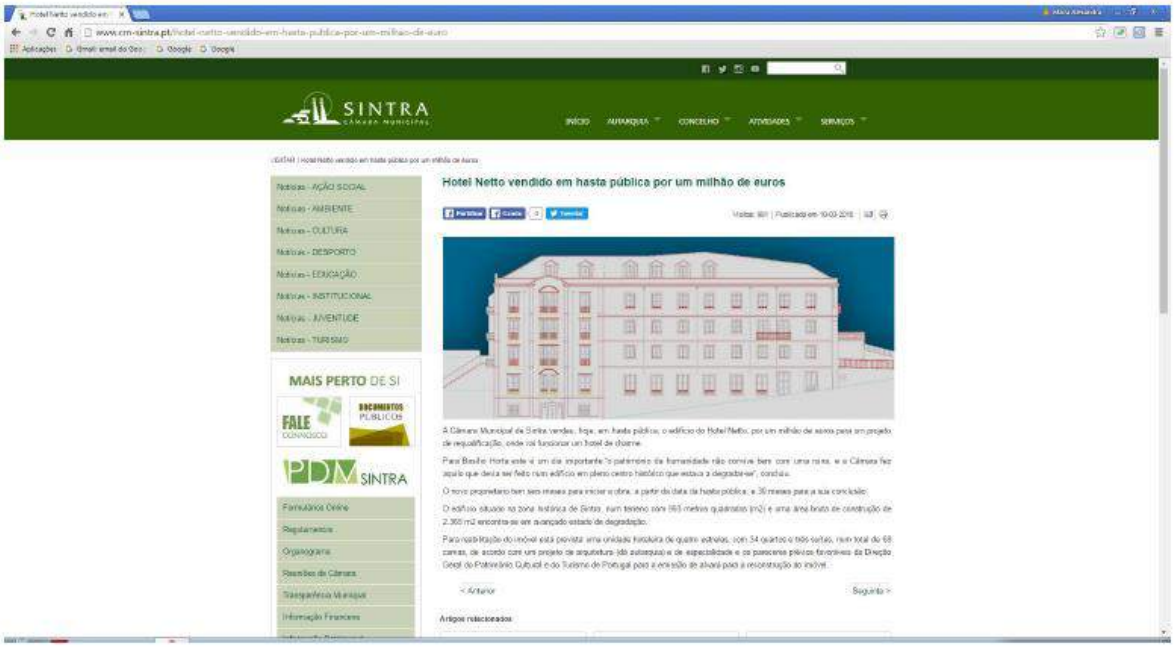

Fig. 8: News on the sale of Hotel Netto. Credits due to the *site* of the *Câmara Municipal de Sintra*.

Fig. 9, 10: Ruins on the main way to the historical centre of Sintra.

Hotel Nunes — Hospedagem diária, com pensão, de 1$800 a 2$000 réis. Serviço de restaurante: almoço 800 réis; jantar 900 réis, com vinho.

Hotel Netto — Hospedagem diária com pensão, de 1$600 a 2$000 réis, comprehendendo vinho, luz, almoço, jantar e refeição da manhã. Serviço de restaurante: almoço 700 réis; depois do meio dia, 800 réis; jantar 800 réis. Mesa separada, almoço 800 réis; depois do meio dia, 900 réis; jantar 900 réis; fructa ou queijo ao almoço, é considerado extraordinario. Chá, torradas ou bolachas, 200 réis; servido em quarto, mais 50 réis por pessoa. Almoço ou jantar no jardim, mais 100 réis por pessoa. Quartos sem pensão, a 500 réis e 600 réis.

Fig. 11: Reference from the beginning of the 20th century to the Hotel in *Guia do Via□ante*, 1907.

Fig. 12: Hotel Netto, a ruin confining to the National Palace and in front of a 4□Hotel in the historical cask that has been sold last month in order to be transformed into a □*otel de Charme*.

4. Conclusion

Naturally, the issue of sustaining economically the region that has received such a relevant classification like that of Cultural Landscap, at the distance of twenty years now, based on the incomes of hotel business is very reductive but it may be considered since the municipalities that surround it are increasing those revenues in detriment of the ones that pertain to Sintra.
We preconize that these type of areas with economic and touristic potential should not only be under the jurisdiction of the Municipality that manages the territory where the classified values are, but ought to pertain to a juridical and vast group, directly dependent from the Ministry of Economy so that the resources and the managing capacities of higher level could be activated, differently from what a simple Municipality, with all its limitations might guarantee.
Investment and adjusted management attention are needed so that qualified heritage property and landscape does not collapse in the middle ruins

Fig. 13: Hotel that consists in a cultural reference from the 19th century in the novels of the realist writer Eça de Queiroz.

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Architectural experiments and strategies for a productive landscape's regeneration

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Officiamuseum Sicily and its Aidone headquarter: architectural experiments and strategies for the productive landscape's regeneration.
In the world it lies a fortune of uncompleted and/or abandoned areas and buildings, both public and private, which amount to around 600 estates alone in Italy. The regeneration of these sites is, therefore, essential which is what led to the creation of the app - "[Im] possible living" – so as to map them and create a virtual community aiming at a recovery project. You can do a redevelopment of modern buildings through an architectural restyling encapsulating, i.e. covering the existing building with a new skin, protecting it, thus avoiding the costs of demolition and waste disposal, and then inserting new volumes, without neglecting its inclusion in the environmental context. A bit like Peter Zumthor did with the Kolumba Museum overlaying the late Gothic Basilica in Cologne, with the Aidone thesis of the Museum of Applied Arts in an abandoned building, where the aforementioned technique was used on a modern reinforced concrete building, however. This architectural ploy is one of the actions of "Officiamuseum Sicily", that is to say a strategic project to creating a Regional Museum System of Design and Applied Arts, rich in an active artistic craftsmanship, with the Aidone Museum as its core. This area will be transformed into a HUB creative, economic and tourist centre, relocating the small town in the centre of a tourist district, the heart of the Sicilian integrated relational tourism.

Keywords: uncompleted/abandoned modern buildings, architectural restyling encapsulating, Officiamuseum Sicily, HUB creative, Integrated Relational Tourism.

1. Introduction

«In the new era markets are making way for networks while ownership is progressively being replaced by access. Companies and consumers are beginning to abandon the core of modern economic life: the market exchange of property between buyers and sellers. […] In less than twenty years, the global marketplace successfully absorbed large parts of what formerly was the government sphere, including public transport, public utilities and telecommunications, into the economic domain. Nowadays, the economy has turned its attention to the last remaining independent area of human activity: the culture itself. Community events, social gatherings, civic engagements, the arts, sports and games are increasingly becoming part of the commercial sphere» [1]. The planet we live on is experiencing a very thorny period, the post-globalization or better, the third industrial revolution, as defined in 2011 by the American economist Jeremy Rifkin in the book of the same name. This period has been predicted by market specialists « […] global manufacturing has become scale-agnostic» [2], and sociologic specialists «The industrialization destroyed villages, and the human being who lived in community became a solitary crowd in megalopoli» [3], so that the origins, the roots and the culture of every single region faded.
This new epoch should affirm the territorial, cultural and social identities paradoxically transforming the difference into an instrument of cohesion, interest and also the driving force of local economies. The

purpose of this paper is a real future for the so-called local handmade design, an experimentation undertaken by some radical designer, such as Ugo La Pietra in the ‘70s. «Since the 1960s we had set ourselves the problem of how trying to overcome “the internationalist architecture and design” (the one which planned houses, hotels and various buildings using the same formal and distributive values in Frankfurt as in Palermo and Cairo). We wanted to focus the attention on local resources, the nature of different territories, social behaviors. […] I can say that the first awareness and expression of the regional design were born in this faraway decade. So, the works I realized in the ‘70s and consequently in the following decades, the Mediterranean design, Beach design and the other type of design linked to different territories, allude to a type of society where difference is recognized as a right and as a part of normal life. The search about differences led me to work in different areas and territories where cultural independence doesn’t exist» [4]. We talk about “art design” « […] –something which seemed to take us back to epochs preceding the one which saw the development of Walter Benjamin’s visions on the mechanical reproduction of the artwork, giving in this way new emphasis on the unique piece and on the late eighteen century applied arts – or a renewed interest in handicraft which found its humus in the gradual revival of local “know-how”» [5]. According to researches of the Piedmont Region handicraft Observatory, edited by Angelo Michelsons starting from 2003, handicraft is one of the key sector of Italian economy while Italy is the first country in EU for the number of companies and occupants, although in the second half of 2015 there has been a reduction of nearly one thousand artisan small companies registered and active, compared to the 11.722 existing in 2010. This is also reflected in Stefano Micelli’s essay entitled “Futuro Artigiano”; Micelli is Professor of Economics and Business Management in Ca' Foscari University and Italian essayist who think that «The craftsmanship is one of the distinguishing feature of Italian culture and economy. It has always been an element of identification of our country in the world. Its importance has been decisive in the development of business clusters and small companies that have marked the economic growth of the ‘80s and ‘90s. […] in a type of economy populated by knowledge workers, what characterizes Italian Industry is a sort of “Know-how” that few other countries could preserve» [6]. We’re talking about the handMade in Italy, as defined by Claudio Gambardella in the essay that introduces Ugo La Pietra’s book, entitled “Abitare con Arte. Ricerche e opera nelle arti applicate e nel design”, in which handicrafts are considered as stops of a “Grand Tour” made by an artist from the Abruzzi. «Carrara Marble, Arbisola Ceramics, Nanto stones, Este Ceramics, Murano Glass, Red Verona Marble, Monreale Mosaic, Volterra Alabaster, Igneous Rock in Sicily, Ceramics from Vietri sul Mare, Ravenna Mosaic, Faenza Ceramics, Caltagirone Ceramics, Ceramics from Friuli, Sesto Fiorentino Ceramics, Grottaglie Ceramics, Ceramic from Lombardy, Enamelled Copper, Ceramic from Nove, Wool and Felt Production, Pieces of Furniture from Verona and Lombardy, Adamello Granite, Altare Glass, Methacrylate from Lombardy, Lecce Stones, Ceramics from Deruta, Gold from Arezzo, Bucchero from Umbria, Stones of Lavagna are all Ugo La Pietra’s stops during his “Grand Tour” trough Italian manufacturing landscapes. He travels to run into the handicraft of different places. He not only studies but also he works with craftsman» [7]. We are not talking about a wistful return to old professions but we are discussing a modern and innovative renovation. Through the meeting between designers and students from Universities existing in that territory, and small companies, bearers of a solid experience and a “know-how” handed down from generations, a new project that affects the overall concept of the product and, therefore, the production cycles is assured. This aim can be pursued in a region like Sicily, recently industrialized, but with an incredible cultural, "artistic" and artisanship resources, through a strategic project, which promotes the local development by the renewing of old, crafts. The idea may be the one already pursued in Campania with Officiamuseum, creating a system of museums specialized in each territorial excellence to set up a temporary one as its vital center. Offiaciamuseum Sicilia – this is the name for the Regional Museum System of Design and Applied Arts of the island – it can actually contribute to promote the local development of companies, involving them in a program which let Universities and design supporting craftsmen, in the planning and realization of new design products, also making use of the tourism industry which is very important in Southern Italy. This type of industry is far from the idea of mass tourism (hit and run) prior to the '90s, but it approaches a new form: the Integrated Relational Tourism, defined by the two planners of Palermo School, Ferdinando Trapani and Fabio Naselli in the text “MOTRIS- – Microcentralità relazionali nel Mediterraneo. Una ricerca per la mappatura dell’offerta di turismo relazionale integrato in Sicilia”. Upstream this system must exist a strategy, in this case a strategic design, as defined by Francesco Zurlo, Professor of Industrial Design in Politecnico in Milan, in Treccani encyclopaedia. «The phrase strategic design is a problem, an open system that includes different points of view, interpretative articulated models and various disciplinary perspectives. [...] it operates in public environments; it supports the action thanks to its abilities and finalizes its efficiency to the production of a sense effect. The result of this procedure is realized in offer systems rather than in accurate solutions, in a product-service rather than a simple product, visible representation of this strategy. [...] One of the first strategic design’s task is to explain the model, as well as to help you define identity; it requires an efficiency which is very similar to communication design and corporate image. Strategic

design also intervenes in other aspects that affect the behavior and the motivation of individuals. It deals with cultural aspects related to material and nonmaterial elements, symbols, specific rituals that are traditional for every human activity and that are realized into the style, the inner style, that the organization decides to dedicate itself» [8]. The aim of this strategic project is to build and communicate the brand of small-medium sized craft companies of a region which hope to join the "system", investing in the design and the young, and to allow them to present a preview of the new products in the temporary museum, to make them visible, even in the international arena, before the next marketing. This mechanism may enable an overall regeneration of an area, the Sicilian one, characterized by an economic situation, summarized in the article of 29 December 2015 by Massimo Costa «[it has been noticed] during the last seven years, "the worst decline since the war", that is, since there has been a statistical service. For unexplained reasons the fall in employment and incomes, by all welcomed as rehabilitation, has not led to an economic boom, but to the collapse of the internal consumption» [9].

2. Offiaciamuseum Sicily

«The idea of creating a Regional Museum System of Design and Applied Arts follows a decade that has been crucial for design in Campania (1990/2002). It is marked by a series of experimental collaborations between fifty-three designers and thirty-one local companies producing local handicraft goods […] The idea of “System” comes from highlighting the presence of specialized museums in places where handicraft goods of Campanian excellence are produced as well as trying to bring the worlds of business and culture closer, a driver for development in the South. It also tries to involve small business owners, in a strategic project focused on design that has a wider scope and is more long-term. Local development depends on museums. In 2002 the Second University of Naples, appointed by the Campania Region, drew up the preliminary project of a “regional museum system of design and applied arts”, with it being conceived as a virtual regional network of twenty-one specialized museums, public and private, of applied art and crafts as well as temporary museum of Campanian business in Pompeii, located along a strategic tourist route in the region that connects Naples with the most important centers of products of excellence in the region […]» [10].
This project can also be extended in other Italian regions with a deeply rooted artistic handicraft, such as Sicily, becoming fundamental for the design and its economy. It is characterized , as mentioned above, by a series of experimental collaborators (designers) and local companies which produce local crafts, demonstrating in this way that it’s possible to do design in an area poor of industries, but full of craftsmen and small businessmen. The study and the analysis on the Thesis in Interior Architecture, A smart poly-centric city: un Museo nella Terra di mezzo [11], with inspections, interviews and documents drawn from the Chambers of Commerce of the former Provincia of Sicily, has led to the understanding and the development of the enormous potential of the so-called artistic handicraft. There are, in fact, hundreds of companies involved in producing and decorating ceramics, scattered all over the island; in particular, the city of Caltagirone (CT), Santo Stefano di Camastra (ME) and Burgio (AG) are known all over the world. In addition, the textile industry has a handicraft, which is still alive, from Marsala to Messina, going down to Ragusa. The gold and the silver industry, once very active sectors, have, today, very few handmade companies; the first in Palermo and Trapani, while the second in Catania and its provinces. The same goes for the woodworking, formerly famous for the production of furniture, Sicilian carts, puppets and toys of very highest quality, which unfortunately, is now localized in only few areas, such as Trapani, Bagheria, in Catania and Ragusa. Again, we can consider "endangered" activities located in cities or other island’s areas of high historical and artistic value to safeguard. We can consider, for example, corals manufacture in Trapani and Sciacca; iron working in the provinces of Palermo and Catania; papyrus in Syracuse and glass processing in Bagheria, Catania and Ragusa. The idea of Officiamuseum as museum system, is justified by the presence of 49 specialized museums in places where the handicraft of Sicilian excellence is still alive. Only in very few cases we see a separation between the production site and the museum. For example, in Sciacca there is a Coral Jevellery Museum but no craftsman is registered for its manufacture; in Bagheria, on the other hand, this type of working activity is present, but it lacks a museum. So local development can depend on museums existing in territories in which there is the manufacture of such excellences and on putting them in the system (and on the contribution of the project culture). Drawing up the "Regional Museum System of Design and Applied Art" project means to conceive a physical / virtual regional network of specialized museums with a central temporary Company Museum in Aidone, seen as the driving force of Officiamuseum “system” in Sicily. The architecture of this museum will not express a single brand, but that of an entire area. It also will try to create a dialogue between companies and museums, and to convince the various operators that this is a great cultural and economic opportunity. As with the other systems, you will have to take into account the connections, being also virtual and multilingual, that will guarantee a greatest speed and easiness in being sustainable and intelligent. The extension from Officiamuseum in Campania to

Officiamuseum in Sicily is part of a larger project: OffiaciamuseuMED, which also includes the Mediterranean countries (Fig. 1). «There is more though. OFFICIAMUSEUMED brings with it an ancestral and poignant attraction towards the East that pervades our world. An east that Maffesoli called "mythical" because it does not necessarily coincides with what lies to the east of us, which is found only in the most established forms of art, but also in the most basic tourist consumerism towards distant destinations, both East and West. An attraction rooted in Western Culture as well as the spirit of our time» [12]. Thanks to Universities, which, together with the Chambers of Commerce and trade associations, play a directing role of the entire system, "bridges" with Turkey have been created, and in particular with the Okan University in Istanbul, and thanks to «[…]subsequent "Summer School in Designing of Company Museum Systems in Euro Mediterranean Area"(2013) […]» [13]. In this case, we can speak about Officiamuseum Turkey, with a temporary Company Museum of its excellence in Canakkale, which, like Pompeii in Campania and Aidone in Sicily, is a "great attraction" for the very close city of Troy and Assos.

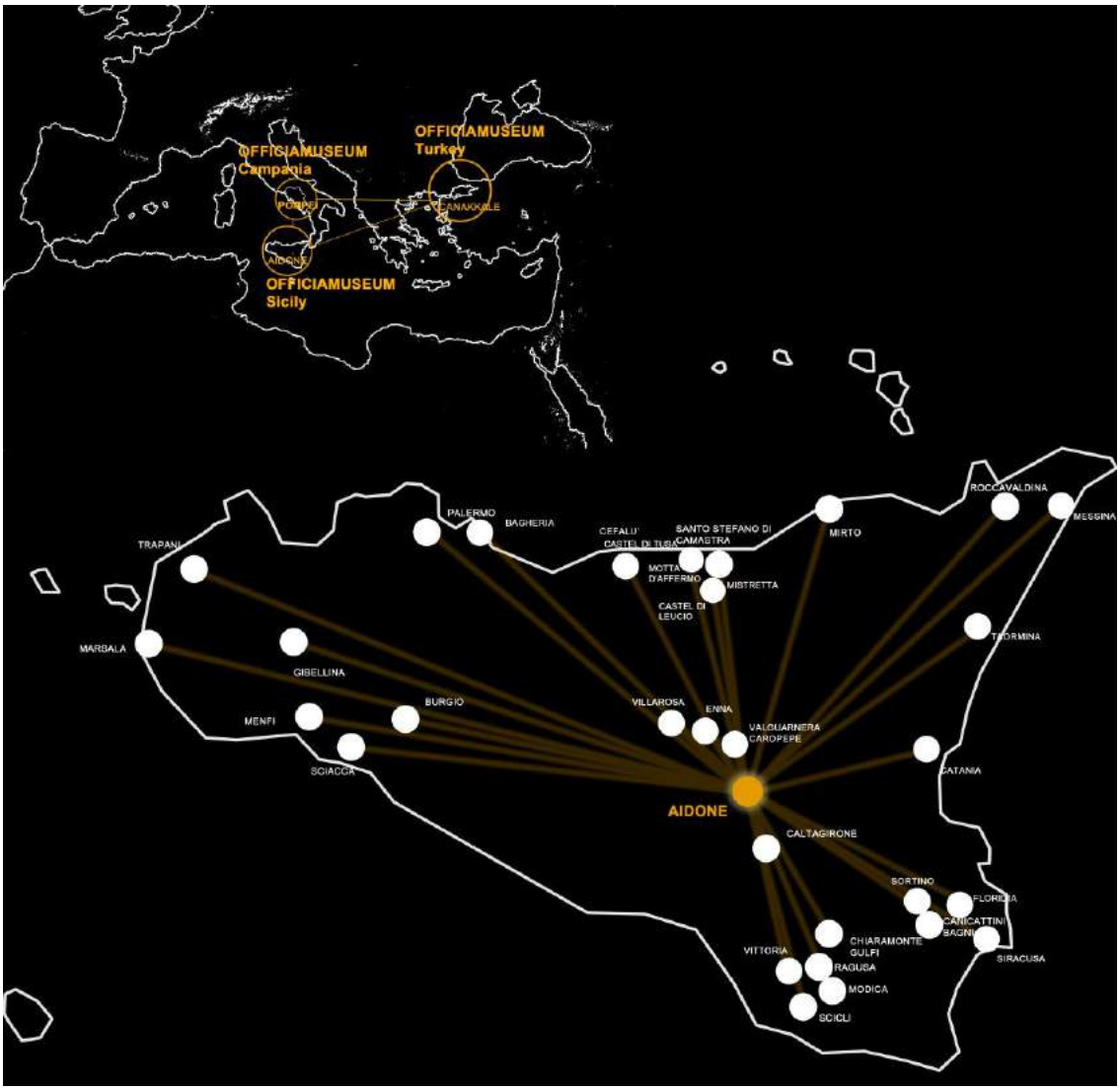

Fig. 1: OfficiamuseuMED and Offiaciamuseum Sicily.

3. The Museum location. The district Umbilicus Siciliae

The temporary Company Museum of Aidone can be placed, as expected in the Thesis entitled A smart poly-centric city: un Museo nella Terra di mezzo, in one area of Contrada Mountain City to 850 m above sea level, a sort of acropolis, about 4 km far away from the inhabited center. From here, you can enjoy exceptional views of the Plain of Catania, Etna, the Erei mountains and Gornalunga River. In 1998 the local council of Aidone in compliance with requests from economic operators of crafts sector, which required the allocation of areas equipped for the creation of industrial sites, localized on the municipally owned land, intended for manufacturing settlements to identify and plan infrastructures

necessary to equip the identified area, in Contrada Montagna (Fig. 2). The area is predicted to be in the town plan by the Commissarial resolution n□74 of 15/10/1997 [14]. According to the executive plan presented in 2003, they had to make 30 prefabricated sheds for the development of eight productive activities and a community services center to house a showroom, a seminar room, management offices with meeting rooms, first aid, bank counter and post office, bar, keeper accommodation and utility rooms. The work began in 2004 and have never been concluded. Today this area presents six prefabricated sheds, partially used by local companies, 8 m high, with level roofs, and an unused service center reinforced with cement brick at a single level with jumps in the roof, from 3.50 m to 5.50 m. In 2011 works on the creation of a Centre of Municipal Collection of urban waste differentiated began in the southern area bordering with ours, but never completed.

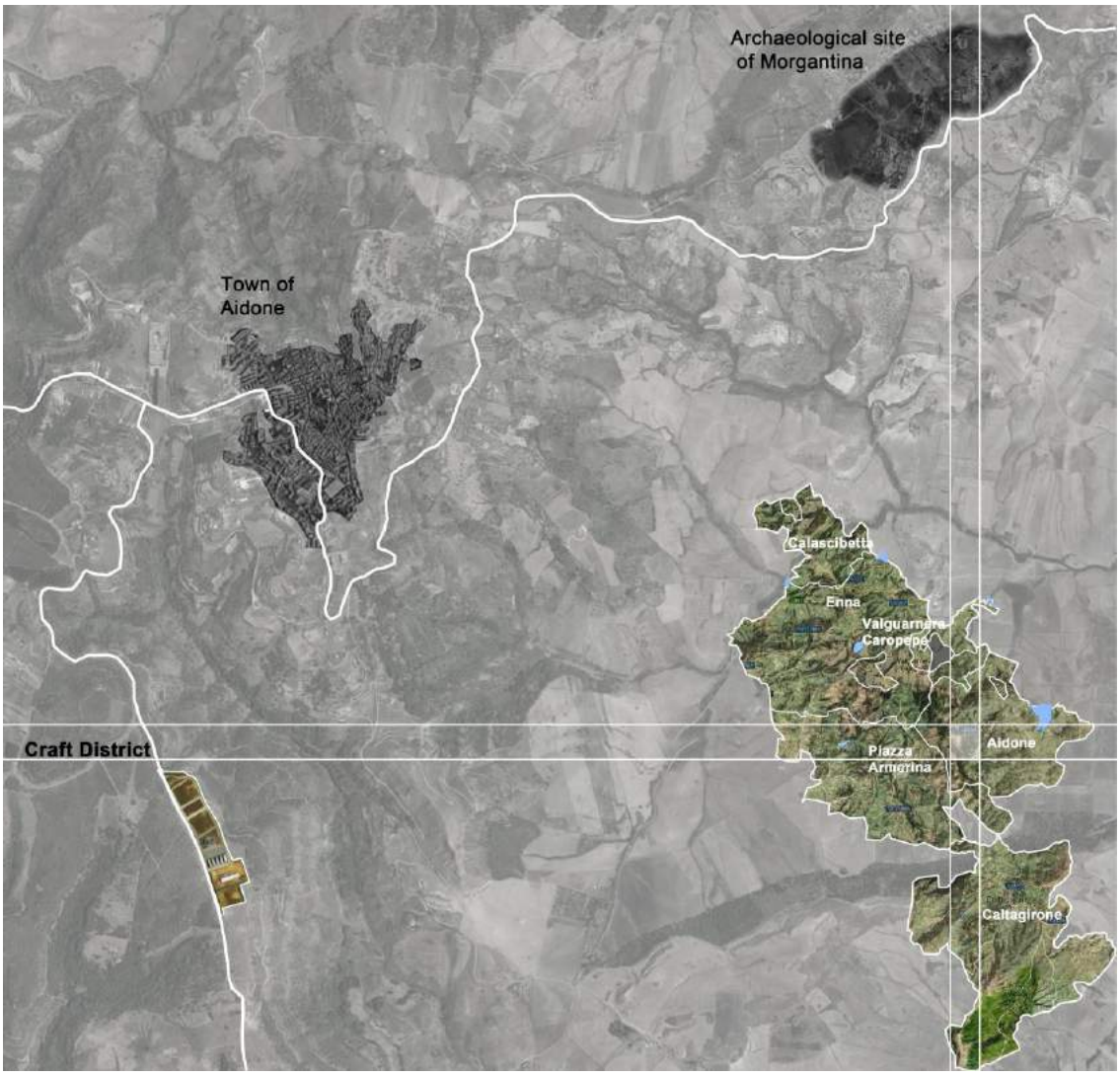

Fig. 2: Orthophotos of Aidone and the District Umbilicus Siciliae.

The center location of the museum system in Aidone is not a random choice. The small town of Enna, unlike Pompeii, is not the biggest attraction in Sicily as Palermo or as The Valley of the Temples in Agrigento - but is located in a highly strategic point for the tourism of the island. It rises on the eastern offshoot of Erei mountains, about 800 meters above sea level, from where you can enjoy a 360 degree panorama (Fig. 3) on the plain of Catania, Etna, Erei mountains and the wooded lands from which originated the branches of Gornalunga River, which crosses the territory. It is located in one of the most interesting cultural and natural area of central Sicily: in its territory, there are the important Hellenistic site of Morgantina (Fig. 4) and the Pietratagliata Castle of the Arab-Norman era. The town has a territory rich in natural and artificial woods that occupy the north-west, and considerable naturalistic sites: it shares with Piazza Armerina and Enna the Ronza Park; on the border with the province of Catania there is the Ogliastro artificial lake, a wet land of significant natural value.

Fig. 3: View of the inhabited city of Aidone, the plain of Catania and the Etna covered in snow.

Fig. 4: Archaeological site of Morgantina, in the foreground there is an example of Hellenic theatre.

According to the map of the territory, following the MOTRIS model for the articulation of the TRI concept, Sicily is divided into large districts, «[…] whose plan exceeds the administrative limits of provinces and municipalities, sticking to building, landscape and environmental emergencies, with significant cultural identities as well as craft fine traditions» [15]. Aidone is placed in a district in the heart of Sicily with the geographical center of the island in the former provincial capital: Enna. Navel of Sicily, as defined by Callimachus in his verses. This district gathers together five municipalities of Enna Province: Calascibetta, Enna, Valguarnera Caropepe, Aidone, Piazza Armerina and one municipality of Catania Province, on the border with the province of Enna: Caltagirone. The district is also a cultural and social center; in fact, here we can find Hellenic, Latin, Arab and Norman-Swabian influences: Enna with its hundred churches, Valguarnera Caropepe and Calascibetta with their necropolis, Piazza Armerina with the largest Roman mosaic in the world, Caltagirone with its centuries-old culture of ceramics manufacture (Fig. 5). The aim is to place our district in a relational tourism circuit, and a network of different type of micro-centrality in it (thematic itineraries): parks and nature reserves, archaeological sites, military buildings (towers and castles), religious buildings (churches and monasteries), civic buildings and museums. «The hypothesis of a tourist use of large areas like routes constitutes a differentiated form of cultural tourism trough which local economy can be brought back» [16], together with handicraft intended to be precluded in that area. We should inculcate a new idea of social and economic regeneration into inhabitants' mind not only focusing on villages or churches restoration, but also pointing the increase in value of cultural events, traditions and traditional crafts.

Fig. 5: Designed by Ugo La Pietra, realized by the Institute of Art of Caltagirone.

4. Museum of Design and Applied Arts in Aidone

This museum has a different idea if compared to "classical museums"«[...] designed to meet the strategies of companies, it must be transformed into a completely new type, free from the principles of the traditional museum design and more appropriate to deep changes in economy and markets». Despite the fact that the major products to be exhibited are previews and / or prototypes and the museum is, therefore, « […] thinking head of the company and driving force of its strategies», its history and its past are still important and they are signs of experience and reliability. Our museum (Fig. 6) is versatile, conceived « […] as the cultural / event space, able to attract lots of tourists and students, especially university students» [17]. Outdoor exhibitions, in the park in front of the museum are not excluded, as guided tours in the sheds behind it, where everyone can observe the manufacture steps of products, which are in the exhibition area of the museum. The building is divided into two distinct parts: the exhibition hall, large in size (500 square meters) and height (6.05 m), to allow more than four companies to showcase its products (ceramics, textiles, coral, jewellery, etc ...), with a large free space in the center, only with a non-bulky structures in corian with versatile and fitted shelves (Fig. 7); and an interactive multimedia area (to the second level) in order to involve and educate visitors on what they are observing; a meeting point for companies, such as in a fair; and a big reception area with a wardrobe, a ticket office and a storage. In another part of the museum we can find the bookshop, specialized in design, crafts, visual arts, graphic design, fashion and architecture; the refreshment area with kitchen and a design café on the top floor (Fig. 8), to leaf through the book in quietness enjoying the extraordinary landscape, or to spend evenings of culture even after the exhibition areas' closing hours, to emphasize the non occasional nature of the visit.

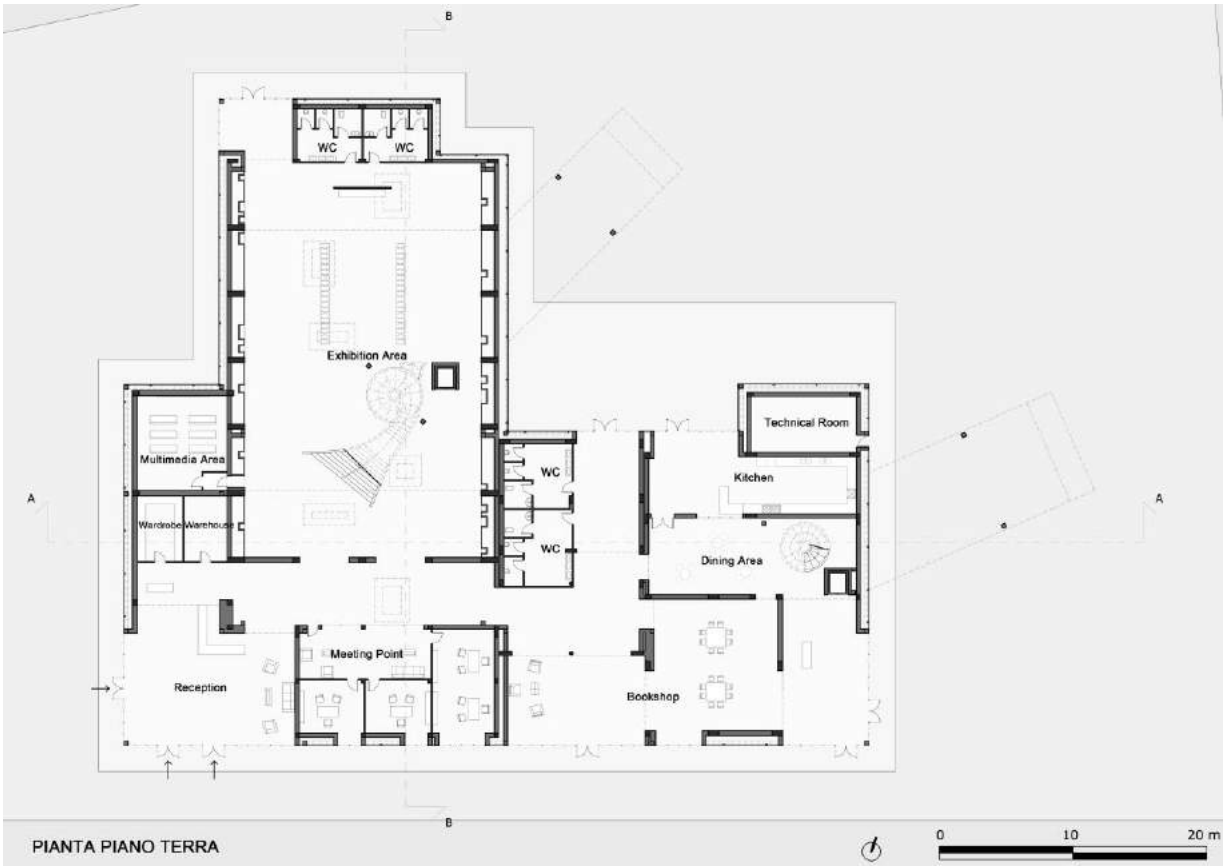

Fig. 6: Ground Floor Plan- Museum of Design and Applied Arts in Aidone.

Fig. 7: Rendering Section of the exhibition hall.

Fig. 8: View from the design café on the first floor of the Museum.

4.2 Recovery of modern buildings: Architectural restyling encapsulating

In the world, in Europe and in Italy there are lots of ancient areas and buildings, public and private, never completed or abandoned that would be more than 5 million only in Italy, according to an estimate of Legambiente [18]. Former barracks, decrepit industrial areas, sheds which have been never dismantled and / or unused for a total of 2,000 square kilometers [19], former fair-exhibition areas are blatant examples within our planet, where only a quarter of it is in a natural state, resisting the overbuilding. Matteo Renzi addressed to mayors of Italy on 2th June 2016 saying: «Locate a blocked barracks, an abandoned building, a closed building site, an administrative proceeding to speed up [...] We will verify the state of the implementation plan and - when appropriate - to proceed with the law-decree called "Unblock Italy"» [20].

«The long economic crisis that lashes all countries has inevitably brought down budgets, but the atmosphere of modernist optimism and confidence in the future is completely vanished [...]. However, in this spirit we can find fragments of possible and necessary future actions, which could give back meaning to contemporary design» [21], as Luca Molinari, architect and critic, has written in his article for DOMUS magazine A museum's second life. This type of design, seen as a way to save, does not aspire to demolish what still exists, avoiding unnecessary costs of demolition and waste disposal. This technique, called architectural restyling encapsulating in the thesis A smart poly-centric city: un Museo nella Terra di mezzo, allows not only the preservation of what exists, but also its restoration, so that buildings fulfill a new function provided by a strategic and estimated planning. It consists of the existing structure surrounded by some "boxes", with the supporting structure made of steel and which

are maximum 50 cm far away from the existing building, which improve the thermal insulation and allow using modern building materials, easy to be installed, to create the steel covering. In this regard Molinari has written that «The intelligent restoration of the National Automobile Museum», completed in 2011 by Cino Zucchi, Recchi Engineering and Proger, «as well as other interventions realized for celebrations of 150th anniversary of national unity in Turin , all based on the careful restoration of the existing heritage, wants to focus our attention on the fact that maybe this is no time for the insane use of territories and resources, but this is the time for a radical change of mind on the common and complex heritage of our country. [...] Albertini's building, with its great hall looking out into the Po river and the circular exhibition stand with a behind auditorium, has become a perfect model to follow for a sophisticated strategy of functional and symbolic restoration. The building, hard and prismatic in its different original volumes, is enveloped by a new skin made of glass and metal, which defines a unified geometry, obtaining showrooms and service places along the outer perimeter» [22]. Other examples of architectural restyling encapsulating can be found in the international arena, as in St. Petersburg, in Russia, thanks to Mamoshin Studio, the Business Center Avenue. Joseph Grima has written «The complex, obtained from the restoration of a factory dated 1990 and occupied by offices and commercial areas, [...] has been selected by the planning commission of St. Petersburg to represent the city in various international competitions. The ceramic tiles that make up the new facades ,slightly separated from pre-existing ones, reminds the classic tonal nuances of brick industrial buildings [...]» [23].
In this way we have also reasoned for the service center of Aidone; we have made a discretization of the various dimensions of small volumes existing, encapsulating the entire structure with two boxes of different heights (5.45 m and 7.05 m). At first sight, our two capsules appear to intersect and it seems to have created new ones, however they refer in plan and in height to the existing reinforced concrete structure, creating a new outer face with a steel structural system and forming a cavity 30 cm higher than the pre-existing. Only aluminium sections are anchored to infill walls (insulated to avoid heat losses) to allow the assembly of the aluminium sheet metal (Fig. 9). "Above" these two capsules, two "telescopes" have been installed to take advantage of the two exceptional views that our site have, acting as interactive area and design café (Fig. 7) of our design museum and applied arts in Sicily.

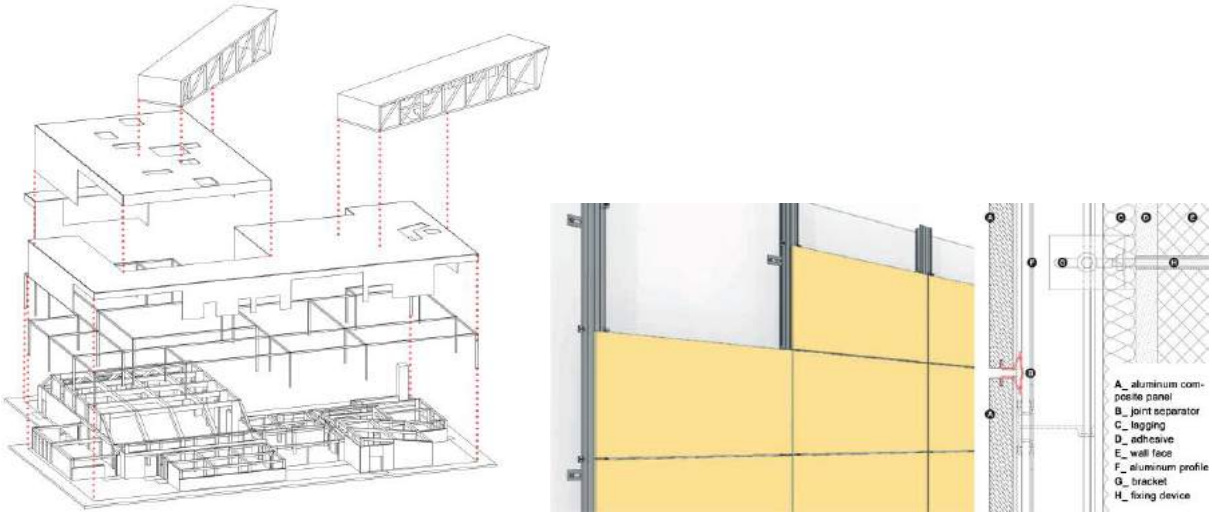

Fig. 9: Exploded isometric- Fixing detail.

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WORLD HERITAGE AND DEGRADATION
Smart Design, Planning and Technologies
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Architecture, degradation, conservation. The Sanctuary of Saint Lucia to Villanova Mondovì. A study case.

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Abstract
The protection and promotion of cultural heritage is a theme that today has assumed special importance because the World Heritage has assumed the value of the good of all humanity. This also thanks to the work of UNESCO that sensitizing experts and public opinion on the need to conserve and protect from degradation the existing heritage.
In Italy, the promotion of art, architecture, history environment is the mission of the FAI - Italian Environment Fund - which manages and protects the landscape in all its forms.
The Sanctuary of S. Lucia in Villanova Mondovi, object of this study, is one of the places that, thanks to the FAI, was identified between *"Places of the Heart",* sites or buildings not to be forgotten and to protect from degradation and neglect.
The Sanctuary dedicated to S. Lucia is situated on the slopes of Mount Calvary, in the province of Cuneo and consists of three distinct but interconnected parts: the *cave-Sanctuary, "the hospice"* perched on the mountain and the *"Opera Bernardi"*.
Despite the importance that this site has assumed over the centuries as a place of devotion and as a place of importance in terms of landscape and environment, the structure, unused for a long time, has reached a marked deterioration. It is therefore essential to document this place through surveys and designs to enhance and regenerate the environment while respecting the history and local identity.

Keywords: Sanctuary, degradation, conservation, representation.

1. Introduction

The protection and promotion of cultural, architectural, historical and environmental heritage, is a theme that, in recent years, has assumed special importance because the World Heritage has assumed the value of the good of all humanity. This also thanks to the work of knowledge and protection of UNESCO that, with the recognition of a growing number of sites, sensitizing experts and public opinion on the need to conserve, protect from degradation and regenerate the existing heritage.
The issue of architectural, city and territory degradation is central to contemporary culture. The degradation is a physical condition whose negative connotations are obvious. But it is also a psychological condition of discomfort related to the time in which we live. It appears in at least two different aspects: physical - namely material - and aesthetic – namely qualitative. The deterioration of the historical architectural and building heritage is the most visible and the one against which most often action is taken using the well-established culture of restoration. The analysis of the degradation brings attention to the protection of architecture, cities, landscape and in particular on architectural operations in urban and regional environments historically connotations.
In Italy, the promotion and respect of nature, art, architecture, history and culture of the environment and landscape is the mission of the FAI - Italian Environment Fund - which manages and protects the landscape in all its forms, with particular attention to "minor heritage" of which Italy is dotted. The association has the merit of having saved many precious places in Italy, making them accessible to the public and has helped to raise awareness of the community with respect to the historical and artistic heritage of the nation.

The FAI through the project *"The places of the heart"* with the reporting of citizens, identified sites, monuments, historic buildings not to be forgotten and to be protected from degradation and neglect. One of these monuments is the Sanctuary of Saint Lucia in Villanova Mondovi, place of worship and relevance from the point of view religious, landscaped and environmental.

2. Location

In the Alpine valleys of Monregalese - south area of Piedmont in the province of Cuneo - develop many of the most beautiful caves in the region because the geological nature of the Maritime Alps lends karst phenomena. There are many caves and cavities accessible in the Ellero Valley including the Saint Lucia cave. The Ellero valley is oriented from southwest to northeast, alongside the Pesio and Maudagna valleys and draws the southern border with France. On the southeast slope of Mount Calvary facing toward the valley has entered the Sanctuary of Saint Lucia, at an elevation of 610 meters.

Fig. 1: The complex of Saint Lucia and the view of the Ellero valley seen from the Sanctuary.

3. The complex: three distinct parts

The Sanctuary, dedicated to Saint Lucia of Syracuse, appears in all its seriousness and its splendor to those who take the road of the Ellero valley towards Mondovi. The complex is located a hundred meters above street level and is divided into three distinct parts: the *cave-sanctuary* not visible outside, a building dating from the early seventeenth century called *"the Hospice"* and a last part called *"Opera Bernardi"* of the nineteenth century.

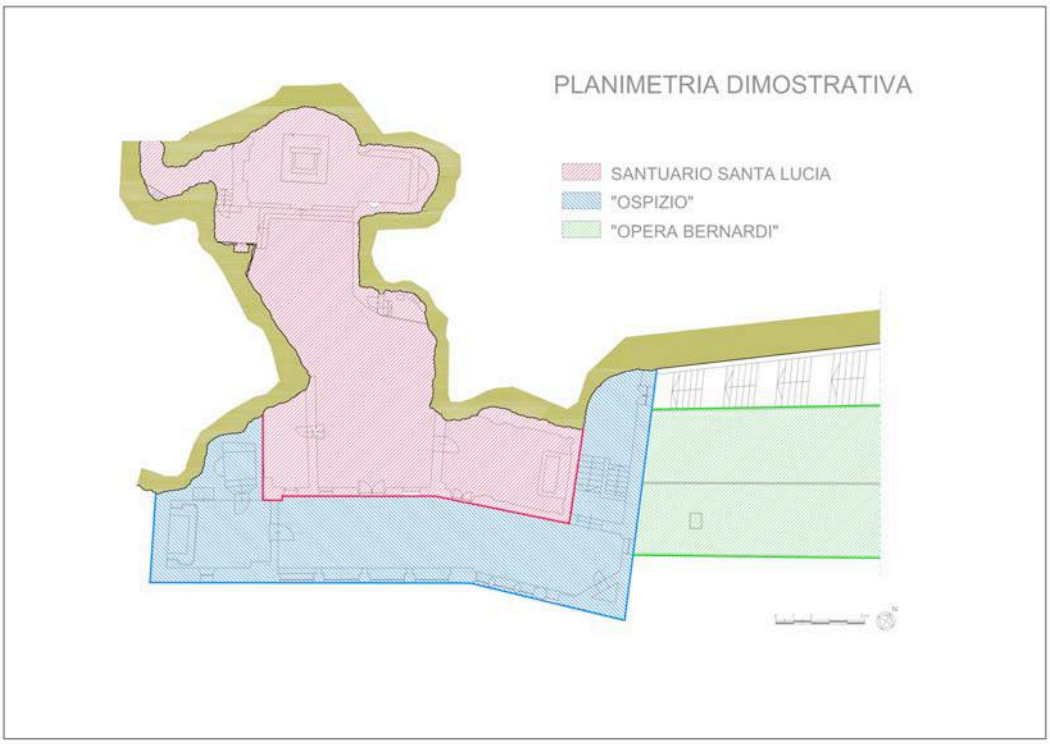

Fig. 2: Demo plan with the identification of the parties that make up the complex (author's design).

The *Sanctuary*, whose entrance is sheltered from the the Hospice portico is a large irregularly shaped cavities entirely carved into the rock. It is about 20 meters deep and 8 meters wide and the floor is slightly tilted towards the entrance. The cave is illuminated through the front door and two side openings to this that open onto a gallery and a window placed higher above the door.

Fig. 3: The cave of Saint Lucia and the gallery which overlooks.

Entering on the right there is a door leading to the Chapel of the Addolorata. It was destined to sacristy until the mid-eighteenth century when it was adapted in the baroque style and topped with a dome and two oval windows. The walls are covered by a twentieth-century *boiserie* to a height of two meters.

Fig. 4: The Addolorata Chapel. Interior and exterior of the dome with oval windows.

Also on the right, in the middle of the cavity, in a small anfratto, it is an imitation of Our Lady of Lourdes cave. On the back of the church, the main altar right there is a small chapel with brick vaulted. The presbytery is located in the end of the cave, elevated by two steps; the altar is leaning against a pediment provided with niche to accommodate the alabaster statue of the Holy.

Fig. 5: Exterior view of the Hospice and mullioned window of the porch.

The *hospice* is arranged over five floors and is placed directly on the rock; the front facing the street is covered with a whitish plaster and it has an irregular grid of openings - rectangular on the sides and arched in the middle - that scans in vertical strips. The high wall ends with a big cross on plaster and with a top floor clocked by arched openings of large dimensions that form a gallery that serves as a vestibule to the cave. From this gallery you have a wonderful panoramic view towards the Ellero Valley. The opposite prospect is dug into the rock to the entire surface. The roof tiles is topped by a steeple of triangular shape and the dome with oval openings of the Addolorata Chapel.

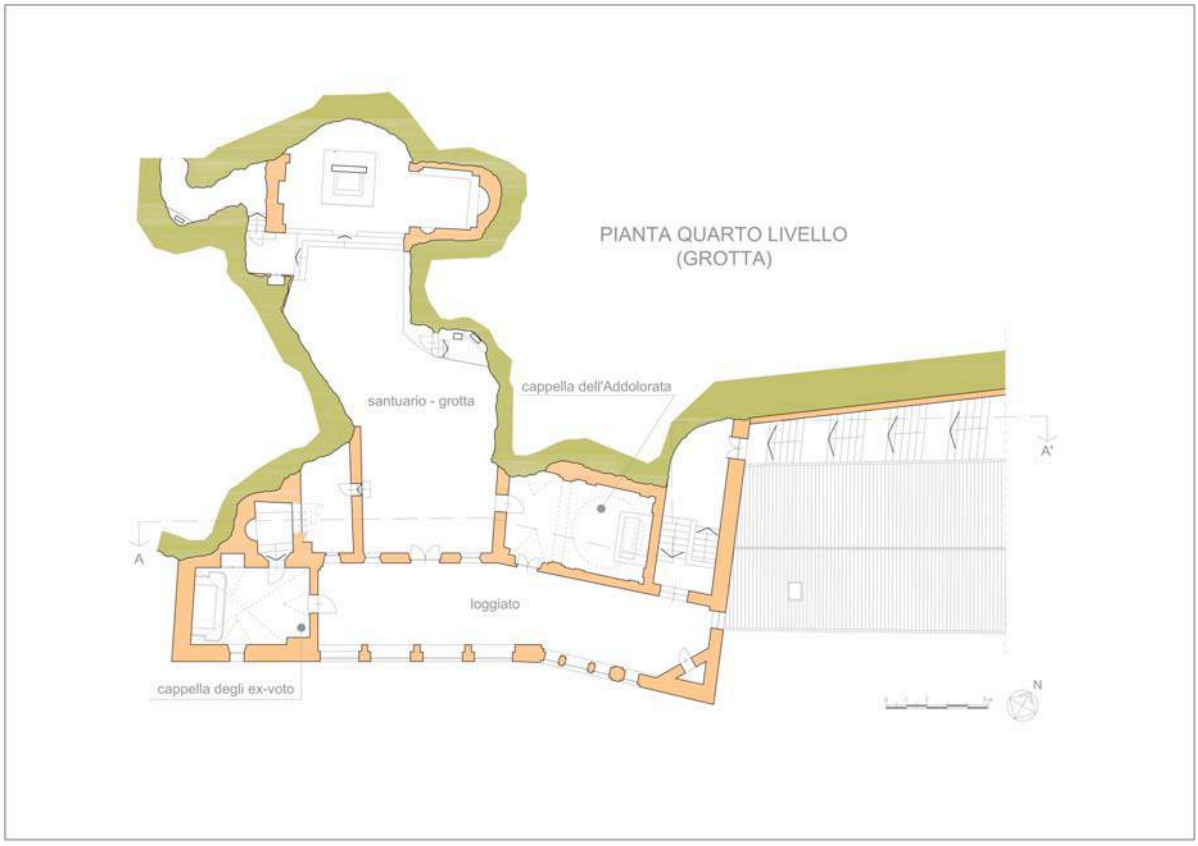

Fig. 6: Survey drawing of the fourth level of the complex (author's design).

The *Opera Bernardi* is a building that, on the side facing street, is in brick and has three rows of arches for a total of ten per floor arches and it corresponds to the rooms overlooking the gallery. The other sides are coated with pink plaster and have small openings. The building was built in the nineteenth century to be intended to accommodate meeting groups, thanks to Gian Andrea Bernardi, main benefactor devoted to Saint Lucia.
Access to the complex is by means of a scale to more ramps located on the northwest side of the building and leaned against the rock wall. In the early seventies of the twentieth century they were made of internal renovation, especially to adapt the structure and equipment to hygiene and health standards in order to continue to provide hospitality and receptivity. Outside the sanctuary looks quite degraded, especially with regard to walls and plaster.

Fig. 7: The *Opera Bernardi*. Facade to the street and east elevation.

4. Origins and description

Understand the reasons that influenced the choice of such a particular site for the construction of the building is difficult because the historical documentation is lacking. Since it is a sanctuary, the origin are known: there is a figurative call - pylon with the image of the saint - from which occurred miracles or healings. But a correct reconstruction of historical events is complex due to lack of correspondence and documents. This is mainly due to two reasons: the effects of the Napoleonic occupation of Piedmont in the last years of the eighteenth century that hit the town archives of Villanova with vandalism. And the lack of administration of the sanctuary, over the centuries, by a religious order that she could make a regular cataloging archival.

Popular tradition has it that in this place was placed a pillar dedicated to Saint Lucia after a deaf and dumb girl was healed and had received indications because this were moved to a rocky hollow of the mountain that now welcomes him. The most credible date for the Sanctuary is the end of the fifteenth century, which is a century before the first documents (acts of the apostolic visits of 1582-1583). This is because it is believed that one hundred years are a time frame sufficient to allow the diffusion of popular devotion for the Holy.

By the acts of the pastoral visit of Monsignor Scarampi of 1582 it shows that in the church there were at least five altars (today is only the high altar) four of which will be demolished in 1867. The first report describing the external appearance of the Sanctuary dates back to 1658-1661 (pastoral visit of Monsignor Beggiamo) which speaks of the presence of a gallery in front of the church that protects the entrance and serves for accommodation of the hermit. Also cited in the report is a brick vault built to protect the altar of Saint Lucia from the cave water infiltration.

The Sanctuary of Saint Lucia was, from its origins, used as a place for meditation and spiritual exercises, even for its location and its isolation. From the first half of the eighteenth century the devotion to the Sanctuary grows much and it must adapt to accommodate the growing number of pilgrims. In the early nineteenth century the Sanctuary was then equipped with a separate building suitable to accommodate a greater number of devotees: the *Opera Pia Bernardi*. In 1819 it was then realized the building to the right of the Hospice and directly connected to this on every floor. The building is organized on three levels and is characterized by a triple row of round arches externally in brick; these internally delineate a gallery that serves as the entrance vestibule to their respective rooms. The ground floor, which was once used as storerooms and warehouses, conserves overlooking a small garden. The works created are listed in a dossier of 1820 interventions where the architectural features required are briefly described. The construction had to be three floors with rooms with vault, paved and equipped with a door and a hinged casement window and balcony with parapet. The building was designed and built with the express purpose of making the sanctuary a rational and equipped center of hospitality for meetings of groups and breaks the silence of nature, position he held until the beginning of the new millennium.

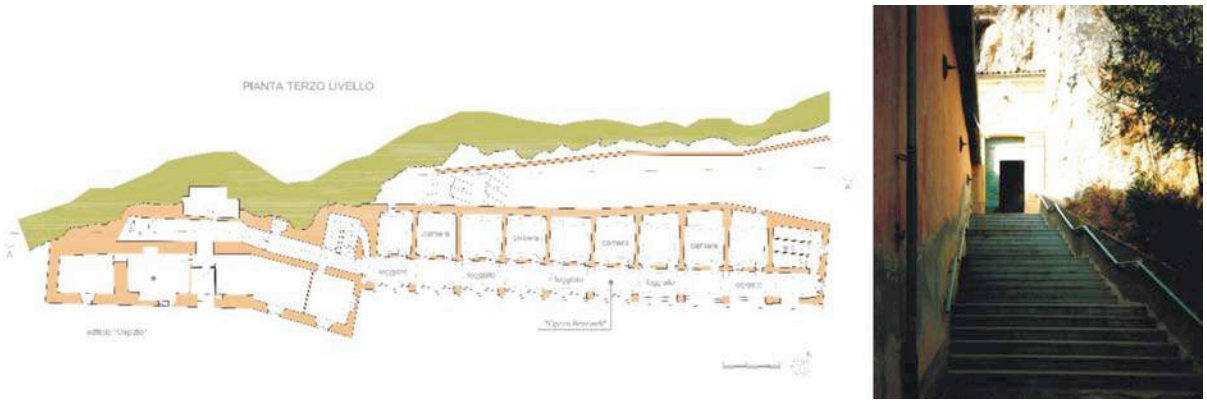

Fig. 8: Survey drawing of the third level and entrance to the complex (author's design).

5. Conclusion

Conclusion. Despite the shrine of Saint Lucia has taken, since its foundation, great importance both as a place of devotion and as a place of importance in terms of landscape and environmental standpoint, the structure is subject to a continuous degradation. What can be the possible strategies - political, economic, regulatory, technical and aesthetic - to isolate and correct the damage caused by the degradation? What is the most appropriate cultural support to prepare these strategies? Is sufficient the analysis, the study, the representation, the complaint? Or is it perhaps needed a place for critical reflection, the definition and planning of interventions to a larger scale. There are many questions to which we should respond conscientiously to address a complex issue such as the degradation of the architecture and landscape. But personally I think it is an important part of the whole matter to document places and architectural complexes through investigations, drawings, surveys, comparative

analysis, historical and iconographic documents, in order to enhance and regenerate the environment while respecting the history and identity local.

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Restoration of the underwater cultural heritage in Campania: The □reek□Roman dock of San Marco di Castellabate

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Abstract
The paper aims to display a solution for the underwater cultural heritage of the Greek-Roman dock in San Marco di Castellabate, one of the many landing places along the coast in Campania. The rests were partially destroyed during the construction of the touristic port in '60 and the site is still underwater. The touristy dock is a great work opportunity for the town but only in the summer periods, during the winter the area is almost empty. In the 2013 there was the construction of a luxury thermal baths structure near the archaeological site that guarantee visitors during the entire year, but itself it is unable to ensure an adequate number of tourists.
In this degraded site a structure for the fruition of the archaeological site will give a new opportunity for the development of the abandoned waterfront. All the different solutions proposed for the area have the common idea of a little structure for the sustainable museumification of the site, little structures to preserve the maritime landscape, true value of the town, totally visible from the panoramic terrace in front of the Abbot's Castle in Castellabate. The project displayed in the paper could give the chance to develop the waterfront with cultural activities during all the year and it represents also a place where the recover artifacts, stored in the warehouse of the Castle, could be displayed.
Keywords: Underwater Archaeology, Castellabate, Underwater Cultural Heritage, Floating Architecture, Roman Heritage

1. From the roman to the touristic dock

The following paper is focused on the valorisation the roman dock of *San Marco di Castellabate*, in the text will be illustrated one of the first idea for the site. The project is developed with the *Soprintendenza Archeologica della Campania*, under the supervision of the Maria Tommasa Granese, Director of the Archaeological Site of Velia and in collaboration with the underwater archaeologist Alessandra Benini, researcher on submerged archaeological roman site and author of a paper on the roman dock of *San Marco di Castellabate* [1]. An historical and bibliographical contribution comes from the Prof. Gennaro Malzone, author of a book focused on the historic development of the coast, from the Greek-Roman dock to the touristic dock. The main aim is to identify one or more possible guidelines for the underwater site, nowadays abandoned without a real protection.
The presence of this heritage could be a great opportunity for the development of the town towards the seaside, the only project on the coast is the touristic hub, a project built in the 1958 based on the separation between the coastline and the city; the archaeological remains were sacrificed during the construction of the dock for tourist where there were no attentions for the cultural heritage. *San Marco di Castellabate* have an economy based on summer tourism, there are few people during the winter months. The waterfront was almost empty during a survey in November 2015, there are only few activities along the coast as the new thermal bath building *Approdo Thalasso*, designed by the architect Massimiliano Rendina; an important contemporary building for the town but only a single tile

of a more complex urban development of the coast. The tourists have not the possibility to visit other cultural / natural attractions beyond the amazing view from the little beach and the castle's terrace, in front of the abbot's castle.

May be the natural view the only element to attract tourists and visitors?

The double aim is to study a sustainable and feasible proposal for the submerged archaeological site and understand the characteristics of the new building, what kind of experience gives to the visitors, an alternative to the current situation with the touristic dock (a huge water-park) that occupy most of the seaside.
The touristic dock is a dated project from the 60s, far from the contemporary idea of new touristic docks, with the construction of new moorings and the development of the surrounding urban space, a concept well expressed in the document on the Communication on a European Ports Policy published on 18th October 2007. In the document there are generic concepts but the most important idea is to reconcile port activity with culture, tourism linked to the sea and the whole urban development; the dock is not anymore a single entity along the coast but a part of a complex system integrated in the city-life. The harbour as a space of interactions and interdependence, where build new centralities connected to the urban net [2].

2. The roman dock of Castellabate

San Marco di Castellabate is the suburb of *Castellabate*, it is a small town along the coast in the Cilento with 1.200 inhabitants, in the Southern Italy, it is located between two important archaeological presences as Paestum to north and Velia to south, both are Greek archaeological sites. The area of the roman dock of *Castellabate* was analysed by the *ITINERA* society, a Milan-based group appointed to study the site, below a short part of the final relation:

"The survey found the existence beyond the north-pier, long 84.50 meters, an opening 45 meters and rocks that originally formed the Northwest arm, long 144.5 meters, bent at 90°. The width of the docks is 5 meters to the heads, the two plinths terminals are disconnected from the rest of the pier for drainage of the sand within the pond. The construction technique of the plinths is the concrete pouring into the rectangular formwork with reinforcement of vertical supports inside. The holes left by the disappearance of the wood are clearly visible in almost all the blocks of the two docks as well as the holes of the horizontal beams they also included in the concrete-structure.
Externally, the front side shows irregularly squared stone rows of rectangular shape, low height not exceeding the average of 10 centimetres, this type of construction technique allows us to date the port to the first century. B.C. From an excavation essay for the recovery of a fund dolium (earthenware vase) found within the port ceramic fragments were recovered crossing an attendance until the third and fourth centuries A.D." [3]

There were three excavations during the last thirty years but the most complete study comes from the underwater archaeologist Alessandra Benini who identifies the functions of the roman ruins and gives a clear lecture of the elements of the sites, as the holes in the foundation of the pier.
Nowadays is clear that in the roman age the dock was extended all over the coast, with several docks along the seaside to protect the shore; a huge archaeological site destroyed during the construction of the touristic dock in the 60s. About the functions during the roman-age, the site was a dock with a primary role of seaport and provision, with a secondary military function [4]. In this period the most important roman port was located in the current Pozzuoli, 25 kilometres from Naples, it was the port of Rome before the construction of the nearest port of Ostia.
Along the coast there was several docks for the roman boats, partially visible in the photos of the beginning of the '900, as the picture 1 with in the foreground the two piers, nowadays still visible underwater; this heritage is still in danger without a real protection and enhancement actions. The project-site is located on the west-side of the current touristic port, where are still visible a part of the north-south pier, totally underwater, and the east-west roman pier partially emerged, between the two structures there is one roman breakwater. This kind of structures could be located along all the coast to protect the roman shore, during the construction of the touristic port some of these roman breakwaters was destroyed or added to the concrete modern pier (figure 1 and 2).
The north-south pier is today totally submerged, it was built with the technique of the pietra persa (rubble mound breakwater technique), a mix of local stones and hydraulic concrete was arranged on the sea bottom to reduce the depth, after the solidification of the mix there was built with the formwork technique, nowadays survived only the lower layer; this pier is in awful state of conservation with several collapsed areas, with local stones spread for 3600 square meters (90 x 40 meters).
The east-west pier is well conserved, the Roman built the dock with the formwork technique because the sea bottom is low, from -1.5 to -3.5 meters. The entire structure was realized in opus

caementicius, always with the formwork technique with intervals from six to eight meters, the width of the pier was of 4.5 meters. This pier starts from east under the touristic port and continues for 80 meters towards west; the final part of the dock is the best preserved part with precise transversal traces of the stone supports in the concrete, it was inserted every 1.50 meters, the catenae was the horizontal connections of the formworks.

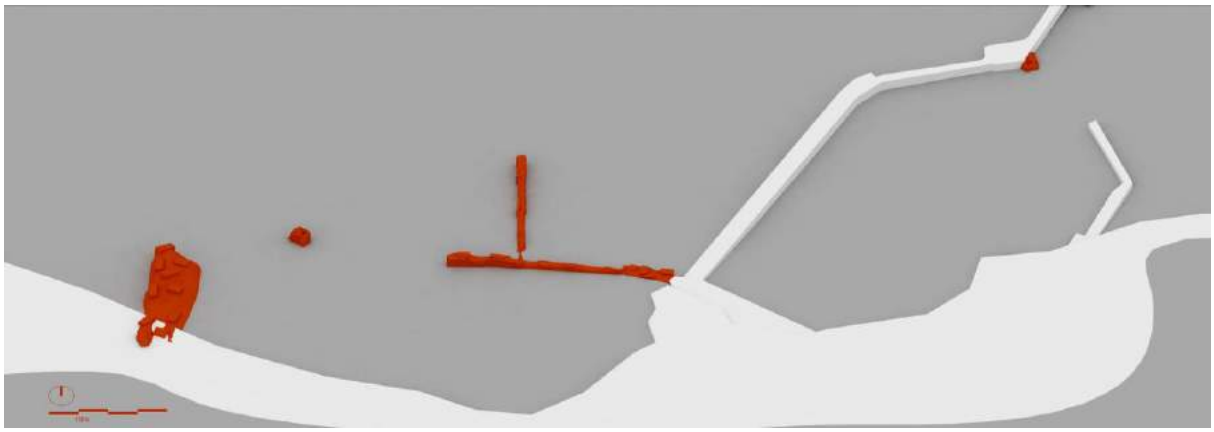

Fig. 1: 3D reconstruction of the north-south pier, the roman breakwater and the east-west pier.

A very important characteristic of this site are the holes in the sea bottom near the west side of the roman dock, here they continue for a short distance, 6/7 meters, hinting that the Roman structure continued in that direction. The archaeologist Alessandra Benini identifies clearly in her paper the function of these holes in the pier's foundation, illustrating the historical precedents as in the roman port of Anzio. The holes were positioned on the sides of the formworks to secure the supports, the stipites had the head covered with a lead foil to protect and toughen the fixed part, an alternative to the burned head solution of the wooden support. The wooden artefacts are not survived and today remain only the holes as trace of this construction technique. Alessandra Benini indicates that the supports were located only in the stretch where the depth of the sea was -1 and -3 meters, in the section near the coast there was not necessary this solution as for the deeper part at -5.5 meters, there was a problem due the length of the wooden support that went out the sea-level of 1.5 meters.
In this underwater archaeological site, we can study the technique of the anchored support for the formworks often made for sandy bottom, here in *Castellabate* we have a rocky bottom so the construction of the docks was expensive and longer than the other sandy places; it is not possible to know if this technique was common or was adopted in an exceptional way.

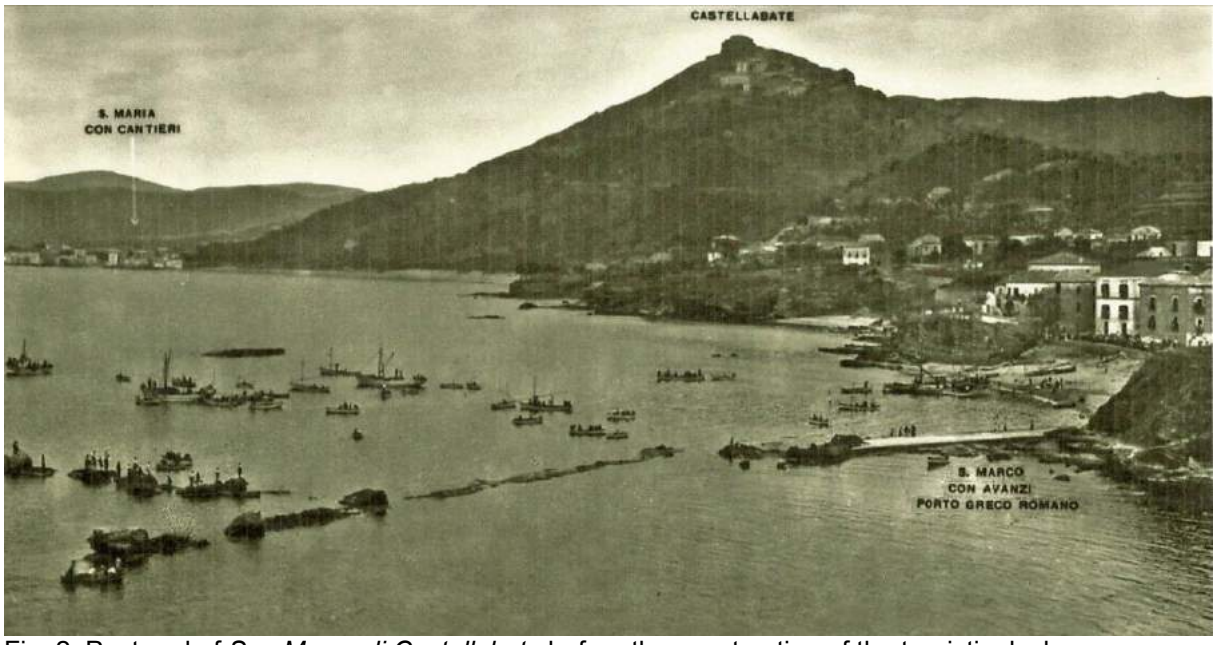

Fig. 2: Postcard of *San Marco di Castellabate* before the construction of the touristic dock.

3. Not another museum…

The design schemes are developed with the archaeologists, this teamwork is necessary for an architect in this kind of works, they know perfectly the site and the restoration techniques. The first sketches were developed after a meeting with Maria Tommasa Granese, Director of the Archaeological Site of Velia, 40 kilometres far from *Castellabate*, at the offices of the *Soprintendenza Archeologica di Salerno* (the public office that manages the archaeological sites, its jurisdiction is provincial). The meeting is finalized to identify possible guidelines for the restoration and valorisation of the cultural heritage, one of the main goal is to understand if exists a valorisation policy in Campania.

One of the first discussion point is about the difficult situation of the archaeological sites in Campania, the low number of visitors and the poor budget for each sites increases the challenge. From this point is clear that is not possible realize new structures with only public funds, it is necessary the support of a sponsor or the European Community funds to the valorisation of the archaeological cultural heritage.

Another discussion is the contextualisation of the proposal, *Castellabate* is a little town with too people during the summer months and with only residents in winter days, design a structure as a museum in this place will be a risk, an expensive structure very difficult to manage. It has been identified a simple and measured solution to the site, based on principles of fast construction with less manage problems and achievable with a small budget. An ephemeral structure could be more practical of a “traditional” building due the strong mistral wind that affect the site. Indeed, in the 2002 the archaeologist Alessandra Benini, after the excavation and relief operations, installed a lighting system on the sea bed destroyed after a violent coastal storm.

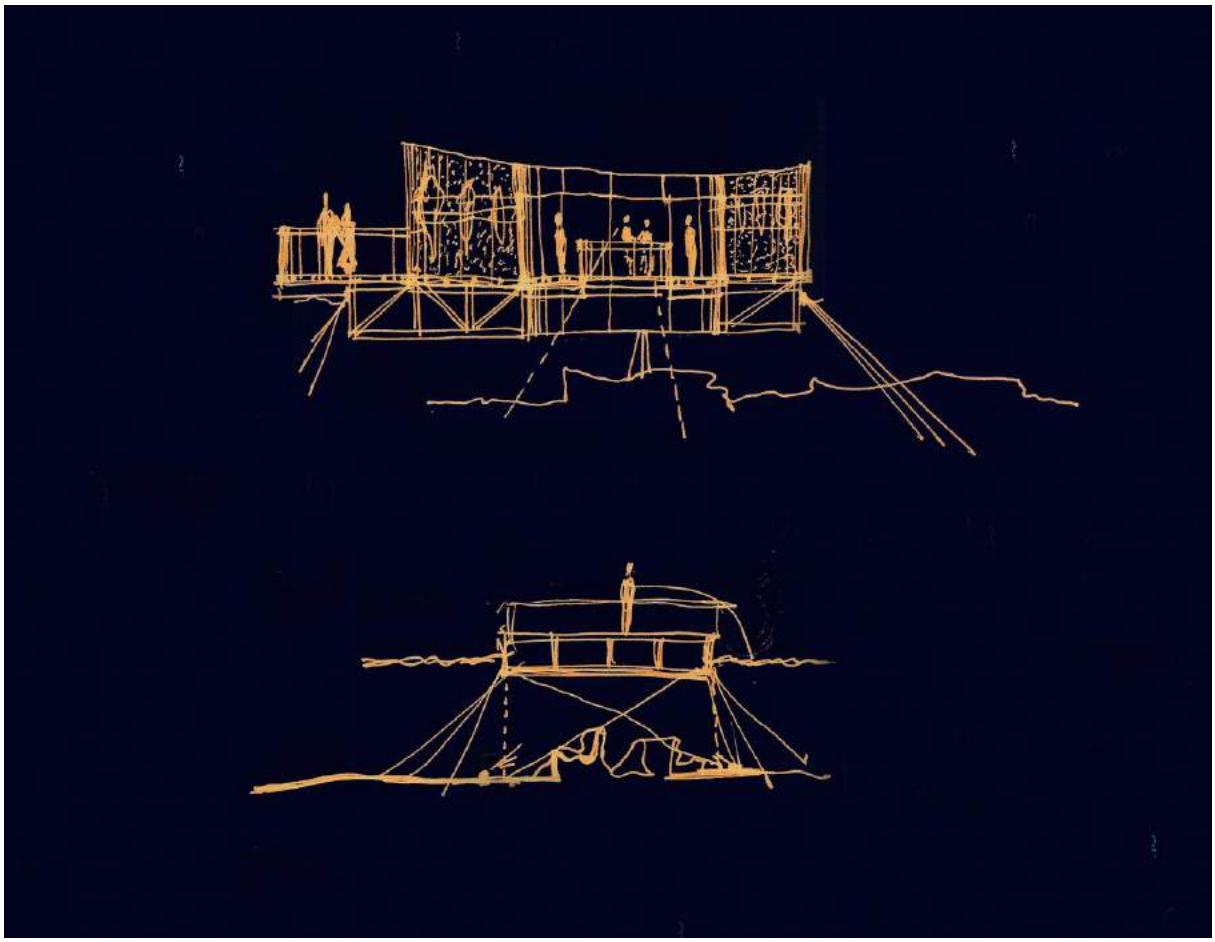

Fig. 3: Sketches of the possible solutions for the valorization of the underwater site.

During the meeting was discussed on what could be today a valorisation and museumification project for the archaeological heritage. The international study-cases are limited and various from the glass bottom boat, solution used for an underwater archaeological site in Ischia by Alessandra Benini to the two museums in China on the underwater cultural heritage, very expansive and complex solutions as the Baiheliang Underwater Museum and the Guangdong Maritime Silk Road Museum. They do not exist intermediate cases as structures easy and fast to build, using techniques that already exists in the field of the maritime architectures as few floating structures used during some underwater

excavations. The study of the international best-practices becomes an occasion to reflect on the past projects in this field and to understand a possible vision for the future. The desire will be to gain into a global knowledge, without denying a contextualization of the architecture that you are proposing, trying not to develop a global solution, not suited to the place where you are working, this is one of the main aim of this work [5].

3.1 Structure

It was discarded the solutions of the glass bottom boat, cheap solution with some problems: during the "visit" there is always a great distance between the visitors and the remains, furthermore for the helmsman is not easy to follow the archaeological site. They were discarded a solution fixed on the sea bed, using the common technology of the cofferdam, solution inspired by dated and very expansive excavations techniques as the rescue of the La Belle shipwreck in the Gulf of Mexico in 1995. This solution eliminates any possibility of underwater visits, which is very important for the site and for the local economy to rental of equipment and boat. This may be an off-scale solution to the site of *San Marco di Castellabate*, the seafront is small and would be sacrificed to build an entrance to the museum or part of it, resulting in a severe loss for citizens because the sea front has already full occupied from the tourist hub.

The solution on which we are discussing is inspired by some projects of medium/small (500 square meters max), based on simple concepts of sustainability, speed of construction, a budget partly funded and the possibility to build it or part of it during a workshop or by volunteers.

The dialogue with the landscape is fundamental in this project because it is the most important value for the residents, during the first meeting with Maria Tommasa Granese, we saw some projects in Europe. One of the finest examples was the Steilneset in the town of Vardo in the Arctic Circle, a memorial designed by Peter Zumthor and Louise Bourgeois in Norway. This is not a floating structure but it represents the address to follow when you work with the landscape, an important element for the project-site, recurring element in architectural production of the Swiss designer as in the pavilions for the zing mine in Allmannajuvet, always in Norway [6].

The references for the floating structure are represented by two projects, the Makoko Floating School in Lagos, building prototype designed by Nlè Architects and the project Jellyfish Barge, floating greenhouse prototype coordinated by Prof. Stefano Mancuso and designed by Studiomobile in Italy. Both designed with the aim to create a low-cost building and an easy to assemble structure, wood is a logical consequence of these principles, they had different functions and was installed in different parts of the world but they share many common elements.

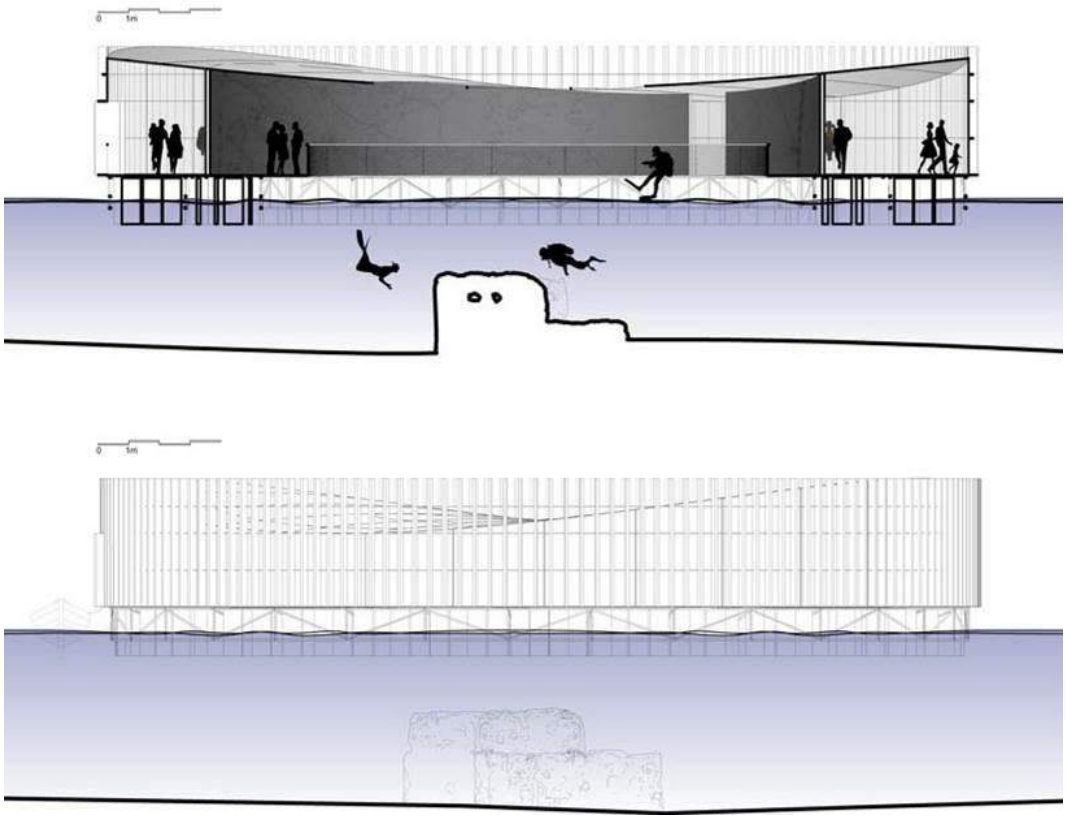

Fig. 4: Section and main facade of the structure.

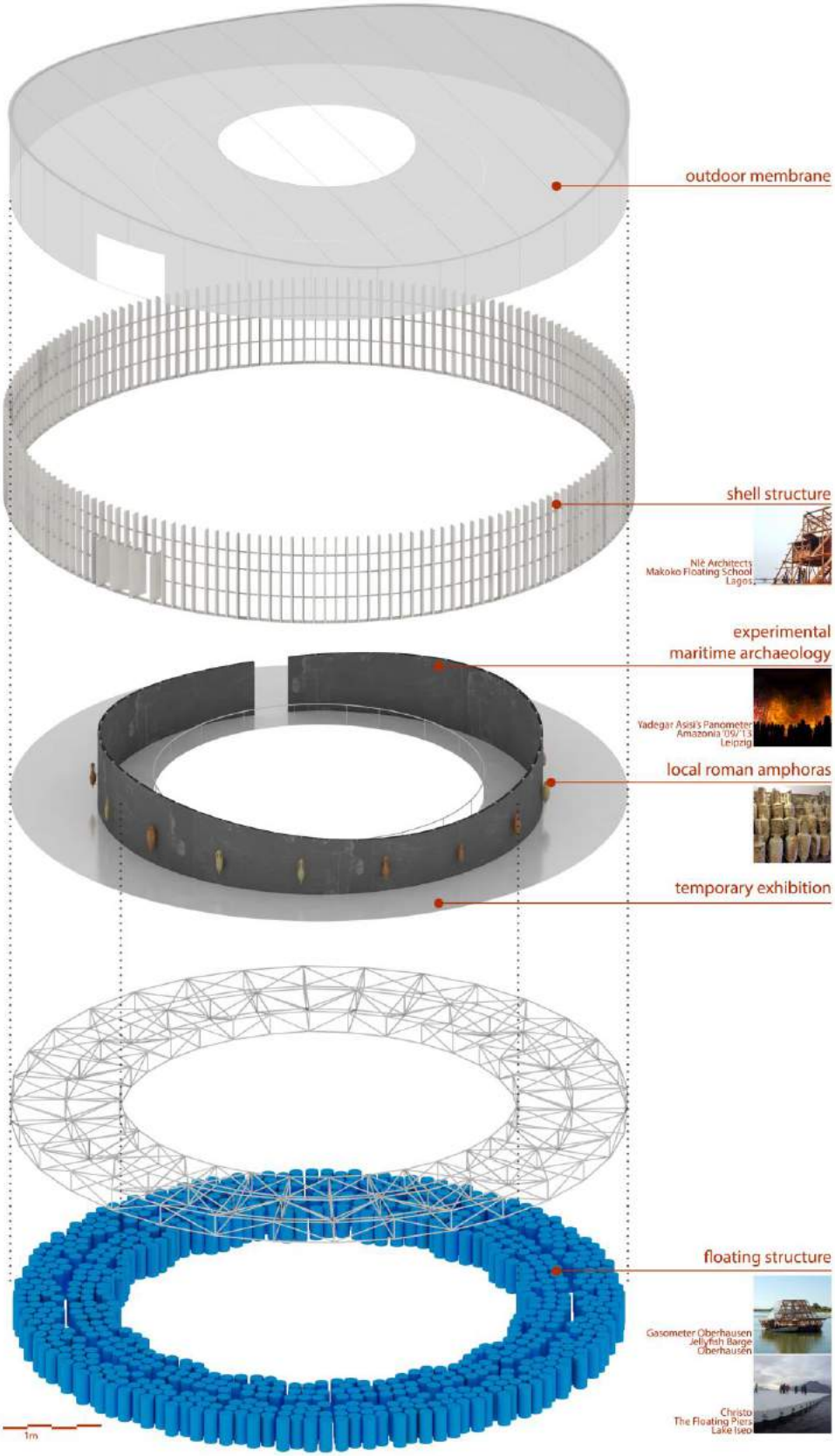

Fig. 5: Exploded axonometric drawing of the structure.

3.2 Temporary exhibitions

One of the primary space identified in this first proposal is the outer ring, an environment with dynamic functions inside. A space organized around the amphorae found during dives in the area and today "hosted" in the warehouse of the castle of the Abbot of *Castellabate*, the privileged location in the sea will make the structure a horizontal overlook, from which you can admire the landscape along the entire circumference without physical obstacles, impossible today due to the presence of moored boats. As shown in figure 6 the space can be used as support to the main exhibition, represented by the remains in the water of the roman breakwater. All contemporary exhibition spaces are designed to implement the visitor experience, direct consequence of the new relationship between the work of art and the observer, the architectures become drivers of the memory, places in which to live or re-live an event [7].

The high-tech installations are not necessary, it is desirable a return to low-tech exhibitions, where visitors can work with the hands having a direct bond with the artefacts and installations, several museums in Europe use this kind of approach as the Viking Ship Museum of Roskilde, adults and children can play with some exhibitions, the interaction became a way to live differently the museum and return another time. In Italy these installations have not used, maybe because our installations are dated and we have a low budget to implement it.

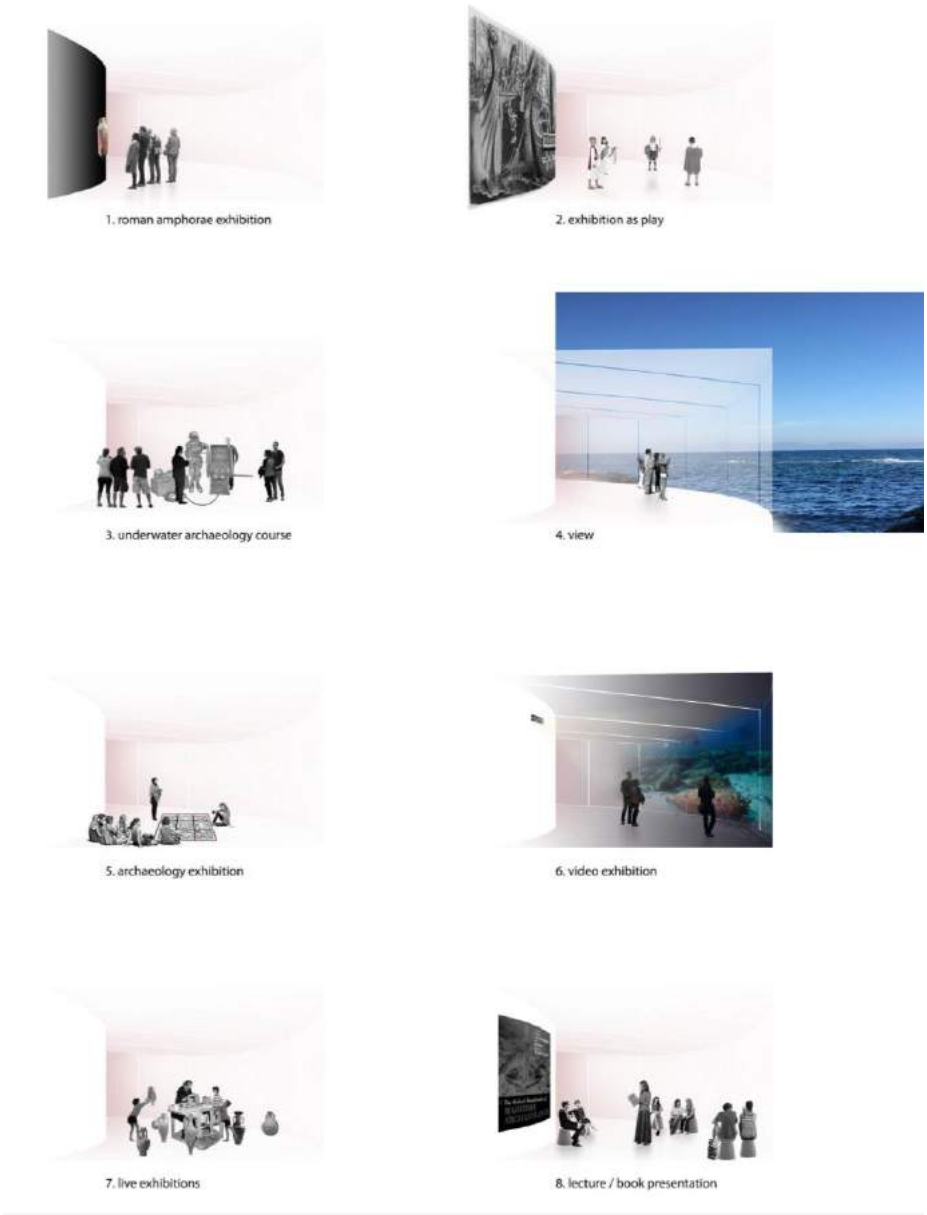

Fig. 6: Possible functions inside the temporary exhibitions space.

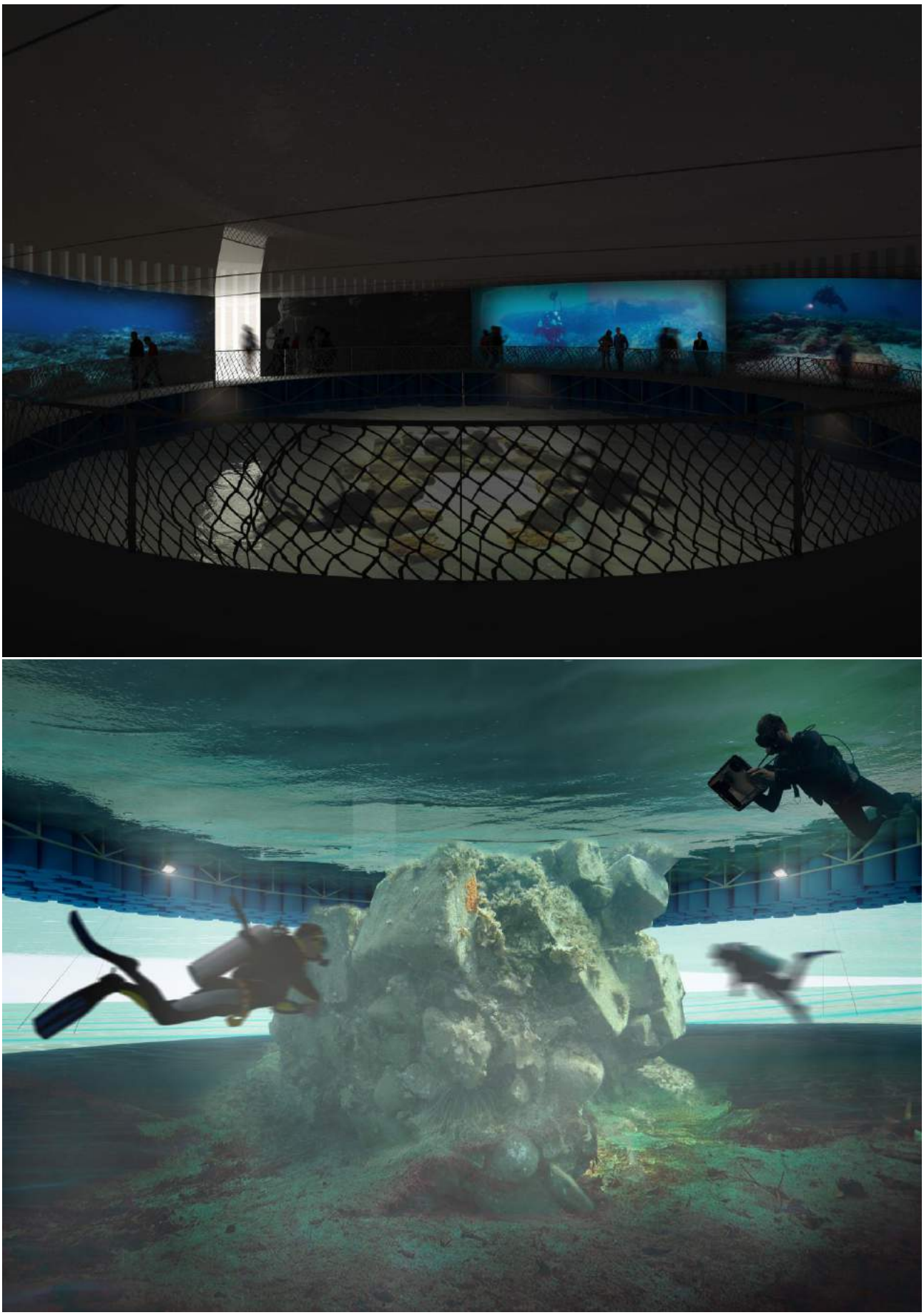

Fig. 7: The permanent exhibition inside the building and during an immersion.

3.3 Permanent exhibitions

The main exhibition is the central part of the circular structure, a space where is possible to see the underwater remains of the roman breakwater, the structure was built with the same techniques of the east-west dock, there are still visible the trace of the wood artefacts inside the concrete mass. In this space there are few elements of the first experiments about the underwater structure carried out by Jacques Cousteau in 70s, with the concept of the liquid door, connection between the architectural ambient and the underwater world.

This space could be used during a courses on underwater archaeology or for a show on the archaeologist's work during an underwater excavation, from the platform you can dive and visit the remains, the sea bottom is at -5.9 meters overlooking a stretch of water, the conditions are favourable for an excellent visibility throughout the entire year. Along the circular hole, under the floor, could be possible to install a lighting system for tours during night hours; with a very complex and expensive system you might think that the lighting system may interact with divers, so you always have the best light conditions, but we leave this solution in further stages.

Particular characteristic of this space is the perimetral wall that you can animate with a simple system of few projectors, transforming this space in a sensitive environment, a collective experience for the visitors, with a simple and low-cost technology. A simple idea well experimented in some exhibitions in the Gasometer of Oberhausen and in the Panometer in Leipzig, developed by the architect and artist Yadegar Asisi, both examples in Germany, realized due the restoration of two industrial building. The Gasometer in Oberhausen uses the projector to animate the huge space otherwise the Panometer in Leipzig has a huge printed cylindrical surface, 105 meters in circumference and 30 meters in height, with a lighting system that changes replicating the day-night effect [8].

In Italy we have some excellent examples of digital technology coupled to the archaeology as the Virtual Museum in Ercolano (the M.A.V.) or the exhibitions of the group *Studio Azzurro* works with the digital technologies on the remain of the maritime villa of Minori in the art installation *Ozi Marittimi* a video-performance on the life 2000 years ago in the town near Salerno.

The projections became an occasion to show how was the area during the roman period or the development during the centuries, or historical photos or video from the divers during an immersion in the site. Utopian and interesting would be a live-streaming of a dive, unique experience to engage visitors and people with disabilities who cannot dive tours.

Fig. 8: the floating structure in the maritime landscape.

4. a way to reuse the underwater archaeological site

The paper tries to identify a possible solution for the valorisation of the underwater archaeological site in *Castellabate*, with the secondary goal of testing the collaboration between the architect and the archaeologist, almost non-existent in Italy differently from Europe. The main aim is to design a structure that can monitor the submerged remains and permit their fruition, an element to revitalise the waterfront which is currently represented by a simple path along the sea, interrupted cyclically from the tourist hub, private structures that invade the public space and the beach with its huge size.
The solution is based on a medium-size building that allows to "visit" the remains throughout the entire year and during the night, integrating with the economic fabric and with local boaters.
The structure is free in the sea without physical connections perfectly overlapped to the roman breakwater, it is not necessary a floating bridge as the project of the artist Christo in the lake Iseo in Italy, will be possible to reach the building with a little boat from the touristic port, the structure remains in its position due removable anchors.
The wooden structure is part of the landscape but in anonymous way, the concept of the reversibility, always linked to architectural projects on the archaeological site, is interpreted in an original way due the possibility of disappearing during a coastal storm or maintenance works.
A solution based on sustainable tourism, a non-invasive proposal with the final goal to become a new symbol for the citizens who living a sterile relationship with the sea from too years. The touristic hub (huge water-park with 371 moorings [9]) is an illusion; it invaded part of the coast reducing the public beach, it is not a project integrated in the urban context, it is an isolated function.
The natural landscape is the real heritage for the citizen of *San Marco di Castellabate* (from the sea) and the residents of *Castellabate* (from the overlook, 300 meters a.s.l.), this value is preserved without the addition of a new human element with the insertion in the landscape of an ephemeral and permeable structure, where inside you can continue enjoying the landscape of the Cilento, without resorting to a solution of mimesis.

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Le Vie dei Mercanti XIV International Forum
WORLD HERITAGE AND DEGRADATION
Smart Design, Planning and Technologies
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Smart Heritage. Cultural Heritage Experiences Project trough Mobile Technology, Augmented Reality, Cultural Tourism and Digital Storytelling.

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Abstract
There is a close relationship between Tourism, Cultural Heritage and technological environment. During the last decade, the incessant development of Information and Communication Technology (ICT) and the extraordinary spread of mobile devices have had important application for the Culture system. The combination "Innovation-enhancement" has encouraged new models of promotion in which the emerging needs of knowledge meet the experience of creative discovery. Particularly, the convergence of one medium into several other functions allows users not only to develop a new method of interaction, but also to shift towards a different approach to cultural landscape. In this effort, the expansion of mobile applications for the tourist represents value added for the planning of a new range of services, personalized, location and time specific based, that were not previously possible. Smart Heritage is a digital interactive storytelling project for the tourist fruition of Cultural Heritage, co-financed by the Italian Minister of University and Scientific Research (MIUR) under the "Culture and Augmented Impact" theme. It involves Public Institutions, Research Centers and Cultural Industry. The project aims to integrate Mobile technologies, Augmented Reality environments and narrative-driven system to promote new models of interaction, interpretation, reuse and fruition of Cultural Heritage.
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Keywords: Smart City, Creative Cultural Industry, Cultural Heritage Promotion, Digital-Storytelling, Cultural Tourism.

1. Introduction Arial – 11 pt – Lower case letters - Bold – Left aligned

In the last two decades, the evolution of Smart City has been the subject of growing consideration in scientific literature and in international policy programmes.
Many definitions and a large variety of terms are used to identify a Smart City such as Digital city, Intelligent city, Information city, Hybrid city, Creative city, Knowledge city and Smart community, to mention a few. This proliferation of meanings and models denote that "Smart City" represents an ever more inclusive concept, used to describe a new paradigm of intelligent urban development and of sustainable socio-economic growth.
As is widely known, the first debate around the notion of "Smart city" dates from the 1990s, when the attention of the academic and scientific world was caught by new technological advancements related to the function of modern Information and Communication Technologies (ICTs) infrastructure. However, its evolution is far from being limited to technological aspects [1].
The preface to the UNESCO Report on *Information and Communication Technologies in Development* explains: «the rapid development and use of information and communication technologies is having a direct and dramatic impact on all aspects of life. The traditional distinctions among media, publishing, telecommunications, computing and information services are becoming blurred, and new paradigms

for creation, dissemination and exploitation of knowledge are evolving. In this transformation from an "industrial" to an "information" society, UNESCO has a unique intellectual and ethical mandate to make these new technologies work for social, cultural and economic development, in the interest of democracy and peace» [2].
The current debate around the construction of Smart Cities is leading to a new theory of the future city, based on the aggregative of intelligences, on the generation of creativity and on the innovation of environments. The cultural infrastructure, the intellectual and social capital are indispensable attributes of urban growth: people, relationships, culture, education, learning, knowledge are important trainers factors of this evolution. Especially, from the "human" perspective, the "creativity" factor is a key driver of Smart City [3]. Robert G. Hollands, in the issue □ *ill the real smart cit□please stand up□ Intelligent, progressive or entrepreneurial*", speaks about the "urban labelling" phenomenon, identifying Smart City as «territories with a high capacity for learning and innovation, which is built in to the creativity of their population, their institutions of knowledge production, and their digital infrastructure for communication» [4].
The principles of "Social innovation" and "Creative economy" are pillars of this new system. Along this perspective, Maurizio Carta explains his concept of *Cit□□0*: «In the "smart and creative city scenario" we must aid the passage from cities that attract the creative class to cities that generate creativity, innovation, new morphologies, relationships and economies. […] Culture is the primary factor of urban creativity a resource that puts down roots in the palimpsest of the history of the cities and stretches it branches out to the future. […] A more cultural-based development aims to constitute cultural districts as an innovative engine factor for urban regeneration» [5].
This is a city planned to transmit and generate knowledge, in which the mix of learning/experience, culture/identity, business/communication, technology/creativity with hybrid social, cultural, and economic enterprise is increasingly close [6].

2. Knowledge and Creativity in Smart Cultural Heritage Promotion

The model of "Smart City" is strictly connected with the concept of "Knowledge City", defined as «a city that aims at a knowledge-based development, by encouraging the continuous creation, sharing, evaluation, renewal and update of knowledge. This can be achieved through the continuous interaction between its citizens themselves and at the same time between them and other cities' citizens. The citizens' knowledge-sharing culture as well as the city's appropriate design, IT networks and infrastructures support these interactions» [7].
Two thousand years after Christ – explains Marc Luyckx Ghisi (former member of the Forward Studies Unit of the European Commission in Brussels) - we are shifting toward a global trans-modern transformation, in which everything changes: trade, measurements, tools of production, management and structures. The post-industrial "Knowledge Society", creates value by applying knowledge to create new knowledge. In this new society "the value creation process is immaterial" and "no longer adds value to an object", but applies knowledge to knowledge in order "to create new knowledge" [8].
The European Union Strategy "*Europe □0□0. Smart, sustainable and inclusive growth*" works in order to achieve this purpose: to make the EU competitive in this society, respecting the environment and social inclusion [9].
Extending to the very heart of structured communities and representing a pillar in the construction of the so-called "Knowledge Society", Cultural Heritage, plays a key role in providing a sense of belonging and social responsibility. The entire heritage sector contributes to the generation of all a series of values, knowledge, belief and traditions that are decisive both for helping us to preserve our habitats. In this effort, the close relationship between Tourism, Cultural Heritage and technological and digital environment should have a significant innovative responsibility, not only in order to promote new and richer interpretations of common culture, but also contributing to sustainable economic growth.
UNESCO has long advocated and demonstrated that culture, in its different manifestations - from tangible and intangible cultural heritage to cultural and creative industries - is a driver and enabler of the economic, social and environmental aspects of sustainable development" [10]. The relation between Cultural Heritage and Creative Industry sector is evident in the report *Understanding Creative Industries Cultural statistics for public-polic□ ma□ing* that defined Cultural Industries as "industries, which combine the creation, production and commercialization of creative contents, which are intangible and cultural in nature". In fact, the term "Cultural & Creative industries" include a broader range of activities, which include the cultural industries plus all cultural or artistic production, whether live or produced as an individual unit [11].
Since its origin this term has produced a huge corpus of literature worldwide that includes extensive discussion of definitions, purpose, philosophy, measurement, impact, utility and history [12]. In 2000, Peter Coy, in the lead article wrote: «I certainly agree with those who say that the advanced nations are shifting to information-based, knowledge-driven economies. The Industrial Economy is giving way to the Creative Economy, and corporations are at another crossroads […] with the most important

force of all: the growing power of ideas… ideas, like germs… can spread to a huge population seemingly overnight» [13].
The cultural and creative industry involves both individuals and entities who engage in activities that add value to society, that are inextricably linked to human creativity manifesting itself, throughout the process of ideation, creation, production, distribution, and use. It is an even more important economic and social component that is becoming increasingly important for modern post-industrial and knowledge-based societies. Moreover, it is a vehicle of cultural identity and it plays an important role in fostering cultural diversity [14].

3. Information and Communication Technology in Culture and Tourism

In the framework of the 2015 WSIS Forum a UNESCO discussion panel on "*Cultural diversit□ and identit□, linguistic diversit□ and local content*" debated questions on how ICTs fostering cultural entrepreneurship in the cultural and creative industries. In current society, ICTs represent a formidable vehicle for improving our "creative capital" that supports our collective vitality, our economic growth and ability to compete on a global scale [15]. The pervasive influence of digital technologies continually and radically renovates our attitude to creativity, modifying not only the way we access and preserve cultural assets, but also providing us with unique tools to better create and communicate [16].
Even the Cultural Heritage system has been involved in this important process of evolution. The advanced of ICTs, combined with the development of applications based on artificial intelligence, opens new possibilities to investigate Cultural Heritage. Cultural institutions gradually use more digital media to communicate with their audience. In addition, the relationship between contemporary reality and historical city becomes a central element in the planning of urban "smartness creativity" [17]. The urbanist Richard Florida, speaking about the "creative class", explains how energy and creative, knowledge-based companies - particularly in the high-tech field - are increasingly consolidating in urban areas, generating a new economic growth model [18].
In this context, ICTs have a direct impact on the modality in which cultural expressions are created, disseminated and accessed. At the same time, they play an increasing role in the safeguarding and transmission of Cultural Heritage, and in the promotion of cultural diversity.
During the last decade, the incessant development of ICTs and the extraordinary spread of mobile devices have had important applications for the Culture system. Particularly, the convergence of one medium into several other functions allows users not only to develop a new method of interaction, but also to shift towards a different approach to cultural landscape[19].
Not surprisingly, the combination "Innovation-enhancement" is encouraging new models of promotion in which the emerging needs of knowledge meet the experience of creative discovery. The European Travel Commission (ETC) and the World Tourism Organization (UNWTO) Report on *Cit□ Tourism and Culture* underlined the potential development of the creative use of Heritage as tourism attractions. This approach is being actively developed as a major source of revenue for many communities and cities across the globe. Tourism creates spatial dynamics for transforming the urban landscape of the cities. It can be a catalyst for revenue generation for innovative practices in heritage conservation and management. In fact, this regeneration process not only builds a quality visitor experience but also safeguards and enhances the quality of life for the local community by providing economic, social, cultural and environmental sustainable benefits including the spatial distribution of attractions, the promotion, the accessibility and the conservation of natural and cultural heritage [20].
In the recent years, the growing synergy of tourism and culture has been one of the major themes in "creative city" development thanks to ICT infrastructure [21].
As the Web has changed people's daily life, it has significantly influenced the way that information is gathered and exchanged in the cultural tourism sector. The development of innovative cultural-creative tourism is a vehicle for developing new products, addressing niche markets, upgrading the quality of services and hence enhancing competitiveness. Innovation and technology can synergize with the activities and services of the city in order to provide benefits to the residents as well as enrich the experience of the visitors. We are uploading from the "e-tourism" to "m-tourism" – Rosa Anna La Rocca writes – «a dimension where tourist becomes "mobile user", namely he can be continually connected with any place and/or any community to exchange data and opinions in real time, participating actively […]. It is approximately the mechanism of social networks, of tourism 2.0 based on the culture of sharing and participation (web 2.0). This sharing takes place in real time, during the travel experience and has radically changed the role of the tourist: from "consumer" to ""evaluator"» [22]. In this effort, the expansion of mobile applications for the tourist represents value added for the planning of a new range of services, personalised, location and time specific based, that were not previously possible.

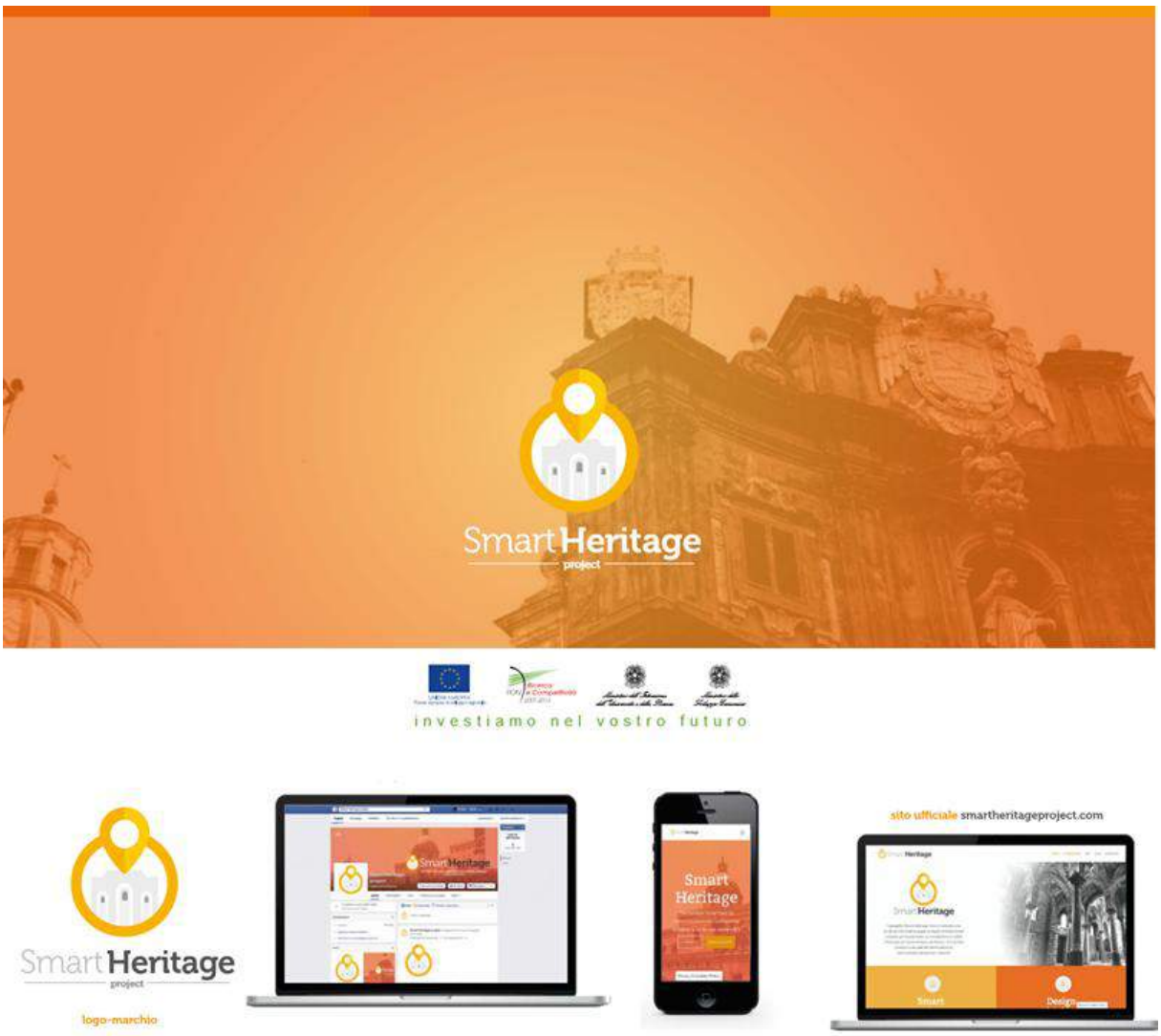

Fig. 1: SMART HERITAGE. Project. Corporate Identity Mobile-Web-Social (by Kappaelle).

4. The Smart Heritage Project: a Cultural Heritage experience

The huge amount of funds made available by the European Union and in Italy by the Ministry of Education, Universities and Research (MIUR) through the announcement of policy and normative solution for working out "strongly innovating solutions" for the region's development and the enhancement of the quality of life in the cities, has attracted the attention of business, public research authorities, universities and public administration, who have been asked to integrate their respective competences in order to set up projects for developing Smart Cities. Today, "historic preservation" means attention to cultural landscapes, the role of historic buildings in comprehensive sustainable development, downtown revitalization, heritage tourism, the contribution of historic sites, trails, and corridors to outdoor recreation, and – the focus of this report – economic development.

SMART HERITAGE is a project co-financed by (MIUR)) in the *National Operative Programme for Research and Competitiveness* (PON 2007-2013) - *Action Plan Cohesion* (PAC) – *Start Up – Line* □. *Culture and Augmented Impact*□*Cultural Space* □*0* [23], with a partnership among three Start-ups of the Cultural and creative sector: InfrmaMuse S.r.l, Kappaele S.l.r, E.Lab S.r.l.; and two Departments of the University of Palermo: Department of Chemical, Management, Computer and Mechanical Engineering (DICGIM) and Department of Cultural Heritage and Society (DBCSC) [24].

SMART HERITAGE is a narrative-driven system capable of offering "cultural adventures", extended in space and time, through hybrid structures based on interdisciplinary research, personalization and adaptability, Digital storytelling, on methods of interaction-oriented, Mobile Technologies, Mixed and Augmented Reality environments.

The project case study is the city of Palermo and its antique historic centre, where the Cultural Landscape is an interconnected system of Cultural evidences and activities (museum, archaeological

area, historical monuments, art masterpieces, demo-ethno-anthropological costumes, ancient crafts and traditions), material and immaterial expressions of local cultural identity.
SMART HERITAGE aims to support aims to guide the user in the experience and knowledge of the city, through an innovative enhancement process of the Cultural Landscape. Despite the intrinsic value, the artistic and cultural heritage of the area involved in Smart Heritage is difficult to access for several reasons, including the information system and the tourism and cultural services. In order to fill this gap, the research team has developed several functions: the optimization of the visiting timetable; access for users with disabilities; the provision of multilingual content; the possibility to share comments; the ability to deliver content personalized to user types or "theme"; the direct access to the tales of story, places and person that personify the territory.
Digital tools used to tell stories are becoming increasingly popular. Narratives dimension qualifies the development of personal and community identities, and the creation of meanings. Many international studies have revealed the incredible spread of a new social avant-garde the “Cultural Creatives”. This is a social miscellaneous group, bounded by the common will to pursue the positive values of ecological sustainability, the recovery of own history and tradition and human ethics: they have a perspective on the quality of life based on “unique experiences” of personal growth, on critical and conscious access to knowledge and the consumption of more cultural than material products. They are “creatives” because of the fact that – acting in a discerning way regarding information, operating in a selective manner and elaborating their own awareness form – they act on culture, producing culture in their turn [25]. The observation of the emergence of this social phenomenon suggests that communication projects for Cultural Heritage, which are ready to follow the evolution of these processes, can really change the relationship that citizens have towards their 'own' territory and can have a great impact on the perception of their property, on the sense of mutual belonging and identification, on the construction of a cultural identity to live, share and respect. A so determined approach, which aims to build a direct relationship with the good through the experience that the user makes of it, can help to create new culture and to form a society oriented to the production of knowledge.

4.1 SMART HERITAGE Technological Solution

The project’s focal point is based on the development of an Itinerary/Entertainment system that allows users to enjoy the city's cultural landscape, according to a system of Points of Interest (POI), a specific cultural location that may be found useful or interesting for the user. Create location-based stories: public space is a privileged environment for learning and cultural heritage mediation. Using the city as a new learning environment enables to ensure the promotion and valorization of knowledge and culture.
From the technological implementation point of view, Smart Heritage draws on an innovative mode of integration of hardware (mobile devices, cameras, sensors, displays) and software (Research and optimization of routes, 2D and 3D representation, Mixed Reality, Geo-referencing).

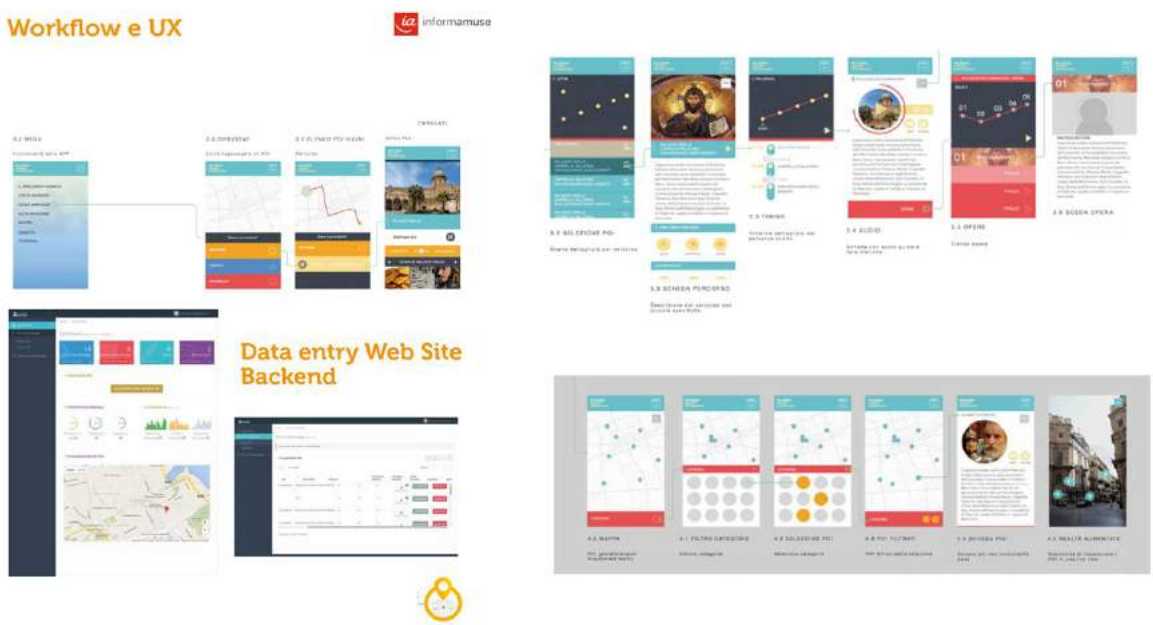

Fig. 2: SMART HERITAGE Project. Technological Development, Workflow an UX (by InformAmuse – e Lab).

A data structured system based on suitable logic model, integrates the IT Database with the Content Management System and provides access to information from the web or mobile devices.
The location-based systems provide additional information, give directions, and customise the offer, enhancing the user's experience.
SMART HERITAGES enabling technologies are:

- Optical character recognition – Optical character reader (OCR).

Thanks to this technology, the user can use the camera of their devices to frame the QR code or the images of the monument for quick access to information and contents associated to every POI(opening times, ticket, rules of conduct, multimedia description of the site),

- Global Positioning System (GPS) and Geographical Information System (GIS).

Thanks to the space-based navigation system that provides location and time information, the user can access a map of the territory, capturing, storing, checking, and displaying data related to POI positions and to the thematic tours. In this way, it is possible have tips on how to reach the nearest POIs or selected one.

- Augmented Reality (AR).

This technology arranges real and virtual objects with visual representations of the real and virtual spaces. Users can receive context information superimposed in real time to the view of the camera, thanks to the optical recognition of video stream. Accordingly, the supply tourism-supporting services through more and more innovative applications, transforms tourists from simple observers to the leading actors of their visiting experience.

1.2 Content Management System I.S.P.E: Digital storytelling of Cultural Heritage

SMART HERITAGE draws on narrative traditions declined in digital key, thanks to the development of interactive and multimedia content.
Promoting and enhancing the Cultural Heritage through modern digital technology means developing new communication strategies that increase the emotional experience, knowledge and convey a sense of identity and belonging, focusing the interest on the content of the disclosure.
The history of Cultural Heritage is based on the narrative character of the message of which this is the bearer for nature, as well as on the dialogue that has been able to weave with their users. The value of this asset can be determined looking at this relation, as a shared significance.
Building knowledge, developing the sense of recognition, belonging and identification means to act through a communication model and to establish a relationship of dialogue and exchange with the heritage.

Fig. 3: SMART HERITAGE Project. Content Management System. Identification POI (by CDS).

In this effort, SMART HERITAGE Project aims to:

- ✓ implement the runtime system of the Cultural Heritage;
- ✓ promote the contextualization and understanding of the Cultural Landscape;
- ✓ enrich the immersive knowledge space;
- ✓ create a new experience of learning environment.

To achieve this goal the project team has develop a specific methodology of Production and Management Content System I.C.P.E, structured in four steps:

Phase 1: IDENTIFICATION.
This phase was preceded by a careful and detailed analysis of the territory cultural offer. In order to give an overview of the city Cultural Landscape, the main Points of Interest (POIs) to be included in the App were identified in two steps:

- POI Selection: overview of the main material and immaterial, tangible and intangible Cultural Heritage.
  It is carried out according to a historical, artistic, anthropologic and naturalistic approach. The sources reference covered from three different categories:
  - Guide 2.0 (Web, Social Networking, Blogs, TripAdvisor ...);
  - Traditional Guides (Touring Club Map Loney Planet, De Seta-Spadaro-Spatafora ...);
  - Human resources (Guides, Tour Leaders, Managers of additional services…).
- POI Mapping: recognition of the of geospatial density concentration, in order to obviate to possible isolations.
  The POI mapping was structured in: Macro-thematic areas and Sub-typological categories

Phase 2: CATALOGUING.
The Department of Culture and Society of the University of Palermo have compiled the catalog card (according to the format of the Regional Centre for Inventory, Cataloging and Documentation of the Cultural Heritage of the Sicilian Region C.R.C.D.), with the technical, historiographical and critical information related to each POI.

Phase 3: PLANNING INFORMATION PALIMPSEST.
This phase was certainly the more interdisciplinary. It was focused on the design of the content architecture and on the relative informatics configuration of the App. The “POI FORMAT” represents the cornerstone around which the Content Palimpsest is organized. This card is organized under the following headings: Description – Don’t Miss – Curiosity – Filters – Multimedia – Useful Information.
Since July 2015, the "Arab-Norman Palermo and the Cathedral Churches of Cefal□ and Monreale" is the 51° serial site of UNESCO World Heritage list. This important inclusion have led to an architectural review of content that was re-designed to include a specific UNESCO itinerary-section. To maintain coherent and useful structure, it was modulated according to the generic POI Format.

Fig. 4: SMART HERITAGE Project. Content Management System. Cataloging POI – Palimpsest Information (by CDS).

Fig. 5: SMART HERITAGE Project. Content Management System. Design Contente Architecture (by InformAmuse – CDS) .

4. EDITING.

The belief that the scientific information about the Cultural Heritage may be communicated to the large audience in an informal, engaging and enjoyable way is the core of this last phase of development. Among the sharing models oriented to the inclusion of the community in the process of interpretation and re-use of Cultural Heritage there is the narrative technique of “Storytelling”. This methodology identifies in the narrative plot a communicative and cognitive tool which can recall to memory experience through the attribution of new meanings.

Using emotional and immersive strategies, it helps to generate a sense of empathy, through the social sharing of the story. The application of the digital and transmedia Storytelling method to the Cultural Heritage, with its playful and creative approach, is particularly used in the museographer ambient.

This contest represents a rich font of inspiration, and the distinction key by the more diffuse Touristic App.

For this reason, in the editing phase, the model adopted was implemented by the most recent communication theories developed in museums field [26].

Fig. 6: SMART HERITAGE Project. Content Management System. Editing Contents (by CDS).

In terms of “narrative economy”, the story was structured according to the following guidelines:

- Tale through characters and first-person narrative;
- Question Form an informal dialogue;
- Comparison with the contemporary world.

5. Conclusion

Interactive and digital tourist guides, Augmented Reality and multimedia reconstructions make the perceptual and cognitive experience increasingly richer and articulated. At the same time, the user is less a passive spectator and more an active actor. Thanks to the spread of smart devices and social networks, the ability to customize the cultural experience, to share, to build together a common identity and new awareness spreads in a widespread manner.

Mixed Reality solutions, along with systems of mobility enabling, promise to make not only the Cultural Heritage sites most attractive, but also to provide new means of knowledge, favoring new model of transmission and analysis. The user becomes again a “traveler”, ready to discover new cultures, to find its own identity and collective dimension, the dimension of experience, empathy, emotion, that the continuous live of Cultural Heritage is able to evoke.

In fact, the development of Web technologies has brought a radical change in the mode of communicate the cultural contents. The Digital evolution of the Storytelling practices represents an innovative frontier in the communication of Cultural Heritage. It has opened new opportunities for Museums and Cultural Institutions to reuse and to promote their resources, trough a process of implementation, that continues to involve in a live fabric formed by social actors, technological artefacts and sharing practices. A significant evolution from imposed and listened tale, to a participatory, re-created and shared.

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The Revolarization of Industrial Heritage: AGU Sümer Campus in Kayseri, Turkey

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Abstract
The Sümerbank Textile Factory in Kayseri (1932-1935) was one of the earliest and largest industrial complexes designed and constructed following the foundation of the Turkish Republic. This was a striking ensemble of buildings with rationalist and functionalist vocabulary, which also functioned as an urban center of social and cultural modernization, providing work and cultural/recreational activities based on a secular and westernized way of life in contrast with the existing traditional society.
The factory went through a number of technological changes during its production history, and was finally closed and abandoned in 1999. The site, located along the northern development corridor of the city, and its buildings soon became derelict and were vandalized. Various projects for its regeneration as a green area were not implemented. National designation followed for the site in 2003 and for the buildings in 2007. However no conservation or adaptive re-use plans were made until the allocation of the complex to Abdullah Gül University in 2012.
Today the complex is being transformed into an urban university campus. The master plan dated 2014 aims to redefine the urban and socio-cultural function of the complex. The open campus concept will welcome the citizens to an architecturally preserved and restored site with a selection of new activities focusing on culture and education at different levels where the spirit and memory of place will be sustained.

Keywords: industrial heritage, open campus, Kayseri, Sümerbank, Abdullah Gül University

1. Introduction: Kayseri Sümerbank Textile Factory (1932-1935)
Kayseri Sümerbank Textile Factory (1932-1935) became one of the first major investments based on the first five-year development plan (1932-1934) following the foundation of the Turkish Republic in 1923. The architectural and industrial production design of the complex was developed with Soviet consultancy and financial and technological aid. The architectural design was directed by architect Ivan Nikolaev for Turkstroj, a commercial trust founded in Moscow. The complex was opened to production on 16 September 1935. Besides being one of the largest industrial investments of the period, this project also aimed to create a socio-cultural center for the urban and economic development of the city, serving the Kemalist ideology of modernizing and secularizing the society through scientific, political, cultural and industrial revolutions. [1]
When completed, the complex located on the northern development axis of the city and directly connected to the railroad, had a total open area of 922,500m^2 and a built area of 185,000m^2. [2] The rationalist and functionalist tendencies of the period are clearly reflected in the design. The buildings were organized on a grid plan, where large buildings located parallel to each other in the north-south direction were separated by wide alleys. (Fig. 1) The 2,100 workers and 155 administrative and technical staff employed by the factory and their families, constituted almost 1/4-1/6 of the total population of the city center in 1935. [3] The complex serving these people was designed as a metropolis, where various activities were housed and supervised, including administrative, production, storage, service, educational, social, cultural and recreational facilities as well as in-service housing for the staff and workers. [4] The life style provided by these houses alone was revolutionary for a

closed provincial urban society as in Kayseri with novelties such as non-stationary furniture, central heating, water, sewage and electricity systems and geometric plans. The lifestyle provided by the complex, on the other hand, brought about a socio-cultural revolution not only for the employees but also for their friends, relatives and the rest of the citizens. These included activities such as movies, theatrical plays, concerts, evening dances and dinners as well as balls on certain occasions. Meanwhile the sport facilities including soccer field, tennis courts and an open swimming pool brought new recreational possibilities. (Fig. 2) This design and function concept was also supported by the Soviet models of the period, as illustrated by examples such as the Vesnin Brothers' "housing planning model for Soviet industrial settlements". [5]

The privatization policies in the 1990s led to a decision to cease all production activity in state factories in 1996. Accordingly Kayseri Sümerbank Textile Factory was closed in 1999 after 64 years. During its service period, various alterations and additions were made to the buildings as well as the production system of the complex. Although its general architectural characteristics and integrity were preserved, some changes such as the remodeling of the lunchroom in the Great Storehouse and the removal of the machines of the Power Plant, were observed. Following technological developments changes were made to the production line as well, and some of the original machinery lines were modernized to fit new standards.

However, the changes following the closing and abandonment of the complex were more drastic as removable parts of the buildings were sold as scrap materials and the buildings were heavily vandalized and even burnt. Nevertheless, at a period when most state factories were privatized ad sold Kayseri Sümerbank Textile Factory remained in the ownership of the Treasury because of the recognition of its importance and significance in national industrial, economic and socio-cultural development. Although the complex was allotted to Erciyes University in 2001 in order to preserve its integrity and make an appropriate reuse project possible, this did not result in an attempt at architectural and/or urban preservation. Most buildings remained unused and derelict while inappropriate interventions were made to some, including the main Plant and the Great Storehouse. Most of the detachable original machinery was sold as scrap metal during the same period. The complex was designated as a national monument in 2003, and the singular buildings were designated as monuments in 2007. Kayseri Metropolitan Municipality's attempts at transforming the site into a city park failed, and this historic urban focal point remained disused and neglected. Also during this period,

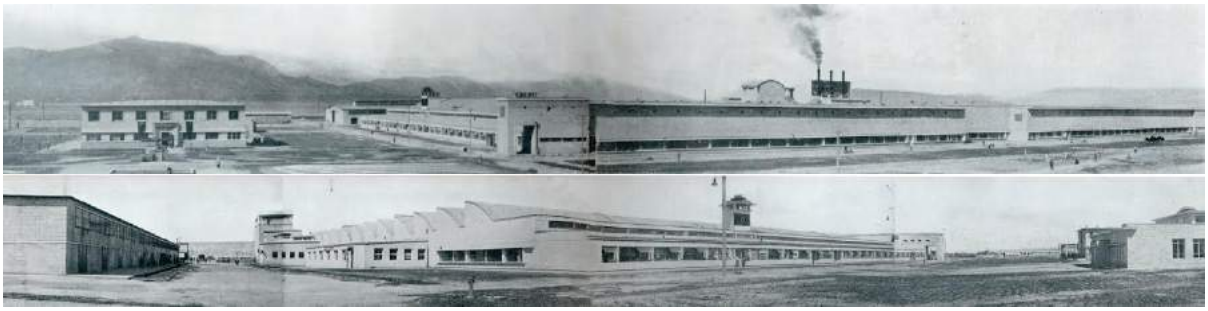

Fig. 1: The Kayseri Sümerbank Textile Factory, 1935. [6]

Fig. 2: Life at Kayseri Sümerbank Textile Factory: The medical dentist and his family at the in-service housing complex for the staff in 1941 (left; N. Baturayoğlu Yöney Archive) and one of the skilled workers' families cycling in front of their in-service housing in the 1940s (right; İ. Babacan Archive).

formerly unbuilt areas around the perimeter of the site were developed for mass housing while the former dormitory for single workers outside the main complex was transformed into a community center. Meanwhile the various schools built later remained in use.

2. Transformation: Abdullah Gül University Sümer Campus

A new initiative was created in 2012 when the complex was allotted to Abdullah Gül University, a new institution of higher education founded in the same year. The university decided to use this important historic site as its city campus, an open campus project, which will become the interface between the academia and students and the citizens of Kayseri, in accordance with the education, research and societal service mission of this institution. Once an urban focus, the campus will be regenerated as a new urban hub, preserving it as a memory place.

The master plan prepared by the authors in 2014 to direct this transformation (Fig. 3) was based on a research and analysis of the site as guided and defined by international documents, including the Madrid Document (ICOMOS International Scientific Committee on Twentieth Century Heritage Approaches for the Conservation of Twentieth-Century Architectural Heritage, adopted June 2011), Dublin Principles (Joint ICOMOS – TICCIH Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes, adopted 28 November 2011) and Valetta Principles (ICOMOS Principles for the Safeguarding and Management of Historic Cities, Towns and Urban Areas, adopted 28 November 2011). The master plan aims to define dominant function zones although administrative, educational and socio-cultural functions need to be integrated into all of the zones. The restoration and adaptive reuse projects for single buildings focus on the preservation of the original characteristics of architectural design, spatial composition and building materials and technologies as well as the economic, social and cultural history of industrial production, including characteristic period interventions, alterations and additions. Although degraded and in some cases partially destroyed, the buildings in the complex are documents to the development of building technology and materials throughout the 20th century. Despite the constraints in the acquisition of building materials, only some of which were produced in Turkey at this period, a close survey and study of the buildings reflect the innovative design strategies and details that were devised. Comparisons with the surviving documents in various archives demonstrate that the visionary and ambitious architectural and structural designs in monumental proportions were effectively realized. Furthermore, the buildings have survived in acceptable condition in spite of the neglect and vandalism in the 15-year period of abandonment. Since most of the machinery has been lost after the closing of the plant to production in 1999, the architectural restoration and adaptive reuse projects focus on sustaining and presenting

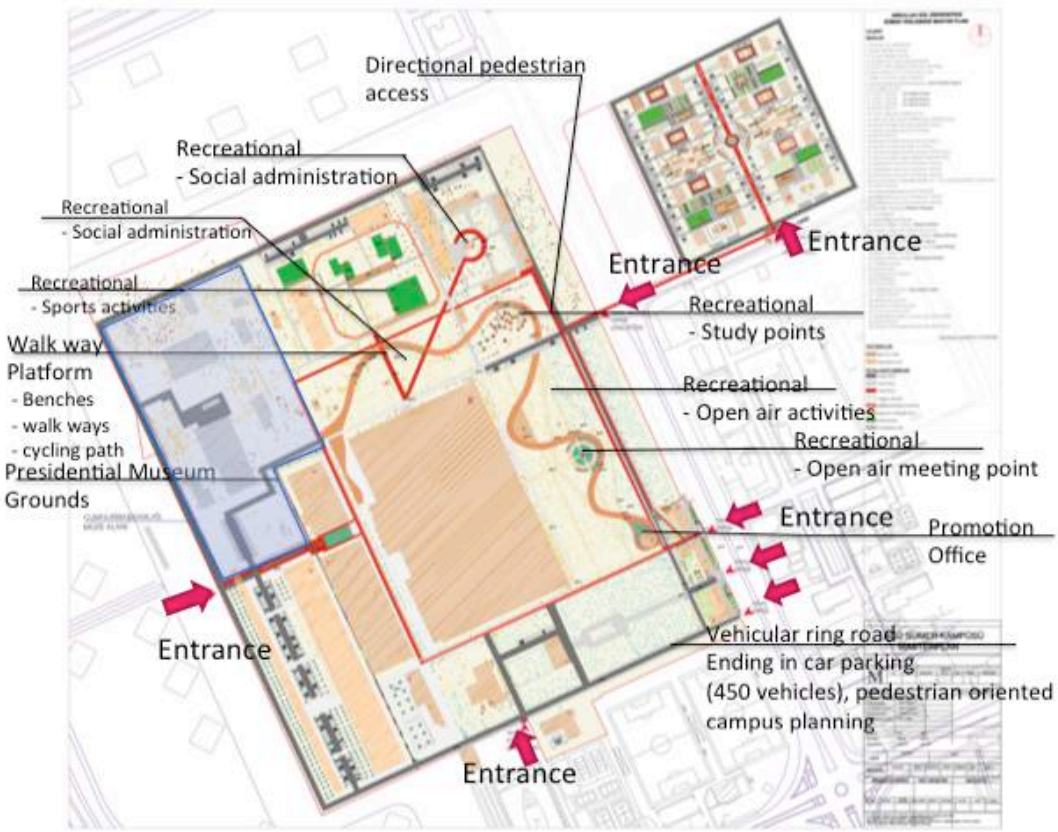

Fig. 3: Abdullah Gül University Sümer Campus Master Plan, B. Asiliskender and N. Baturayoğlu Yöney, 2014.

what has been preserved, i.e. the buildings themselves. Contemporary interventions dynamically display the original architecture and technology while distinguishing the new additions at all scales. Transformation and spatial changes unavoidable due to adaptive reuse requirements aim to be reversible while adapting and minimizing the impact of current building regulations. [7]

Unfortunately, the construction of a new administrative and education building, designed at the southwestern corner of the site by EAA Architects (Istanbul) based on a former and inadequate master plan was completed by the time the new master plan was ratified in 2014. This structure became the first phase of the new function although it creates an inappropriate bulk however conveniently located in a formerly unoccupied section of the site. Its alien design has also been an attraction for the whole city, and became a successful initial step in re-directing the attention of Kayseri back to the campus.

The various in-service housing ensembles within the complex were renovated during the 2013-2014 period to house faculty and students. These renovations were carried out under the “simple repair” definition in Turkish Act 2863 (1983) on the Preservation of Cultural Heritage and the Principal Decision No 660 of the High Commission on the Preservation of Cultural Heritage. These were limited to minor interventions, such as the repair of doors and windows, re-plastering of walls, recladding of floors and the re-furnishing of kitchens and bathrooms. Work on the facades included concrete repair, cleaning of stone surfaces, repointing and painting as well as the repair of roofs. There were no spatial alterations or changes in architectural elements and/or characteristics. [8] Further work in terms of housing is in progress for the following years with the possibility of new buildings in suitable locations at the site.

The adaptive reuse project transforming the Power and Steam Plant into Abdullah Gül Presidential Museum and Library, designed by EAA Architects (Istanbul), is to be completed in 2016. The Presidential Museum is expected to create a boost for the campus, bringing visitors from different age and interest groups to the university not only from the Kayseri but also from rest of the country.

The restoration and adaptive reuse project for the Great Storehouse, designed by the authors (for the AGU School of Architecture), is also to be completed in 2016. The building will be the second functioning building in the campus and first of the restoration and adaptive reuse projects to be completed. The Great Storehouse is a large building around 6,000m^2, elongated in the east-west direction. It was planned as a high (5-9m) single-story space divided with transversal walls based on a wide-spanning (5.50-8.00m) reinforced concrete skeletal system with slender elements. A colonnade running along the western side of the building faced the railway line. The interior partition walls are constructed with bricks while the exterior walls are constructed with local tuff. The doors and windows are all iron; these include strip windows above large door openings running along the east and west façades. The restoration and adaptive reuse design is based on preserving the continuous interior spaces intact and inserting the new spaces as freestanding boxes. The height of the structure allows the insertion of an upper floor. The new spaces, consisting of classrooms on the ground floor and faculty offices on the upper floor, are designed with a removable structural system, composed of steel-framed boxes with timber floors and panel partitions. The southeast corner is reserved for architectural workshops/studios, and the northern section, transformed into a lunch hall in 1970, is redesigned as cafeteria and café with the insertion of a kitchen also as a freestanding box. The lower sections of the building along the east and west façades as well as the central high section are left as circulation spaces, which would also serve as the student commons. The sections of the original building shell where the original stone masonry was lost, were reconstructed as glazed façades to provide more natural light. (Figs 4 and 5) [1, 9]

Fig. 4: The Restoration and Adaptive Reuse Project for the Great Storehouse at the Abdullah Gül University Sümer Campus, B. Asiliskender and N. Baturayoğlu Yöney, 2014-2015: interior views.

Fig. 5: The Restoration and Adaptive Reuse Project for the Great Storehouse at the Abdullah Gül University Sümer Campus, B. Asiliskender and N. Baturayoğlu Yöney, 2014-2015: exterior views.

The implementation of the adaptive reuse project for the Main Entrance Facilities, also designed by the authors (for the AGU School of Architecture), is continuing and will be completed in 2016 as well. This building group, composed of three separate blocks will become the interface between the university and the city, including university store and promotion offices and spaces as well as service functions including a café and market. The main pedestrian and vehicular access points to the campus are also located between these blocks. These buildings are composed of simple rows along continuous corridors with colonnades facing the outside. The main entrance was emphasized with a higher colonnade between the two blocks on the south. It is known that the short wings of these blocks as well as the third block on the north were added later. The structural system is composite, utilizing a reinforced concrete skeletal system for the colonnades and roof slabs while the load bearing walls are made of brick masonry with a thick tuff stone cladding on the outside. The restoration and adaptive reuse project proposes spatial alterations and contemporary additions to the block on either end while the central block is preserved with minor changes and simple repairs. The contemporary addition to the linear northern block is designed as a reinforced concrete cube, enlarging the café located at this end. The market occupying the rest of this building makes use of the original workers' entrance, which was designed as a tunnel through this section. The additions to the L-shaped southern block consist of a permanent exhibition hall, designed with a steel-framed structural system made up of triangular surfaces, and multi-purpose hall, designed as a reinforced concrete rectangular prism. All of these additions are designed for the western side of the building group, and do not alter the original architectural composition of the eastern façade as they are minimally visible from the outside, symbolizing the transformation of the campus and surprising the visitors once they enter. The restoration intervention will also reinstate the original color scheme of the building through the re-integration of wall and floor surfaces with appropriate new materials. The original architectural elements, including the wooden door and window frames will also be repaired and/or remade according to the original designs. (Fig. 6)
Some of the less important auxiliary buildings, including the former Fire House and the Storage Spaces for in-service housing, which now serve as the student dormitories, are being renovated as social and recreational spaces and service buildings. These include a restaurant, students' club activity center and healthcare center at the Fire House and a café, security rooms, garden shed and other storage spaces at the dormitories. [8]

Fig. 6: The Restoration and Adaptive Reuse Project for the Main Entrance Facilities at the Abdullah Gül University Sümer Campus, B. Asiliskender and N. Baturayoğlu Yöney, 2014-2015: renders.

Fig. 7: The Restoration and Adaptive Reuse Project for the Maintenance Workshop and Foundry at the Abdullah Gül University Sümer Campus, 2015-2016: render.

Other adaptive reuse projects are underway for the Main Production Plant, the Maintenance Workshop and Foundry, the Social Center and the Administrative Building, which will house a series of functions related with administration and education as well as social and cultural activities. Recreational areas are also being integrated into the existing landscape.

Among these the Maintenance Workshop and Foundry has special characteristics as this is the only building in the complex with in-situ machinery and equipment although these do not belong the main textile production line of the factory but were used for producing spare parts and repairing them. This is a mostly single-story building with high ceilings especially at the foundry with large strip windows. The structural system and architectural and material characteristics are similar to the other buildings in the complex. The adaptive reuse proposed for this building includes a series of related new functions, ranging from museum and visitors' center to a research institute and archive for the Kayseri Sümerbank Textile Factory. Following the completion of architectural design projects, this building will be restored in 2017. (Fig. 7)

3. Conclusion: Revalorization of Industrial Heritage

The termination of production at an industrial heritage site presents a economic, social and urban disruption. In order to regenerate an obsolete site as a functioning component of the contemporary urban ecosystem, continuity could be recreated through adaptive reuse. However, such new functions must bring about new meaning and vitality to an abandoned site while preserving its architectural and cultural characteristics and historic associations. Today sustainability has become a key concept in enabling such continuity but it must go beyond the mere reuse of physical building stock through the preservation of architectural, technological and material characteristics and create a new economic, social, cultural and historical vitality. [10]

Kayseri Sümerbank Textile Factory (1932-1935) is being transformed to the city campus of Abdullah Gül University, revalorizing a former economic and social hub of the city as a center of educational and socio-cultural activities creating a new interface where the academy meets the citizens. The heritage management plan focuses on making efficient use of the existing building stock while preserving the tangible and intangible cultural heritage characteristics. Some of these refer to the modernization and secularization of the society during the early years of the Turkish Republic while others are related to the architectural authenticity and spatial integrity of the complex as a Soviet design and Turkish construction. The underlying history of design and technology as well as the proposed heritage preservation plan will make this complex unique in Turkey.

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Wooden churches in Lithuania
Analysis of failures and degradations, guidelines for restoration

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Abstract
Wooden Lithuanian churches represent an architectural heritage which is fairly preserved by the local community, but unfortunately the biggest destroyer is the aging of the buildings, intensified by an inadequate maintenance.
The main causes of damage and structural degradation are the atmospheric agents, infestation of dry rots and insects. Sometimes also incongruous reconstructions contribute to the structural decay, associated to the wrong choice of protective materials and furnishings, the absence of ground works, the economy of the interventions, the inappropriate uses.
In order to preserve this architectural heritage, that witnesses the development of our culture and history, we hope and study for restorations particularly careful in the use of traditional materials while limiting the use of incongruous materials, as well as the uncultivated tamperings, demolitions and replacements.
This research can give a detailed analysis and knowledge of the wooden buildings and their failures and degradations, associated to useful guidelines for technicians and workers that operate in restoration and maintenance interventions [*].

Keywords: Lithuanian churches, wood, degradation, cultural heritage, restoration.

1. Analysis and recognition of failures and degradations
The main part of Lithuanian wooden sacred buildings becomes into a sensible decay condition, because of absence of the necessary attention and technical competence, able to preserve these buildings. The churches represent an heritage of wooden technical culture which remains all to explore for the conservation of the valuable architecture of this Country.
Frequently many incorrect restoration works were made, often executed using incongruous materials or products scarcely compatible with the existing ones, that resulted in defective implementation of the supporting structures and completion, also associated to the original absence of fundamental constructive elements, able to preserve and give stability to the building [1].
During the restoration works of wooden churches is usually taken into consideration the outer cladding, forgetting the interior structural elements, which are also affected by different underlying causes; also the same replacement works of the outer coating are often made without taking into account the original appearance of worship.

2. The most vulnerable wooden building areas
Usually the most damaged parts of the wooden building are those that remain directly in contact with water, in that areas where an excessive percentage of moisture accumulates. The most vulnerable structures are also those exposed to strong winds or affected by vibrations of church bells, likewise the roof structures which bear the large loads of snow.

The extent of damage and decay can be largely determined by the general state of the building and by its ancientness, as antique buildings are more susceptible to the damage of external agents such as damp weather, temperature changes or negative effects of ultraviolet rays. The deterioration due to these factors occurs imperceptibly and slowly over time.
Unlike fungi and insect attacks, wind force and incorrect restoration or maintenance works as well as the risk of fires cause more rapid effects and are microscopically more evident [2].
It's very important to track the causes of damage on the wooden material immediately and promptly, to remove them quickly, performing appropriately the necessary restoration and/or the replacement of the damaged parts (Fig.1).
These wooden elements must be kept under observation and constant revision, because their degradation can also provoke a damage to the other connected structures.
Therefore causes of deterioration must be recognized and removed by adopting suitable measures and implementing any necessary consequential structural changes.

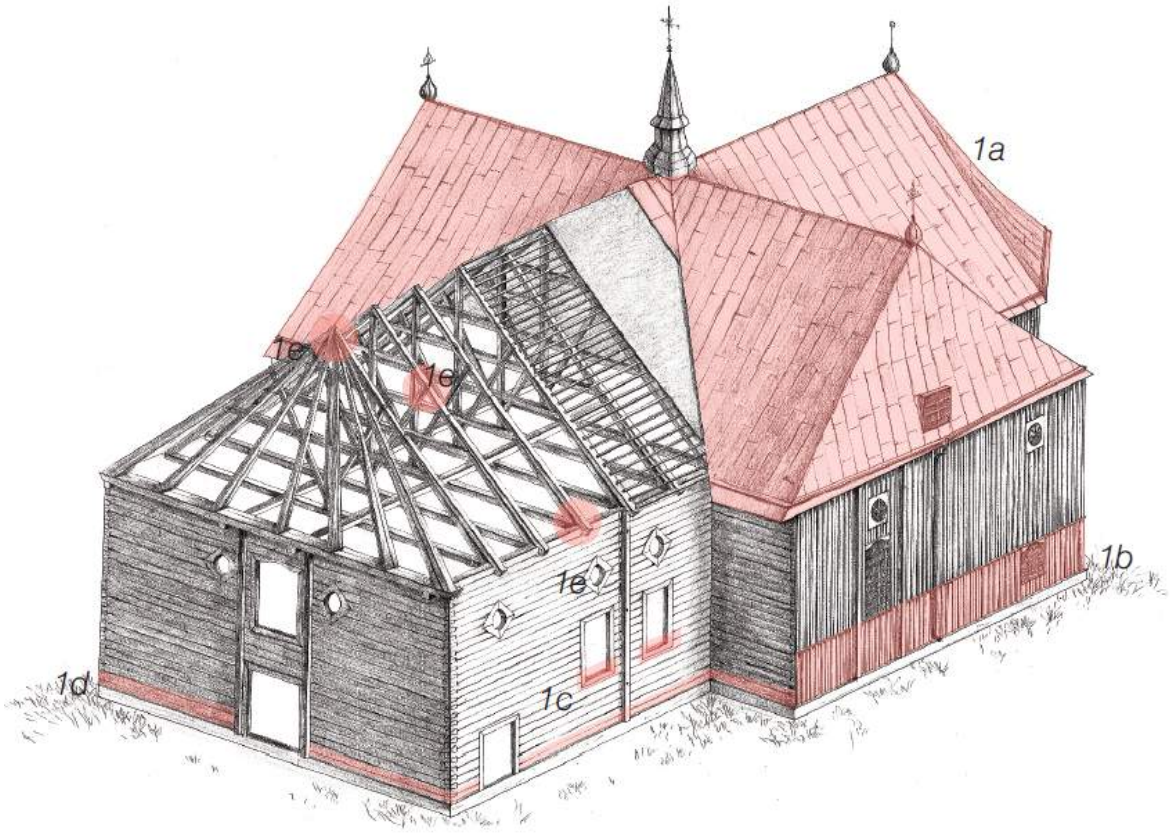

Fig.1: The wooden building elements that require more frequent maintenance works:
1a - wooden shingles, that are often the main coat of the roof;
1b - wooden boards of the outer wall-covering, together with the copper flashings;
1c - wooden frames of the windows and doors, together with the outer windowsill;
1d - lower trunks of the *Blockbau* system, directly connected with the stone foundations;
1e - some elements of the roof structure; in particular, the constructive nodes of the structural frames.

3. Recognition of the main causes of damage and deterioration

3.1 Environmental influences

The deterioration caused by environmental influences such as water, temperature changes, sun and wind are manifested especially in outer parts of the buildings, noticeably the degradation of the window and door frames, cladding of the vertical wooden walls, wooden covering of the roof structures and also the wooden fences, that often enclose the land pertaining to the churches.
When the wooden external coating is damaged the rainwater frequently penetrates into internal structures, causing further more serious structural degradation, that is very difficult to recover.
In particular, temperature variations cause significant degradations: thermal excursions in Lithuania can reach extreme limits, from -35°C (this thermal condition causes the expansion of the ice in the cracks of the wood) to +35°C; in this last case, if some structural elements exposed to the sun, (such

as the wooden boards of the coating, the wooden door and window frames) are not well protected with an appropriate coating, UV rays can determine a surface degradation of the wooden structures, causing initially a browning or yellowing of the color of the wood and progressively a subsequent decay.
The part of the building facing the South is always the most vulnerable; the effects of temperature changes can also bring a damage not only to the wooden elements of the building but also to the stone structures, such as foundations, which also suffer from contact with the water resulting from melting snow or from intense summer rains. This kind of water exposure can also affect the stability of the ground on which the stone structures are located [3]. (Figg.2,3).

Figg.2,3: On the left: the walls cladding of the wooden boards is one of the most frequently replaced elements. Lack of maintenance of the external cladding can lead to irreversible degradations.
On the right: damage to the outer covering of the roof accumulates water into the attic area, increasing the moisture level (over 20%). This disruption can cause fungal attacks to the roof structures.

3.2 Presence of moisture and fungi attack

The main causes of the appearance and development of fungi, rot and mold are the high levels of humidity of the wood (when it exceeds 20-21%) and high temperature (from 18°C to 36°C) affecting parts of building which are poorly aerated and with considerable degree of water imbibition.

In these environments conditions, the internal and external constructive elements of the wooden church can be attacked by fungi, especially by so-called brown rot and white rot.

The structural components frequently attacked by fungi are those corresponding to the structural coverage units, located at the attic area; in these parts often rainwater infiltrates through the rotten cover cladding and the level of humidity is increased (Fig.4). Also during the cold season, when the building is not heated, the breathing of the churchgoers induces a warm and humid air flux, rising through the ceiling from ecclesial area. A frequent water imbibition phenomenon is also present in lower trunks of vertical external wall; this phenomenon is caused by the increased soil humidity and the water flow from coverage. The perfect conditions for the proliferation of fungi are caused by the inadequate composition of wall paint, that inhibits breathing and ventilation of the wood.

The areas of the building where it's more difficult to detect a fungi attack are those that lie under the paint coating: the damage appears only when the fungi are already well developed, and the paint tends to peel off. Usually, under the paint coat, the white rot develops; in this case, it's necessary to remove all the paint layers, to protect the wood from fungal attack and to ventilate.(Fig.5)

The presence of fungi causes the longitudinal or transversal trunk cracks, severely damaging the wood. These wooden structural and covering elements attacked by fungi are usually those placed on the outer part of the building. Fungus attack causes the reduction of the mechanical strength of the wood, decreasing the consistency of the material by considerable percentage.

The first condition to identify a fungal attack is the change of the natural color of wood: in fact, at a first time the damaged parts become dark and also a visible reduction in size and weight appears.

Thanks to a rubber hammer it's possible to check if the trunk is already damaged by fungus: if striking the damaged zones - using a rubber hammer - the sound is dull and soft, it means that it is no longer a healthy wood, which has lost its original strength and resistance, its natural mechanical characteristics and functional capacity and thus requiring the implementation of recovery works [4].

3.3 Insects infestation

The most common insects in Lithuania that damage the wood are the bark beetles (*Scolytinae*), they are brown or black; these insects can attack any type of timber, freshly cut or well-seasoned.

Trees cut in the summer are more susceptible to insect attacks and the *laburnum*, the part over the bark, becomes the main zone of infestation. They dig long galleries in various directions, deteriorating the wooden section and also they can proliferate in the wood already attacked by fungus or develop under the bark of the trunk (Figg.6,7). Indeed, the area under the bark, known as *cambium*, is perfect for the development of insects; they can creep into a trunk and then spread to other wooden constructions, rapidly multiplying. Wrong varnishing can facilitate the development of insects by not allowing the wood to breathe adequately and not promoting the identification of infestation. Bugs can be mainly identified by direct visual inspection: the group of different sized holes present in the trunk indicates the work carried out by these parasites, also the sawdust removed by insects indicates which holes are still active. It is also possible to observe the insect attacks using simple tools such as the hammer, the gimlet, the drills that allow to hear the sound or cleft of the examined trunks [5].

Figg.4,5: On the left: logs in direct contact with the water which penetrates the old coating of the cover. In this image it's possible to see not only the discoloration, but also reduction of the volume.
On the right: the first consequence of fungi attack, with the alteration of the natural color of the material. In this example, the plaster and paint are detached from wooden elements because of fungi emergency.

Figg.6,7: Example of wooden beams irreparably damaged; even a small number of holes can hide a very serious state of deterioration.

3.4 Structural instability

A through examination must be firstly carried out for typical wood defects (grain deviation, ring shake, timber splitting and cracking, warping, opening of the joints due to shrinkage and density of the logging nodes) as it may adversely affect the conditions of the elements resistance.

A level of danger of timber nodes depends by their number, location and size; an high density of nodes can provoke, in fact, a remarkable decrease of timber resistance [6]. The shrinkage cracks are also one of the main causes of structural instability.

Wooden sections after water evaporation lose their moisture and then reach a drying point that could cause a contraction of the constitutive volume. Therefore, wood is deformed through a slot that occurs from the edge up to the pith of the trunk, tending to enlarge in a “V” shape.

The trunks, deforming in this way, tend to get separated from the structural nodes to which are bound together with other rods and, consequently, the disconnections trigger, resulting in a risk of instability or collapse. The proper interventions able to reduce the damage due to cracking are the suture of the beams injuries after sealing the edges with strips; the wedges are carefully shaped and placed in the cracks with epoxy resin and the monitoring could prevent the spread of lesions and the gaps in the resistant sections.

The ring shakes - as result of separations between the fibers along two growth rings or within the same ring - are also obvious causes in a partial or total separation between the different crowns.

This type of identification is very difficult as the ring shakes are concealed inside the beams [7]; the cases of ring shakes are infrequent in timber construction of softwood, while they are more common in structures made using the chestnut.

As regards the evaluation of the interlocking connections, it must be taken into an account that their state of efficiency constitutes one of the main parameters to ensure the correct working principles of the entire structure.

Structural joints provide the support for various elements are they are often used to link the elements of the bearing structures; wooden or metal nails are also present, as well as metal bracket, in order to tight on the wooden joints.

The predisposition of efficacious joints also constitutes an element of weakness, as it reduces the resisting cross-section, due to a concentration of tensions at that point.

The survey must necessarily start by the execution of such nodal points and should be followed by a careful assessment of the joints ability to transmit efforts between the various elements [8].

In wooden trusses, the strong wind and flexural deformation provoked by snow load or the undersize of constituent sections can cause the loosening of the nodes initially reinforced using wooden nails.

The timber roof structure must be continuously monitored: in fact, always during the spring season is better to control the attics, in order to be sure that there are no loss of shingles after the winter storms and strong winds.

All nodes require a visual analysis, as in case of disruption the structure can tend to get out of wooden nails and pins, that must be reinserted in their housing with the hammer [9]. (Figg.8,9).

Figg. 8,9: On the left: a disconnection between the king-post and the tie beam. On the right: all nodes of the roof structure are disconnected, due to the shrinkage cracks.

4. Guidelines for intervention and restoration

These guidelines would encourage an higher attention of the Lithuanian community and the government to this architectural heritage, not only to improve a general maintenance and recovery, but also to preserve the original character of the wooden structures and the conservation of traditional materials in restoration works.

The principles of enhancement and conservation would direct the local technicians – as well as all that intervening on wooden architectures - to choose the congruous interventions and not to distort the ancient constructive techniques, as well as their original construction principles.

4.1 Intervention of foundation structures

The stone foundations of the old wooden churches were not particularly deep and high but, over the time, the level within the ground tended to increase, due to either settling of the ground or the settlement of the foundation: for these reasons, the lower trunks of the wooden supporting wall, positioned on the stone foundations, resulted in close contact with the soil and, therefore, always accumulated more moisture from the ground. The local workers to avoid these problems preferred to build the wooden churches in higher places, that allowed a better flow of the rainwater on the surrounding area.

It is also appropriate to remove the vegetation around the building and arranged a lay of dry stones of various dimensions all around the foundations, in a wide band at about 30-50 cm [10].

Recovery works of the foundation structures must ensure a stable support for the external wooden walls, with a possible expansion of the bottom section, useful to better spread on the ground loads on the same foundations. Moreover, if the erosion conditions of the mortar occur, it's necessary to restore the continuity of the masonry elements, replacing the mortars into the joints and do all the interventions in correspondence of the masonry substructure.

4.2 Recovery of the wooden supporting walls

The lower trunks of the supporting wall - damaged by the humidity rising from the ground or even because of an inadequate protective coating - often must be restored.

The damaged parts of the trunk must be carefully reinforced or, only in exceptional cases, replaced. When the trunk is completely degraded by fungal attack or cracking from shrinkage extended to the whole section, in that case the recovery works are carried out trying to keep as much of the original material as possible.

The verification of the state of health of the large wooden beams forming the *Blockbau* systems (wooden walls) is often difficult, due to the inner and outer covering by the wooden boards. To verify the actual state of the logs, the works proceed by removing the external or internal covering, in order to ensure a proper inspection and diagnosis, according to where it is easier to intervene.

The type of the restoration works depends on the degradation level and distribution on the surface; if the trunk is slightly damaged, it's better to proceed with a prosthesis that is adapted after a proper preparation of the existing trunk.

The lower logs of the wall are usually damaged at the outside part, while the interior part remains healthy (Fig.10). In such case, it is preferable to operate the partial replacement of the deteriorated trunk by cleaning the surface, removing the decayed parts and disinfect the remaining residue of the trunk with antiseptic products and insecticides.

Figg. 10,11: On the left: the lower wooden wall trunk is in a direct contact to the ground, deteriorating by soil moisture. On the right: in case of total damaged logs, trunks can be replaced raising the wall structure and removing the damaged parts.

Trunks can not be dried mechanically, because the fast exsiccation does not guarantee they to be completely dry, but they became only superficially dry, and then quickly they will be damaged. So that, it is preferred to use the natural drying process that takes few years. Therefore well-kept old weathered wood - taken from the demolitions of other buildings - is used [11].
Once the appropriate timber for the realization of prostheses is obtained, the work proceeds by retrieving the new timber size of the damaged area of the old trunk. The pith of the new prosthesis is placed in the inner part of the old trunk.
The surfaces of the new prostheses and the old trunk must be well smoothed to ensure the necessary compliance and a perfect adherence. Subsequently, the repaired area is varnished with the pine resin. Finally, there is two absolutely rigid elements, stiffened by wooden pins or nails, or if it is necessary by stainless steel or fiberglass bars.
The new prostheses are inserted into the existing structure and distinguished by the lighter color that is later darkened using iron sulphate or a mixture of diluted resin [12]. As already mentioned, if the trunk is severely damaged, it is preferred to resort to its definitive and total replacement, using new trunks with a very large pith (Fig.11). At the end of the restoration works, all of the deteriorated timbers, attacked by fungi or infested by insects must be quickly removed from the building site.

4.3 Structural interventions of the roof structures

There are many types of timber roof structures in the Lithuanian churches: wooden trusses, structural frames and supporting coverage structures. These wooden structures are very resistant, but however - in the attics without sufficient ventilation - a very high level of humidity is accumulated, which facilitate the proliferation of insects and fungi.
The roof logs, at times, are damaged due to the large overhead snow loads; some elements of the roof system can significantly inflect or break at some points. The strong wind, wood cracking due to the shrinkage, the effect of the vibrations of the bells placed on the bell towers may also provoke deformation and disconnections of the various structural nodes.
If the constructive nodes for any possible causes are weaken and loosen, it's straightly forbidden to bring them back to their original position, but it's necessary to strengthen the entire system without particular efforts to the structure.
We frequently notice that, over the time, some repair works in the roof structures has been carried out using metal clamps or other timber elements to strengthen the structure and to prevent future damage, looseness or possible movements. Today this type of consolidation, widely used in the past, does not appear to be effective. Therefore is better to proceed with the metal hoops.
To proceed the correct stiffening work of the building structures, additional elements should be made using a wood, that presents similar characteristics as that originally used in the construction. In some very special cases, when the constitutive elements of trusses, structural frames and supporting coverage structures appear to be severely damaged, it can be replaced in some parts, trying to leave as much as possible of the original material.

4.3 Protection against water and atmospheric agents

In order to allow a better and faster outflow of the rainwater, the local workers mainly used to nail the wooden boards on the outer walls in a vertical direction. In case of replacing the old and damaged outer boards with the new ones, it's necessary to keep attention to the direction of the existing boards and the orientation of pith (principally, if the pith is directed outward or inward).
It's necessary to check the gutters and the downspouts and constantly remove all dry leaves, as they can block the correct leakage of rainwater from the coverage. The wooden surfaces must be prevented from the natural decay through frequent maintenance and varnishing all the wooden surfaces that are located outward.
The layer of paint, in fact, slows down the moisture transmission through the surface of the wood and seals the extractives capillaries inside. The best types of paint are composed with special oils that allow the perspiration to wooden elements; also a pine resin is often used, which is not a toxic material, that impregnates wood, strengthening and protecting its superficial fibers. The pine resin is a viscous material, usually used with seed oil or/and turpentine.[13] Before painting the external and internal parts of the building, it should always be checked the layers of previous paint, in order to restore correctly the original image and colors of the building.

4.4 Protection from fungal infection

When the wood moisture particularly reaches relevant levels, the timber structures or elements can be easily attacked by fungi, in that case it's necessary to check constantly the most vulnerable parts of the building: this assessment is usually made by a hygrometer.
To avoid considerable damage caused by these pest organisms, the wooden structures must be always kept in good ventilation, especially in the attic areas that must be well ventilate, in order to allow the air circulation both in winter and in summer.

The local workers preferred to built windows in the attic area, which, if necessary, should be left open. In attics and foundations of the recently built churches there are always open holes to ensure a good ventilation of such parts of the building (Figg.12,13).
To protect the roof structure from infiltration of rainwater, which would favor the emergence of dangerous moisture conditions, it's necessary to promote the efficient disposal of rainwater, preventing possible water stagnation. It is therefore necessary to control the roof covering, the rain descended, copper flashings, and also provide for other protections for those parts of the building directly exposed to driving rain on wooden elements.
First of all, in case of fungal attack, it will be appropriate to provide for adequate restoration work, identifying and removing the causes and replacing the deteriorated material.
The wood, even if only slightly damaged by fungi, is planed and protected with fungicide products and processed directly with an anti-mold product, in order to avoid further diffusion. When the trunk zones are already strongly attached, these parts are removed and replaced with new wooden elements.
All wood elements must be well protected against moisture penetration, there are mentioned some traditional products that protect the wood from fungi, molds, insects and bacteria: the lime water, the milk of lime and also a mixture consisting of 100 mg of salt dissolved in a liter of water.
All the structural elements already attacked by fungi, should be regularly monitored and evaluated in terms of moisture content.

Figg. 12,13: On the left: in the attic area the local workers during the construction work preferred to install windows that guaranteed a good ventilation of the roof structures, during the year; on the right: in the past, it was preferred to open holes directly in the foundations, to ensure a good ventilation of all foundation zone.

4.5 Protection against insects

The wooden buildings must always be well ventilated and protected, even in relation to possible insect infestations. Into the openings for ventilation, it is necessary to install particularly dense grids, to avoid the entrance of insects. It is required to control any new trunk, planks and boards used for renovations, recovery work and finishing to be sure that these new elements are well debarked and free of small holes, in which the insects could nest. In these kind of operations is suggested to check the surface of examined wood before the general cleaning of the entire surface, because it is possible to find the sawdust produced by these pests that instead, if found, would detect its presence. In such condition, it's necessary to make a correct identification of the insect type, in order to eliminate it and to apply an appropriate remedy to prevent the complete degradation of the timber.
If infested holes are founded in the trunk, the recovery work proceed by injection of a necessary dose of turpentine or permethrin by a syringe [14]. If the wood is strongly attacked by insects, one must proceed with periodic treatments with pesticides, or also with ethylene oxide gas spraying or also methylene bromide. This kind of treatment should be done during the spring season, when insects begins the larvae phase. Performing these treatments, the area must be hermetically closed [15]. After the gas application is required to ventilate the spaces affected by this intervention.

5. Conclusions

Since the 19th century all the Europe witnessed a general decline of the arts and techniques, related to wooden buildings and for a long time no new wooden buildings were made [16].
Architects are no longer able to correctly identify the shapes of the sacred architecture, and this leads to numerous mistakes during the restoration and reconstruction phases [17].
In order to preserve this architectural heritage, that witnesses the development of our culture and history, we hope for restorations particularly careful to use traditional materials while limiting the use of incongruous materials, as well as the uncultivated tamperings, demolitions and replacements.

This research can give a detailed analysis and knowledge of the wooden buildings, associated to useful guidelines for technicians and workers that operate in recovery and maintenance intervention.
We hope that this study can be introduce an operational tool and an impulse to improve and implement the knowledge of this unique building heritage, simply built but rich in history and constructive traditions, that we have to preserve by negligence and uncultivated interventions.

[*] **Note:** This article summarizes a part of the PhD thesis titled *The traditional sacral wooden construction in Lithuania between XVIII and XIX century*, written by ing. L. Berežanskytė, tutor prof. Tiziana Campisi. We would ascribe to ing. L. Berezanskyte the paragraphs nn.4 and 5; to prof. T. Campisi the coordination of the research and the paragraphs nn.1, 2 and 3.
We also would inform the readers that in the proceedings of the XIII international forum of the previous year (2015), the authors present an article that describe the constructive characters of Lithuanian churches, with a detailed report of an atlas of building techniques.

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The Galli Bibiena family in Naples: new contribution to the history of the European architecture

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Abstract
It is aim of the paper to examine the activity of the Emilian architects and set designers Galli Bibienas in Naples and its impact on the training of local artists between the late 17th and the second half of the 18th centuries. The Bibienas were very applauded by monarchs because their work, linked to the evolution of theater, painting and architecture, helped flow of ideas and migration of artistic languages.
The analysis, based on an incisive investigation of archival and iconographic sources, focuses on the amazing work of the two brothers Ferdinando (1656-1743) and Francesco (1659-1739) and the Ferdinando's grandson Carlo (1721-1787). The architects promoted artistic relationships between Emilia region and Naples. Thanks to their activity a new school of scenic architecture was introduced to the city with outcomes of the highest order.
Finally the paper presents the most important results of an ongoing research on career of Giovanni Maria *the Younger* (1694-1777), son of Ferdinando. Giovanni Maria, who lived and worked in Naples for more than thirty years as an architect, engineer, theorist and professor of architecture, had never been investigated before with a scientific approach.
This systematic study is proposed to make contribution to the Neapolitan history locating in the right historic perspective the work of the Bibiena family and its disciples in a period of great development of local architecture and scenography.

Keywords: Bibiena, Naples, 18th century, scenography, architecture

1. Introduction
The Galli Bibiena family is the closest to the history of scenography, painting and theatrical architecture of the 17th and the 18th centuries. Its members excelled in Italy and Europe within the space of four generations. Its inventions and theories affected a large number of stage architects and set designers.
The activity of the Bibienas in Naples was crucial to the development of local scenography. First, let us consider that with the birth of melodrama in the early 18th century Italian architects were called to design spectacular stage machineries for an ever increasing audience: tricks, virtuosity, sudden scene changes, impressive settings. Neapolitan music was increasingly important on the international stage and the works of the great Neapolitan composers were performed in theatres with an unprecedented welcome. But this did not involve, paradoxically, the statement of a scenic design school in the city and Naples was not able to rely on local theatre architects.
From the 17th century until approximately the first half of the 19th century the scenography of the Operas in the great theatres of the Court was really reserved for specialized foreign artists, mainly from Bolognese and Parmesan areas. This was because Bologna, seat of the Clementina Academy, was the Italian city where the merge of architectural painting with stagecraft produced the most significant examples [1]. The Bibienas were the most applauded Emilian artists called to come to Naples.
The following sections aim to make a contribution to the knowledge of the activity of some family members in Naples to finally get a full understanding of the Bibienas' heritage to future generations of local architects.

2. The Neapolitan work of the Bibienas

2.1 Ferdinando Galli Bibiena's stay

Ferdinando Galli Bibiena, «Ingegniero del Serenissimo Duca di Parma», stayed in Naples between 1699 and 1700. His work was linked to the cultural policy of Luis Francisco de la Cerda y Aragona, Duke of Medinaceli, Viceroy of Naples since March 1696. The Duke had deep passion for theatrical performances, very important tools of political propaganda, so he became the impresario of the San Bartolomeo theatre in the years 1699-1700. The San Bartolomeo, built for prose shows and later used for operas, had undergone several renovation works in view of new needs over the years but it was in poor conditions at the end of the 17th century. Therefore, the new impresario started a restyling of the theatre in 1699 and wanted Ferdinando Galli Bibiena to modernize the stage, no longer suitable to accommodate the great performances of that period: «*In questo anno 1699, per altro modo inventato da un architetto bolognese di far comparire più cospicua la detta macchina, si è disfatto di nuovo il tavolato e poi rifatto in altra forma*» [2].

Unfortunately, because of the small size of the stage and pre-existing structures, the project by Bibiena did not achieve the desired results: «*giunse da fuori chiamato dal Vicerè il famoso Architetto Ferdinando Galli detto il Bibiena del Serenissimo di Parma per ordinare nuove invenzioni di scene per l'opra nuova in musica da rappresentarsi nel Teatro di S*[an] *Bartolomeo, avendo à tal'effetto riformato tutto il Teatro, con poca soddisfazione però del Pubblico*» [3].

The Parmesan architect was later appointed by the Duke of Medinaceli to organize stage decorations of the operas in agenda at the San Bartolomeo. Ferdinando Galli Bibiena designed scenes for the *Gl'inganni felici* and the *Cesare in Alessandria* in 1699, for the *Eraclea* in 1700.

Furthermore, in order to celebrate the birthday of the King on 6 November 1699, Bibiena adorned the Great Hallway and the theatre in the Royal Palace where the opera *Gl'infanni felici* was performed. For his work Ferdinando was paid 1,290 ducats on May 1700, as it is reported in archival documents as follows:

> *A Ferdinando Galli Bibiena, Architetto e Pittore, duc[ati] 1290, per gli ornamenti della Sala Reale di Palazzo, Teatro nuovo, scene, pitture e altre cose che fece in detta Sala per il festino e commedia che si celebrò il 6 novembre 1699, al compleanno di S[ua] M[aestà]* (Archivio di Stato di Napoli, Mandatorum, 315) [4].

The latest studies have proven the presence of Ferdinando in Naples until the end of 1700. In particular some receipts of payment on behalf of local artisans reported that Bibiena designed a funeral setup in the Santa Maria La Nova church in memory of the Pope Innocence XII, dead on September 1700:

> *a Domenico La Rocca Mercante di Frisi e Lutti (…) per saldo e intero prezzo dell'affitto dei Panni di Lusso e Frisi (…) e per spesa di cositura, conduttura e riconduttura delli medesimi essendo quelli serviti tutti per l'Apparato funebre solenne e Castellana fatta nella Venerabile Chiesa di S[anta] Maria La Nova dei Padri Osservanti di questa città di Napoli, per la Macchina funebre e per tutta l'affacciata di fuori di detta chiesa, nella quale si sono celebrati i funerali, per la Memoria di Papa Innocenzo XII secondo il disegno che ne fece Ferdinando Gallo Bibiena (…)* (Archivio Storico del Banco di Napoli, San Giacomo, 24 November 1700) [5].

Until December 1700 Ferdinando was rewarded with 800 ducats for the feasts of next year's Carnival and the scenes of the opera *I rivali generosi*, performed at the San Bartolomeo theater on November 1700:

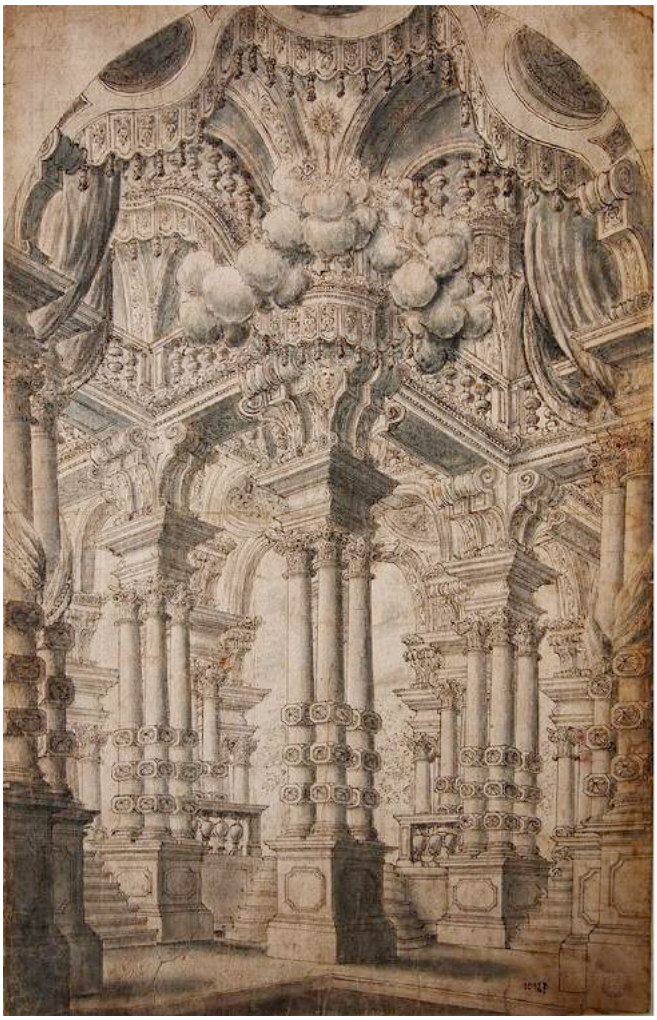
> *a Ferdinando Galli Bibbiena a complim[en]to di D[ucati] trecento (…) e d[ett]i D[ucati] 300 sono in conto del suo onorario del pross[i]mo venturo Carnevàle (…)* (Archivio Storico del Banco di Napoli, San Giacomo, 5 October 1700) [6].

2.2 The decorative setups of Francesco Galli Bibiena

In the 18th century civil and religious feasts were extraordinary tools of political power. For King's and Queen's birthdays or name-days, births, nuptials, baptisms, funerals, military victories, visit of the monarchs, viceroys and leading figures of the Church in Naples all architects, painters, decorators designed theater machines, scenes, catafalques and decorative setups of the highest level.

For special occasions the Neapolitan Court invited also some foreign artists to come to the city. The work of Francesco Galli Bibiena in Naples can be seen under this perspective as a significant example of Baroque theater architecture.

In 1702 the King Philip V of Bourbon visited Naples, «Città fidelissima», from 16 April to 2 June.



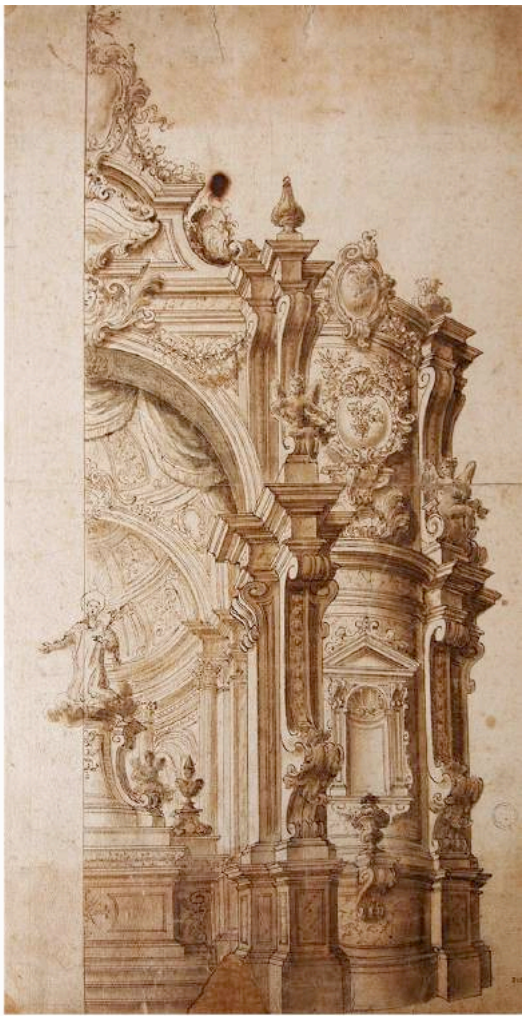


Fig. 1: Ferdinando Galli Bibiena (attr. to), *Scenografia teatrale*. Naples, Museo Nazionale San Martino, 20327
Fig. 2: Francesco Galli Bibiena (attr. to), *Apparato festivo*. Naples, Museo Nazionale San Martino, 20328.

The Viceroy Juan Manuel Fernandez Pacheco de Acugna, Duke of Escalona and Marquis of Villena, who had succeeded the Duke of Medinaceli, invited Francesco Galli Bibiena to supervise the feasts and to design decorations and all the triumphal arches in the city to welcome the monarch.
Francesco, who was already in Naples as collaborator of his brother Ferdinando for the restyling of the San Bartolomeo theatre, accepted the job. Unfortunately no original sketches of Bibiena's projects have been found to date as a result of the investigation in Neapolitan archives. Only some papers of the 17th-century historians had this reported.
Particularly in 1703 Antonio Bulifon attributed to Francesco the decorative concept design only in the Nilo district, as described in his *Giornale del viaggio d'Italia del'invittissimo e gloriosissimo Monarca Filippo V* [7].
In 1739 Gian Pietro Zanotti reported that the great triumphal arches in the Capuano district and the decorations in the Royal Palace were made as well by Bibiena: «*fece egli dunque i grandi, e sontuosi archi trionfali in onor di Filippo V a Seggio Capuano, e a quello di gnido, e nuove scene nel teatro pubblico, e in quello del palazzo reale, per servigio del Re*» [8].
The same information appeared in the *Felsina pittrice* by Luigi Crespi in 1769: «*molti furono gli archi trionfali in onor di Filippo V erettivi, quindi a seggio Capuano, quinci a quello di Nido, e molte scene nel pubblico teatro, e molte prospettive per le strade, e molte decorazioni nel teatro del reale Palazzo: le quali cose tutte furono eseguite con magnificenza, perché col regio denaro: e furono altresì egregiemente ideate, perché dall'ottimo gusto, e dalla dotta invenzione di Francesco inventate*» [9].
In 1702 Francesco was also appointed to design the scenes of the *Tiberio imperatore d'Oriente* and the *Tito Sempronio Gracco* and decorations of the San Bartolomeo theatre.

2.3 Carlo Galli Bibiena set designer in Caserta
Carlo Galli Bibiena worked in the Kingdom of Naples in the second half of the 18th century. In this period a comprehensive reform of the theater field involved also the sectors of music and

scenography. The creative Baroque inventions were definitively replaced by themes and figures inspired by reality and this research of the verisimilitude produced artistic examples less amazing than the past ones.
The earliest documented evidence of the presence of Carlo in Naples dates from 1770. He moved from Berlin to the capital city because of his wife's disease, in search of a warmer climate. On the 13th of August 1770 the opera *Antigono* was performed at the San Carlo theatre to commemorate the birth of Her Majesty the Queen. The first scene, named *Parte interna di ameno Boschetto, formato di palme, contiguo ai Giardini Reali, con più viali*, was designed by Carlo Bibiena.
There is evidence of the stay of the set designer in Naples in 1768. In fact on the 8th of July of that year Luigi Vanvitelli, in a letter to Bernando Tanucci, talking about the appointment of the decorators of the Court theatre of the Royal Palace in Caserta, wrote he wanted as collaborator also Bibiena who was in Naples in those days for health reasons [10]. Although some academics have argued that «*il* Bibiena» mentioned by Vanvitelli could be Giovanni Maria *the Younger*, in Naples for many years, in my opinion the reference to the health reasons would instead suggest the name of Carlo. Anyway, the work was assigned to the Emilian decorator Gaetano Magri.
In 1771 the King Ferdinand IV decided to move the feasts for Carnival from the capital city to Caserta. In the Court theatre of the new Royal Palace four feasts were organized between January and February. Chests loaded with tapestries by Pietro Duranti illustrating the history of Don Quixote of La Mancha left from Naples to decorate guest bedrooms, luxury boxes and chandeliers in the theatre were draped with precious tissues, carriages were hired for the benefit of guests, musicians and actors. Luigi and Carlo Vanvitelli were involved in the organization of the Carnival. They were responsible for technical monitoring and balance of artists and artisans, as the painter Giuseppe Baldi and Carlo Bibiena, appointed to stage the scenes of a comedy to be performed by the Court Theatre Company. Carlo Bibiena designed an extraordinary theatrical machine according to the Baroque tradition built by many blacksmiths, carpenters and «*cartapestari*» (paper-mache crafters). For his work he was paid 100 ducats [11].
In the same year, 1771, Antonio Joli, the set designer of the San Carlo theatre, wrote a letter of resignation due to his health issues. Carlo Galli Bibiena appointed himself for the position and submitted a petition to the King to remind «*d'essersi esercitato in varie operazioni fin dalla sua tenera età presso Giuseppe Bibiena Padre ben noto a tutta Europa (…) Nell'Ettà poi di anni 14 esso suplicante fu chiamato alla Corte del Margravio di Bayreuth, che vi stiede anni 12: passò al servizio del Duca di Braunsvisk varij anni, servendo all'Ocasioni l'una e l'altra Corte avvendo fatto diverse operazioni in tal tempo in Sassonia, ed in fiandra ed altre parti, ecc; ed indi fu chiamato in Londra. E finalmente alla morte del Padre fu chiamato alla Corte di Berlino per essersi da quel sovrano vedute le sue operazioni. E perchè da la Corte di Berlino, ove stava situato al servizio di quel sovrano, è dovuto necessariamente partirsi a cagione di sua moglie Itagliana, che, andando di male, in peggio nella sallute, fu da'medici consigliata di ritirarsi in Itaglia; Perciò si ritrova in Napoli, ove nel suo trattenimento finora a dato varij saggi della sua piccola abilità non solo in Cose particolari, ma anche in servizio di V[ostra] M[aestà]: così nel Real teatro di S[an] Carlo, come nel'Opera premeditata di Carnevale nel V[ostro] R[eal] Teatro di Caserta. Quindi dovendosi fissare in questa Capitale e desiderando d'aver l'onore di servire la M[aest]à V[ostr]a in tutti quelli impieghi che si esercitano dal Jolli*» [12]. The King rejected Joli's resignation and, consequently, Bibiena's petition.
One year later, in 1772, for the baptism of the Royal Firstborn, Maria Teresa Carolina, the Duke of Arcos Don Antonio Ponce de Leon, godfather of the infant and Extraordinary Ambassador of the King Charles III of Spain, organized a sumptuous feast. The Court ceremonial set up a masked ball at the San Carlo theatre on 9 September and three feasts in Toledo Street at Perrelli Palace, rented by the Duke for the occasion. In the Perrelli Palace no gallery could host all the guests who had turned up to participate in the performances on 14 September, so Luigi Vanvitelli designed a 1,600-seat theatre and decorations for the dance hall and the façade of the palace.
Vanvitelli, who probably valued Bibiena's work in the theatre of Caserta the previous year, wanted Carlo to set up the scenes of the drama *Cerere placata* by Niccolò Jommelli. Galli Bibiena got a 500-ducat salary for his work as archival newly-identified documents have proven:

> *D[ucati] Cinquecento (…) a d[on] Carlo Bibiena (…) per ricompenza, e ricognizione che fa allo stesso per avere inventate, e disegnate le scene, e decorazioni diretto la pittura, ed esecuzione delle stesse e soprainteso alla loro collocazione, e maneggio per il Teatro, dove si sono rappresentate le Serenate in occasione delle funzioni fatte, e per quals[ia]si altri lavori fatti, ed incomodi sofferti in serv[izi]o del detto duca, dal quale resta d[ett]o Bibiena col p[rese]nte pag[amen]to interam[en]te sodisfatto, e rimunerato senza che gli rimanga altro à pretendere ne per le sud[dett]e cause, ne per verun'altra (…)*(Archivio Storico del Banco di Napoli, San Giacomo, 12 December 1772) [13].

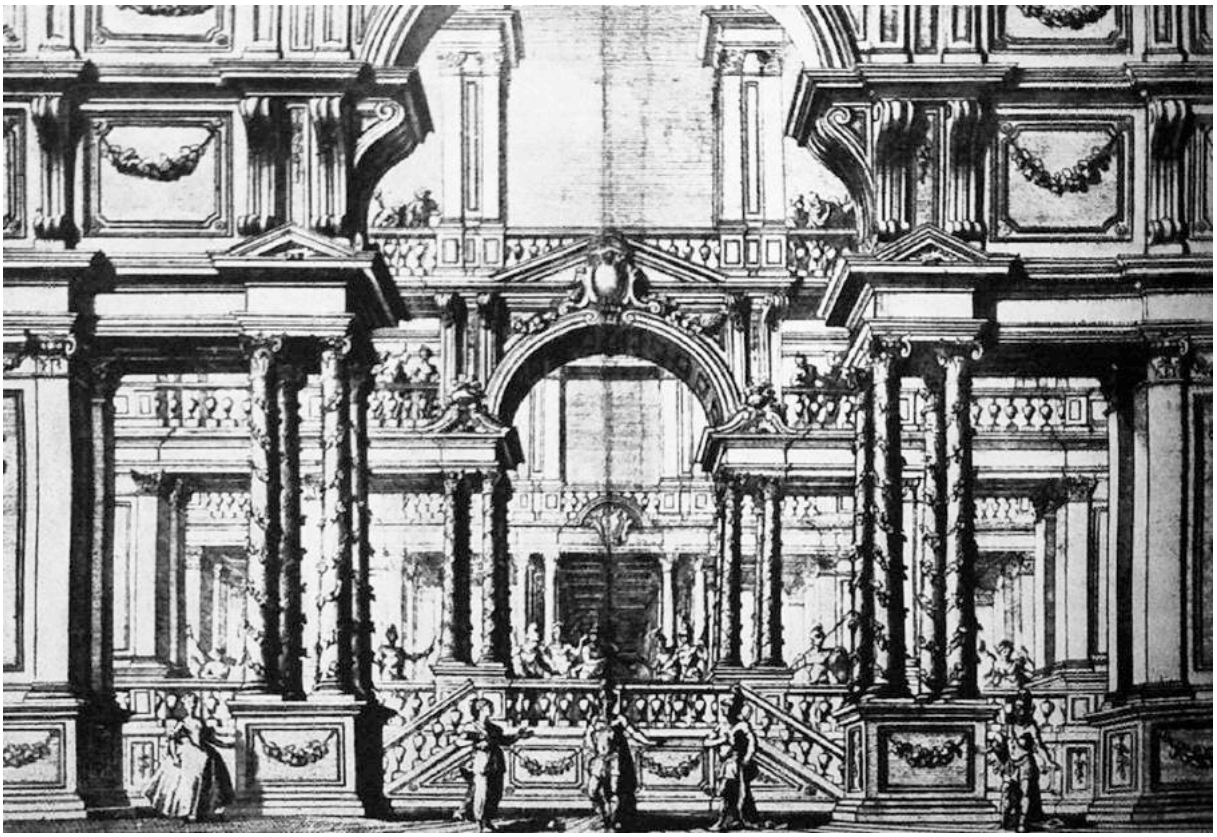


Fig. 3: Carlo Galli Bibiena, *Scena della reggia di Giove* (from *Lettera ad un amico…*, 1772, fig. XIV)

The five scenes by Carlo Galli Bibiena – *Scena della marina*, *Scena dell'asilo*, *Scena della prigione*, *Scena del tempio di Giove*, *Scena della reggia di Giove* - were reproduced in 1772 by Carlo Nolli as copper-etched figures and were part of a document printed by the Duke of Arcos to celebrate the feast in Naples [14].
Based on one central axis and with lack of depth, the scenes by Carlo seemed to be more impersonal and dispassionate than those of the other Bibiena members. They actually came from a stricter composition theory, expression of the Neoclassical season.

3. The impact of the Bibienas on Neapolitan artists in the 18th century

The contribution of the Bibineas in Naples did not consist only in the stage sets they designed for the Court but also in the influence of their artistic language on the architecture of the main Neapolitan protagonists of the 17th and the 18th centuries. In this period, in fact, Naples and the Emilian area intensified cultural relationships thanks to a mutual exchange of knowledge [15].
In the years that the Neapolitan dramas were almost exclusively staged by artists from northern Italy, Emilian architects and set designers had a chance to create the most significant works of their careers in Naples. On the other hand Neapolitan artists benefited from the presence of foreign masters.
Ferdinando Sanfelice was surely one of those who mainly inspired his architecture from the innovative perspective inventions of the Galli Bibienas: in fact in his works it is possible to see a basic scenographic plan that evokes the main themes of the Emilian tradition. The presence of Francesco Bibiena in Naples during 1702 in order to serve the King Philip V must surely had a positive effect on artistic sensibility of the Neapolitan architect who was also working on setups for the same occasion.
Contemporary historians identify the perspective dissolution of the space in palatial interiors or courtyards as the main contribution of the Galli Bibienas' poetics to the work of Ferdinando Sanfelice: the use of geometric models and the interpenetration of volumes, which enable obtaining transparency effects, can be seen as direct application on the field of civil architecture of that *scena per angolo* Ferdinando Bibiena promoted, with sketches of *luoghi magnifici*, since the end of the 17th century [16].
The use in the sector of scenography of multiple vanishing points and essential dynamic diagonal thrust beyond the implied boundary of the proscenium caused in architecture an extraordinary development of elegant external double-flights staircases located in rather narrow courts. This kind of staircases was already familiar in Farnese cities since Baroque era and was linked, once again, to the activity of Ferdinando and Francesco Bibiena. In Naples it was introduced only in the 18th century by Ferdinando Sanfelice, who was able to experiment Bibienas' schemes in an original way.

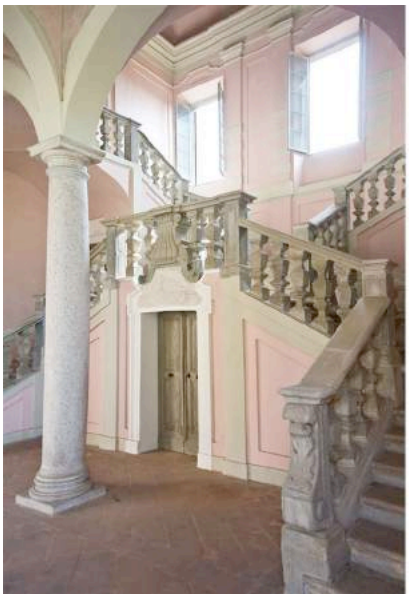


Fig. 4: Ferdinando Galli Bibiena, *grand staircase*. Piacenza, Paveri Fontana Palace.
Fig. 5: Ferdinando Sanfelice, *grand staircase*. Naples, Serra di Cassano Palace.

The Bibienas' teachings influenced also the architect Luigi Vanvitelli. In Naples since 1751, Vanvitelli did not work as set designer though he was highly skilled in theatrical works and very interested in musical shows. The interest of the architect in scenography and stagecraft has been proven by a large number of scene sketches attributed to him, such as the ones from the scenes for the *Tito Manlio* and the *Satira*, where the presence of twin columns and pointed arches remind the prison sketches by the Bibienas. Furthermore Vanvitelli conserved a drawing named *Atrio regio* attributed to Ferdinando Galli Bibiena that could testify his special attention to the lessons of the Emilian master [17]. In this drawing a grand oblique-flights staircase remind the grand staircase designed by Ferdinando for the Royal Palace in Colorno. It might be that somehow the Bibiena's project had influenced the concept of the grand three-flights staircase for the Royal Palace in Caserta by Vanvitelli, which actually evokes the architectural solutions adopted in Piacenza palaces. For example, plurality of views, contrast between light and dark, sequence of columns, pillars, arches and vaults in the vestibule of the Palace in Caserta can be seen as a re-elaborated version of the Ferdinando's *veduta per angolo*.
Much more controversial the relationships between the Bibienas' theatre architecture and the Vanvitelli's project for the Court theatre of the Royal Palace in Caserta. For the design of the proscenium Vanvitelli adopted twin columns separated by statues reminding models used by Francesco Galli Bibiena for the Grosses Hoftheater in Vienna, the Opera in Nancy and the Philarmonic theater in Verona; by Giuseppe Galli Bibiena for the Markgräfliches Opernhaus in Bayreuth; by Alessandro Galli Bibiena for the Hofopernhaus in Mannheim. But if on one hand the Neapolitan architect considered the decorative works of the earlier generations in a positive light, on the other he did not like the scheme, based on the addition of daises between the columns, used by his peer Antonio Galli Bibiena for the Teatro Comunale in Bologna, the Teatro Scientifico in Mantua and the Teatro dei Quattro Cavalieri Associati in Pavia. As theatre designer Luigi Vanvitelli wanted to keep his designs away from the Emilian tradition, «fuori della moda Bibienesca» as he said.

4. Brief historical overview on Giovanni Maria Galli Bibiena *the Younger* in Naples

Over the years Italian and foreign studies on the Galli Bibiena dynasty have continually raised causes for reflection. Thanks to documentary discoveries all over the world to date several themes still require specific research and problems linked to the attribution of sketches and architectural works need to be solved. In particular life and career of Giovanni Maria *the Younger*, Ferdinando's second-born son, have not been investigated before on the basis of a scientific approach. The absence of monographic studies and the fragmentation of information about his activity in Italy and in Europe has made necessary undertaking a systematic research on this architect, whose first results have shown he was high-qualified artist at the service of important Courts until the end of the 18th century [18].
After the training in Barcelona and Vienna as assistant to his father between 1712 and 1716, Giovanni Maria worked with his brothers in Rhineland-Palatinate and in Bohemia in the Twenties. Finally in 1743 he moved to the Kingdom of Naples, where he lived almost continuously for thirty years as «Ingegnere Architetto Civile» of His Majesty.

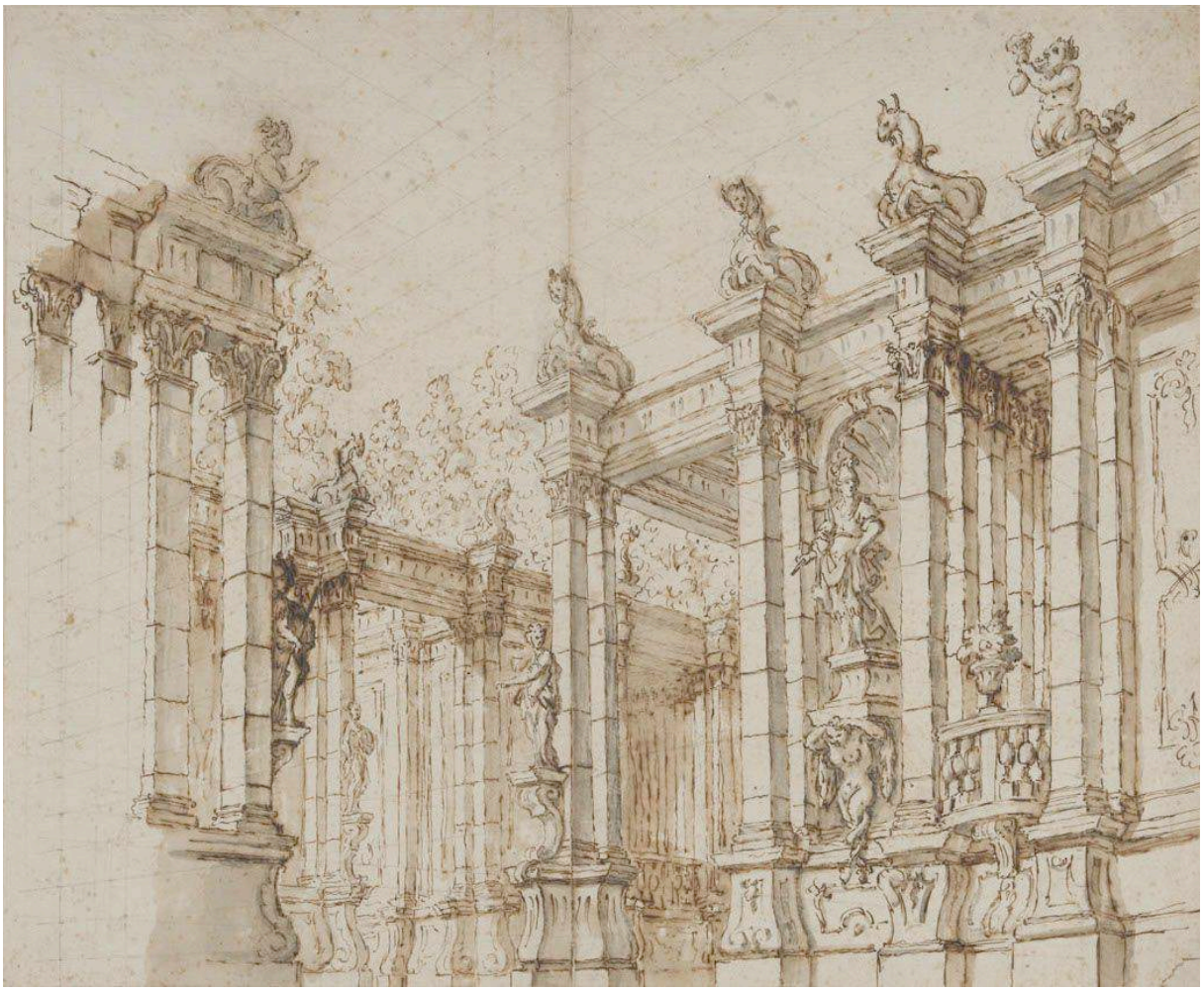


Fig. 6: Giovanni Maria Galli Bibiena (attr. to), *Architettura di un giardino con tritoni*. Venice, Fondazione Giorgio Cini, Gabinetto dei Disegni e delle Stampe, 31529 (photo by Venice, Fondazione Giorgio Cini, Matteo De Fina).

The more intensive activity in Naples was between the Fifties and the Sixties of the 18th century. Unfortunately, sketches of the Neapolitan projects by Giovanni Maria Bibiena have been lost but a large number of archival sources have proven he was at the service of several local clients before turning attention to the theoretical activity.
In addition to his work as architect in the Sant'Agostino Maggiore alla Zecca (1753), the Gesù Nuovo (1755), the Annunziata (1757) and the Santa Maria dei Pignatelli (1754, 1762) churches, Giovanni Maria worked also as «Camerale» engineer at the service of the *Giunta di strada e ponti* alongside some famous Neapolitan architects.
The analysis of the documents has shown that his most important client was Raimondo di Sangro, seventh Prince of Sansevero. The Prince, interested in scenography, firework theatres and time machines, largely promoted the architecture of Bibiena, who actually was «Architetto della Casa» between 1758 and 1765. To date the restyling of the Sansevero Palace in San Domenico Maggiore Square is the most emblematic project by Giovanni Maria Galli Bibiena.
The ongoing research has made it possible to start for the first time a scientific study on this architect, whose work, so far little examined by architecture critics, was an example of the cultural relationships between Parmesan region and the Kingdom of Naples in a period that has seen the greatest development of the arts in Europe.

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New technologies and methodologies for the planned conservation of cultural heritage: a case study applied to Venetian Walls and the former Convent of Sant'Agostino in Bergamo

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Abstract
Time and weather effects as well as damages caused by invasive plants and animals, threaten our cultural heritage. The constant observation and periodic maintenance activities are the most suitable safeguarding solution: they can limit risk situations and facilitate interventions. Today, planned conservation is thus the best way to preserve the monuments as focused on small preventive restoration: actions organized and structured according to a steady and regular monitoring. The preliminary survey, the interpretation of metric and material data and the subsequent verification of the evolution of instability and degradation phenomena based on a comparison with previous information, is a long and expensive activity if carried out by traditional systems. Otherwise, 3D laser scanning and image-based reconstruction methodologies, employed on aerial drones - if properly applied within optimized operational practices and integrated with traditional diagnostic instruments - can allow both the systematic control of assets' conditions and the evaluation of their health status and decay causes in a short time and with lower costs. Therefore, the assessment of any deterioration improvement is possible by means of data and images recorded at different times and catalogued in a web database. This paper intends to show the validity of such an innovative methodology through a case study applied to the Venetian Walls and the former convent of *Sant'Agostino* in Bergamo.

Keywords: planned conservation, survey, new technologies, Bergamo

1. INTRODUCTION
A pleasant feeling of surprise is what proves the unsuspicious traveller who sees the Upper city of Bergamo for the first time. An emotion that results from the discordant dialogue between two monumental structures, which are the expression of historical periods between them really unlike. Upward, the medieval village with its distinctive and evocative urban form, and below the 16th-century city, which strongly expresses itself, through military and symbolic elements (doors, outlining walls, typical designs of bulwarks and platforms): "the first one is overwhelmed by the second as for cuts, violent amputations and arbitrary determinations of new passages. But, in turn, the second structure gives way to the first, with regard to viability, functions, and visual expressions" (1).
The Italian National Commission for UNESCO approved in February 2016, the candidacy for the nomination of the Venetian walls to the World Heritage List, within the transnational proposal (Italy-Montenegro) related to the "Venetian works of defence between 15th and 17th centuries". Bergamo's fortifications are actually an integral part of the more complex defensive system, designed and built by the *Serenissima* Republic of Venice in order to control its territories and the commercial routes leading to the East (2). The town was the westernmost outpost of the urban domains of Venice on the mainland, as well as a crucial place, both for the control of trans-Alpine routes towards the centre of

Europe - through the *Via Priula* along *Val Brembana* (3) - and for the defence of the borders between the Republic of Venice and the Duchy of Milan.
Strategies established by the management plan, which endorses the nomination proposal, and directed at the site's awareness, conservation, and enhancement, are not merely oriented to safeguard the curtain walls. They also concern the buildings directly connected to the defensive works, such as, for example, the former convent of *Sant'Agostino* - today the headquarters of the local university - which dominates the eponymous bastion (fig. 1). Venetian walls in Bergamo absolved a more political than military function, being able to be used only for defensive and not for attacking purposes. This, both due to the too small size to accommodate large contingencies and because not extended to the whole urban area, but limited to the Upper town, the seat of the government and the administration of the region. The curtain walls were, consequently, an impressive architectural structure, which also incorporated some existing buildings that in most traits have influenced their constructive genesis. They had the task of redesigning the city's face and conveying the image of Venice in a historical period in which - with the discovery of the Americas - Mediterranean was losing its central role and the empire of the *Serenissima* was on the path of almost inevitable decline.
On 21 September 2016, with the inauguration of the assembly hall of the University of Bergamo in the ancient church of *Sant'Agostino*, finally given back to the city, a first significant step in the process of walls conservation and enhancement was accomplished. Launched in 2006 and coordinated by the architects Amedeo Bellini and Marcello Sita, the restoration project undertaken a series of actions for the functional and technological re-use of former sacred space, redesigned as a new place for cultural events (fig. 2). The numerous construction sites which since then succeeded, have concerned: safety measures on the plastered and painted surfaces (April 2007 - May 2008), two archaeological excavation campaigns (the first started in July 2007 - the second in October 2010), the consolidation of the facade and the installation of a new roof (May 2010 - June 2011); and, finally, the realization of the *aula magna* (equipped stage with retractable screen, control room for simultaneous translation) and the plant adjustment design (controlled temperature and humidity) for the protection of wall paintings (July 2014 - September 2015) (4).
Today more than ever, an important task has been assigned to the administration of Bergamo and the University: the preservation of what has been transmitted from the past for the sake of contemporary humankind and its transfer to future generations. To this end, the two organizations have together launched - in support of the UNESCO proposal - a programme for the planned and sustainable maintenance of the ramparts to ascertain the evolution of the degradation processes in place and prevent the radicalization of pathological situations. A structured practice of inspections, diagnostics, and well calibrated maintenance activities that should limit the cost of future restoration projects and their invasiveness, and to extend the time interval between a building site and the other. A series of actions designed as a daily care of many architectural features - which constitute the 'stone landscape' of the Venetian walls (5) - specifically conceived by the Lab S.A.B.E. (Survey and Analysis of Building and Environment) of Bergamo University with the technical and scientific support of the Laboratory of Restoration of Architectural and Cultural Heritage of the University of Enna "Kore".
The whole process will be reflected through periodic analyses, direct on-site inspections with traditional diagnostic systems and systematic cognitive investigations (cyclical monitoring of the

Fig. 1: On the left, the layout of the Venetian walls and the former convent. From top to bottom, the fortifications viewed from *Sant'Agostino*, the former monastery through the eyes of a drone and the main cloister.

Fig. 2: On the left, the former church of *Sant'Agostino* now re-used as *aula magna* of the University of Bergamo. On the right, from top to bottom, the conference room in the opening day and the facade after the restoration.

materials decay by means of 3D laser scanner and aerial photogrammetry with drones' surveys). The data acquired will be constantly integrated into a computer database, which will also collect information on materials, construction techniques, and previous treatments. Their analysis will allow defining new conservation programs and planning maintenance operations to be performed on each element, also detailing execution time and resources required, thereby to obtain a precise economic and financial planning (6).

2. THE VENETIAN WALLS AND THE FORMER CONVENT OF SANT'AGOSTINO

Two distinct and recognizable 'towns in the town' compose the urban structure of Bergamo: the Lower and the Upper. The first, originally made up of scattered settlements along the main roads leading to Venice and Milan, is now a much-densified fabric following the urbanization - both at small and large scale - that in the modern age have aggregated the ancient villages. It is the focal point of the town, the seat of the main government structures and administrative offices, as well as the beating heart of economic life, hosting the most important commercial activities. The second - located on a large hill of the Orobie Alps that, to the north, overlooks the valley of the upper course of the Morla river and, on the south, limits large portion of the Po Valley - is the 'living room of Bergamo'; almost an overtime crystallized reality characterised by a rich, composite and stratified history. It was the site of the initial Celtic nucleus in the 5th century BC, which was followed by a long period of neglect. In the 2nd century BC, Romans there created the first real settlement on a regular plan, orthogonally cut by two main roads: the *Cardo* and the *Decumanus*.

Based on archaeological data, the first fortification in the area dates back to the 1st century BC (7). The existence of a town's protective boundary was confirmed by some findings, including an important inscription describing the construction of two ports in the mighty wall. However, the evolution of the first Bergamo's defensive system until the 16th century's Venetian walls is a complex and partly incomplete matter. Some studies - though not confirmed by excavations - conject the existence of second fortified walls that "maintained and completed during Lombard periods and later in the 12th and 13th centuries, this first walled perimeter" (8). In the middle Ages, Bergamo was, in fact, a vast and important fortified village, and it is likely - even for its topography - the modification of the original defensive system, especially during communal age - both with the strengthening of the existing parties and new additions. It is also plausible a possible expansion of the town walls which annexed, for the benefits granted to those who resided within the defensive perimeter than the countryside, part of the land towards the so-called Fara area.

A first theory on the development of boundary walls, advanced by Luigi Angelini in the early '900, identified, also based on the Teresian Cadastre and late 19th century's plans, the possible route of the old fortifications. His comments will give the basis of the detailed plan of conservative restoration of the Upper town and the *Borgo canale* of Bergamo established by his son, Sandro Angelini. The planning instrument, drafted in 1979, classified five stages in the construction of the walls, by pointing with the fourth, the *Muraine*, raised in the Visconti era that enclosed the outer boroughs of the lower city (9) (fig. 3). The design of the mighty walls with bastions, built by the Venetian Republic from July 31, 1561 - with the arrival in the city by Count Sforza Pallavicino, Governor of the Republic of San Marco and the construction's superintendent - and completed in 1588, was strongly influenced by the existence of the convent of *Sant'Agostino*. This was not demolished because Augustinian fathers paid a large sum of money. The originally planned route was then expanded in its perimeter to enclose the

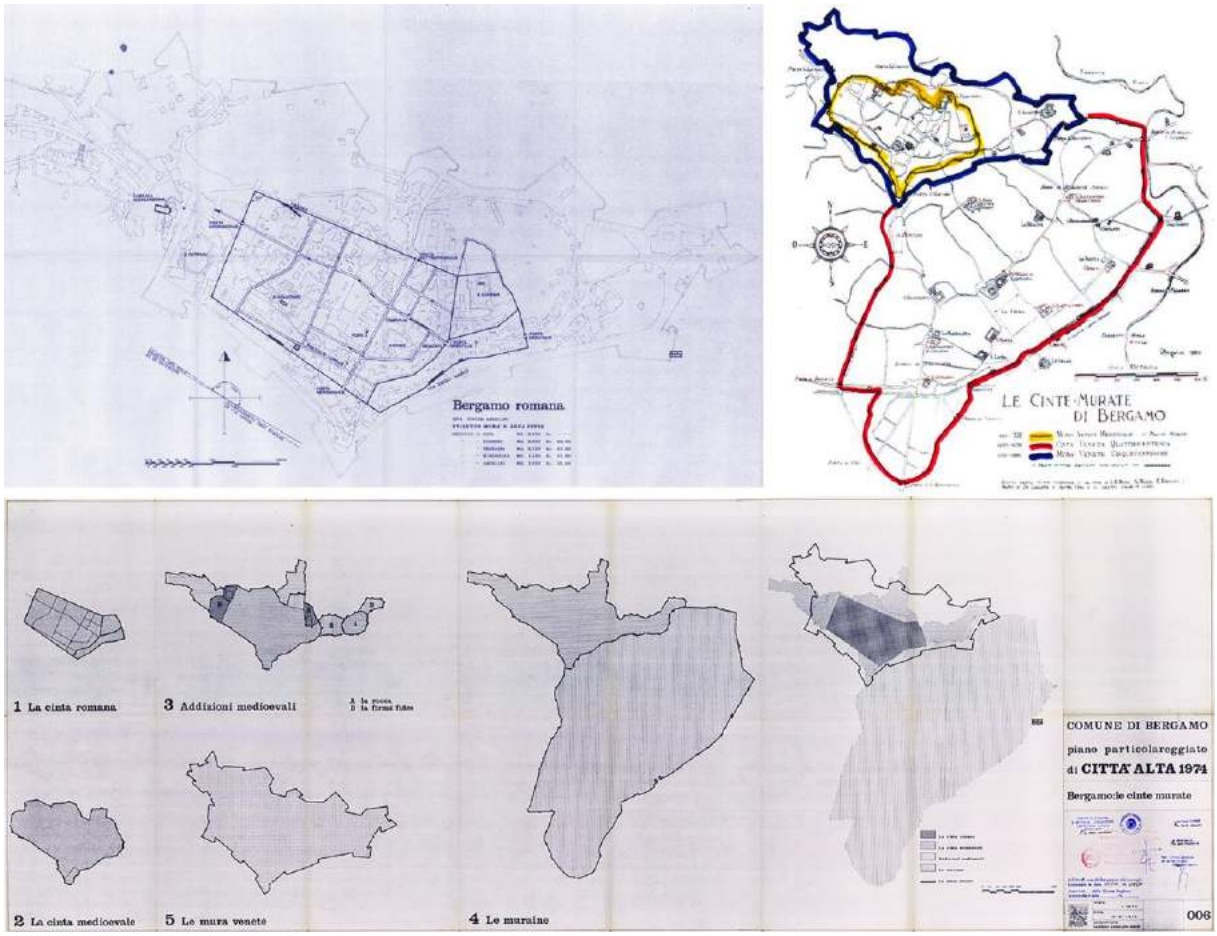

Fig. 3: On the top, from left to right, the Roman fortification in the 1st century BC and the walled city of Bergamo (hypothesis by Luigi Angelini); on the bottom, the the evolution of the fortification system in the detailed plan of conservative renewal of the Upper town and of the *Corso Village* of Bergamo (architect Sandro Angelini, 1979).

religious complex (10) (fig. 4). In addition, the convent of *Sant'Agostino* was particularly appreciated by the aristocratic families who governed the city and had favoured its annexation, in 1428, to the domains of the Republic of Venice. The church, indeed, built in the 13th century by the hermits of *Sant'Agostino*, following the reform of the order for adaptation to the rule observance, had been enriched in th e lastdecades of the 15th century by chapels, built along the aisle, to inhume dead (11). The possibility of having its own tabernacle in a prestigious church such as that of *Sant'Agostino* was an expression of the prestige enjoyed by the family. Therefore, the eventual overthrow of the religious complex had been strongly opposed by those who administered the city (12). According to the architect Elia Fornoni, however, the modification of the first project (which foresaw the walls built against the fortress of San Marco) was mostly motivated by economic advantage linked to the construction. In fact, the original route, as well as to create an easily helpless area, would have required to break down much of the rocky relief of the hill of *Sant'Agostino*, a very expensive and long work (13). In any case, the convent was spared and three outer bastions were built - *San Michele*, *Sant'Agostino*, and the adjoining bastion said *del Pallone* - and arranged in a claw-like defensive configuration (fig. 5). Realized towards 1575, the namesake access, majestic and imposing in its forms, was enriched with the construction in the axis of a fountain, based on the same tripartite scheme. The door had the role of enhancing the most transit road leading from the city in the direction of Venice.

Over the years, the walls were few transformed but once ceased their defensive utility, collapsed in several parts for lack of maintenance and neglect. Following Napoleon's conquest and the creation of the Cisalpine Republic, many areas of the ramparts became private and fenced. The many internal walkways and the so-called ‘covered roads’ used by patrols, turned into warehouses and, unfortunately, became - and still are - inaccessible.

Partly a national (elevated structures) and a municipal property (stands), the Venetian walls - without a proper reuse, which could guarantee a new, compatible function - are today subjected to a slow but inevitable failure. Many parts are covered with trees and weeds shrubs causing, with their roots, the postponement of the stones, so compromising the stability of the whole structure. In more points, interventions of rehabilitation and integration of the missing blocks are needed, either due to natural

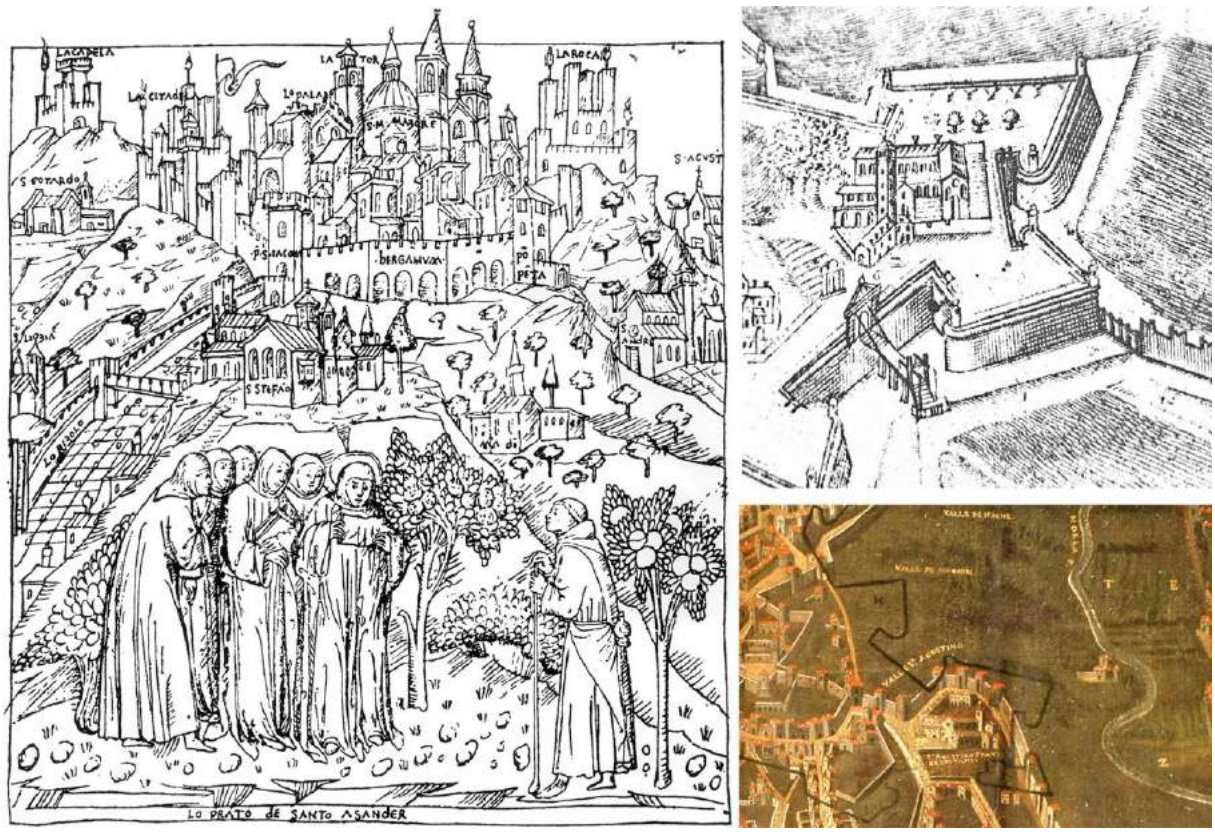

Fig. 4: On the left, the convent of *Sant'Agostino* outside the medieval walls, in a view from the lawn of *Sant'Alessandro* (first half of the 15th century). On the right, from top to bottom, the city in the 16th century with the overlap of the new fortifications track (Alvise Cima, 1643-1710) and a detail of the convent located between the bastion of the same name and that *del Pallone* after the construction of the Venetian walls (Macheri, 1660).

fall or to their removal for a reuse in new constructions. A major maintenance work extended to the entire track was operated in 1976 on the initiative of the City of Bergamo, but since then groups of volunteers have carried out, only sporadic cleanings.

In many ways, the convent of *Sant'Agostino* has shared the same fate of the Venetian walls. Though never abandoned as happened to the ramparts, it has been for a long time neglected after the Napoleonic decree of 25 April 1810 on the suppression of religious communities and the confiscation of Church's properties. Whether the 18th-century historical chronicles describe the complex as an important "place of prayer and study, rich in works of art (…) where even the cloisters were gorgeous in vegetal architecture" (14), those of mid-19th century narrate of its conversion in military garrison with the church served as a horse stable.

Several improper re-functionalization, regardless of the historical and artistic past of the structure, have unfortunately occurred in the 19th century. In the years 1880-1881, the nave was divided in its height with a wooden mezzanine and the upper floor transformed in an archive. On that occasion, the frescoes were hidden behind brick walls made to respond to new requirements, but this partly ensured their protection.

A great cultural significance has always been recognized to the complex within the city so much so that, in 1933, the Diocese of Bergamo, following the Concordat between the Holy See and the Kingdom of Italy asked for its transfer to the Italian government. The will of Mons. Bernareggi, then bishop of Bergamo, was that of reconsecrating the church to open it again for worship and simultaneously transform the former convent into a diocesan museum and library. The Archbishop's Curia was willing to cover the entire cost needed for the restoration and then entrusted the engineer Luigi Angelini with a project, which was unluckily never realized. In 1955, the former church was still used as mechanic's workshop and garage; some ex-soldiers families lived there in small apartments built instead of the sacristy.

Today, the process of recovery and revaluation of this important cultural heritage has been already put in place. Nonetheless, it seemed necessary to supplement architectural restoration activities already carried out and/or work in progress - not to supplant but rather to influence them - with new ways of prevention and degradation control, able to "maximize the authenticity's permanence" of concerned architectural objects (15). Modes that find in conservation planning strategy their most effective instrument; a practice that is clearly opposed to a widespread idea of 'maintenance' that often during

Fig. 5: From left to right, the hills on which stands the city of Bergamo: the representation of the ancient topography with the overlap of the perimeter of the new Venetian walls, the floor plan of the area of *Sant'Agostino* before and after the construction of the fortifications in 1561 (Elia Fornoni, 1883).

the implementation phase depletes buildings which are a testimonial evidence of cultural and historical values.
However, the conscious and careful management of an extensive and detailed *ensemble* as the one represented by the Venetian walls can become a prohibitive task. In order to facilitate and make accessible a goal so difficult and ambitious, this research has then sought to benefit from the use of new technologies, while respecting the guidelines that the culture of restoration (and, of course, its methodological and practical apparatus) has over time developed.

3. THE 3D DOCUMENTATION IN SUPPORT OF PLANNED CONSERVATION

The automatic three-dimensional survey - with both active (laser scanning) and passive sensors (terrestrial and aerial photogrammetry with drones) - offers new opportunities for metric and material monitoring of landscape and historic buildings. The rapid acquisition of spatial geometries, combined with the high metric and chromatic reliability, allows the easy planning of survey campaigns that, if conducted on a regular and cyclical basis, can deliver a database able to provide clear indications about the degradation changes, the occurrence of new instability phenomena; and/or, in general, to document the overall aging of the buildings in their context.
In particular, the information's high-density permits the construction of maps with the accurate localization of metrics (such as lesions and deformations) and material abnormalities in an easy manner and in reduced times (16). The systematic sequence of graphical representations, two-dimensional orthographic projections and/or axonometric views, in fact, when compared with each other, allow assessing the extent of diseases related to moisture and weeds, the consistency of detachments (plaster or stone material), and the crack patterns' aggravation.
The information, having a qualitative and not only quantitative character as those obtained by a simple photographic campaign, lets operators to plan future activities, establishing whether to call for urgent action (because degradation phenomena had a rapid mutation) or, alternatively, to delay them since any change, which could compromise structure's functionality and safety, occurred.
All the same, these investigations still need to be confirmed by diagnostic analyses - preferably carried out speedily, by light and automated instruments, easy-to-use even by not high qualified personnel. This allows both to limit the time frame for the tests and subsequent data processing, and to cyclically repeat the analysis. The eventual small decrease in terms of accuracy, compared to more complex and costly operations that demand higher performance equipment and the presence of specialized technicians, is widely rebalanced by the advantages given by the most frequent acquisition of data carried out at different times and their constant comparison.
On this basis, the project of planned conservation on the Venetian walls has been established. A programme that unfolds through two equally important parts: a first observation on a large scale provided on an annual basis - for the system of fortifications and the imposing architecture built on the ramparts - and a second more precise, undertaken every six months, which provides a series of repeated observations on some buildings with high historical, architectural and artistic values.
More in detail, the first procedure will employ automatic detection technologies based on aerial acquisitions by drones - in accordance with Italian Civil Aviation Authority regulations - combined with 3D laser scanning and terrestrial photogrammetric surveys in complex areas due to the geometry of the fortifications and/or to the morphology of the terrain (fig. 6).
The quick capture of the wide extent of the walls - more than 5,000 meters - will only be possible thanks to fixed-wing UAVs, which will acquire geo-referenced images, both in nadir view - for cartographic and floor plans - and by the camera suitably inclined (variable angles between 45□and 60□in relation to the height of flight) - for the correct measurement of walls facades. Actually, a drone with fixed wing has a higher speed and much more autonomy in flight and, therefore, can cover in a

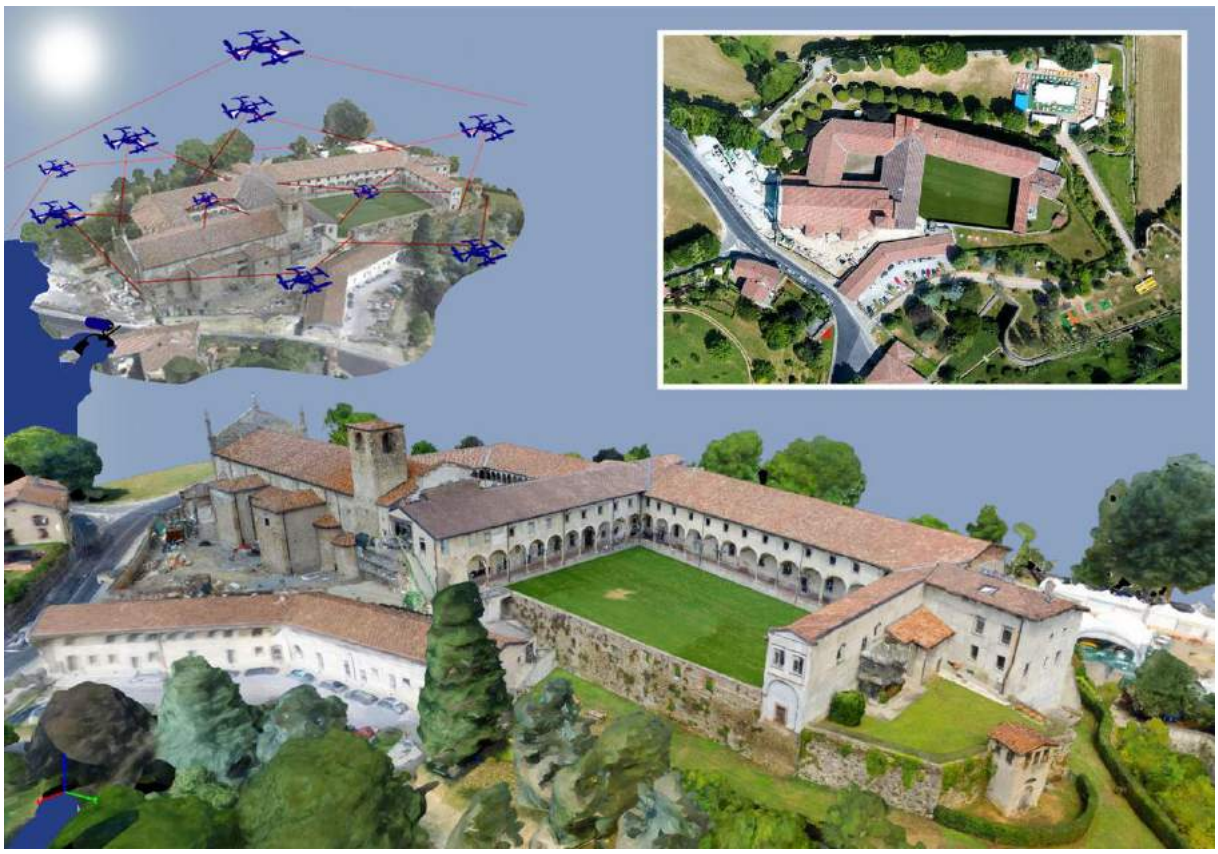

Fig. 6: The complex of *Sant'Agostino* acquired from drone (summer 2015): on the top, from left to right, flight planning, the floor plan of the former convent and walls, and below a bird's eye view of the 3D model.

short time large surfaces._The UAV system that will be utilized, the SENTINEL-MP, is a fixed-wing prototype, powerful and lightweight thanks to a frame in Epo (plastic foam) and carbon (technical characteristics: weight less than 2 kilos, a distance of 830 mm, 1300 mm wingspan and Hacker type 370 watt electric motor). It holds a large interior compartment with removable doors (the side, the summit, and the nose) to place optical cameras in an oblique direction and sensors for the aerial thermal recovery, such as the FLIR VUE-PRO in order to detect pathologies degradation due to the presence of water and/or masonry disconnections. The system has currently only been tested, with good results, on the airfield for model aircraft, but has not yet been used in the project, awaiting authorization for its use in urban 'critical' areas.
Concerning architectural monitoring, indeed, 3D laser scanning and digital photogrammetry technologies will be employed; non-destructive, non-invasive and extensive diagnostic tests carried out by ultrasonic thermo-hygrometric and thermographic instruments will also be used.
Since summer 2015, a trial on the complex of *Sant'Agostino* and the surrounding walls has been developed. To this end, the MAP-1, a multi-rotor of the University of Bergamo, chosen in function of its high stability and the ability to acquire photographic images in steady flight, has been employed. The drone is a small and handy quadcopter, with carbon frame and centre distance between the helices of 700 mm, equipped with a T-Motor U5 850 watt engine, professional flight controller (32 bit Pixhawk and programmable processor ARM Cortex M4), navigation camera, GPS and action camera GoPro Hero 4 Black edition.
For this experiment, the flights took place with both manual drive (for the acquisitions of the hips and to obtain a closer approach helpful to get a more detail) and in automatic mode (for nadir photos up to a maximum height of 70 meters above the ground). The flight plans have been programmed to allow an overlap between the contiguous frames equal to 60□, setting the right interval of time between two successive shots. The open source software 'Mission Planner' supported the study of the trajectories, even for the continuous monitoring of telemetric data. In fact, any anomalies in the inclination of the drone, sudden changes in the number of rotors revolutions, unexpected weather changes - like gusts not perceived on the ground but only at high altitude - activate the controlled landing safety procedure of UAV system.
For the covering of the former convent in its entirety, fifteen flights lasting an average of ten minutes carried in the closed system of the university and the city park of *Sant'Agostino* were taken. The survey carried out simultaneously on the ramparts and on the complex, usually separately studied, has delivered new extended reflections at the environmental scale. The results obtained are

encouraging in terms of the wealth of information gathered and the possibility of their use. For example, they have allowed to accurately plan and estimate, both the simple clean-up activities with the removal from the fronts of the weed vegetation that will be performed by volunteer staff even unskilled, and the restoration and conservation actions - carried this time by qualified technicians - aimed at the removal of stumps and surface residues by hydro-cleaning systems, the restoration of railings and damaged top of the walls, the reinstatement of seals; and - subject to specific project - the reconstruction of missing masonries.
The operations then continued with small-scale acquisitions with the study of the former church of *Sant'Agostino*, which was, as already mentioned, the subject of restoration and renovation activities in the 2014-2015 years.
These works were possible only after several years of archaeological studies, which ended in August 2014. To the excavations needed to locate heating and sanitary systems and for the construction of thermal power plant - which had required the removal of a small part of the existing buried structures - then followed the realisation of the armed concrete slab for laying the flooring, the stainless steel plant ascents and the LED illumination (17). Almost a year later, during the final phase of the construction site, a measurement campaign using 3D laser scanning techniques and terrestrial photogrammetry was then launched.
The first measurement campaign was carried out in July 2015 through the implementation of scans aligned to each chapel, along the longitudinal axis of the church. The not optimal lighting conditions (an uncontrolled mixture of sunlight and incandescent lights) partially compromised the colour quality of point clouds, however, without enabling a first clear reading and 'recording' of the building's state of conservation.
The second campaign, conducted approximately six months after the first, was carried out in March 2016 after the end of restoration works and when the *aula magna* was already operative. Scans were conducted within one day in a more rigorous way than previous, both because in the highest number (in addition to those along the longitudinal axis, other acquisitions were taken frontally to each chapel) and as performed, in an environment characterized by a constant and controlled light, now assured by the new lighting system. This activity has allowed responding to the serious concerns raised by the heavy winter's rains that it was feared could determine the deterioration of areas affected by humidity caused by earlier leaks in walls, especially those frescoed (fig. 7-8). The comparison between the data

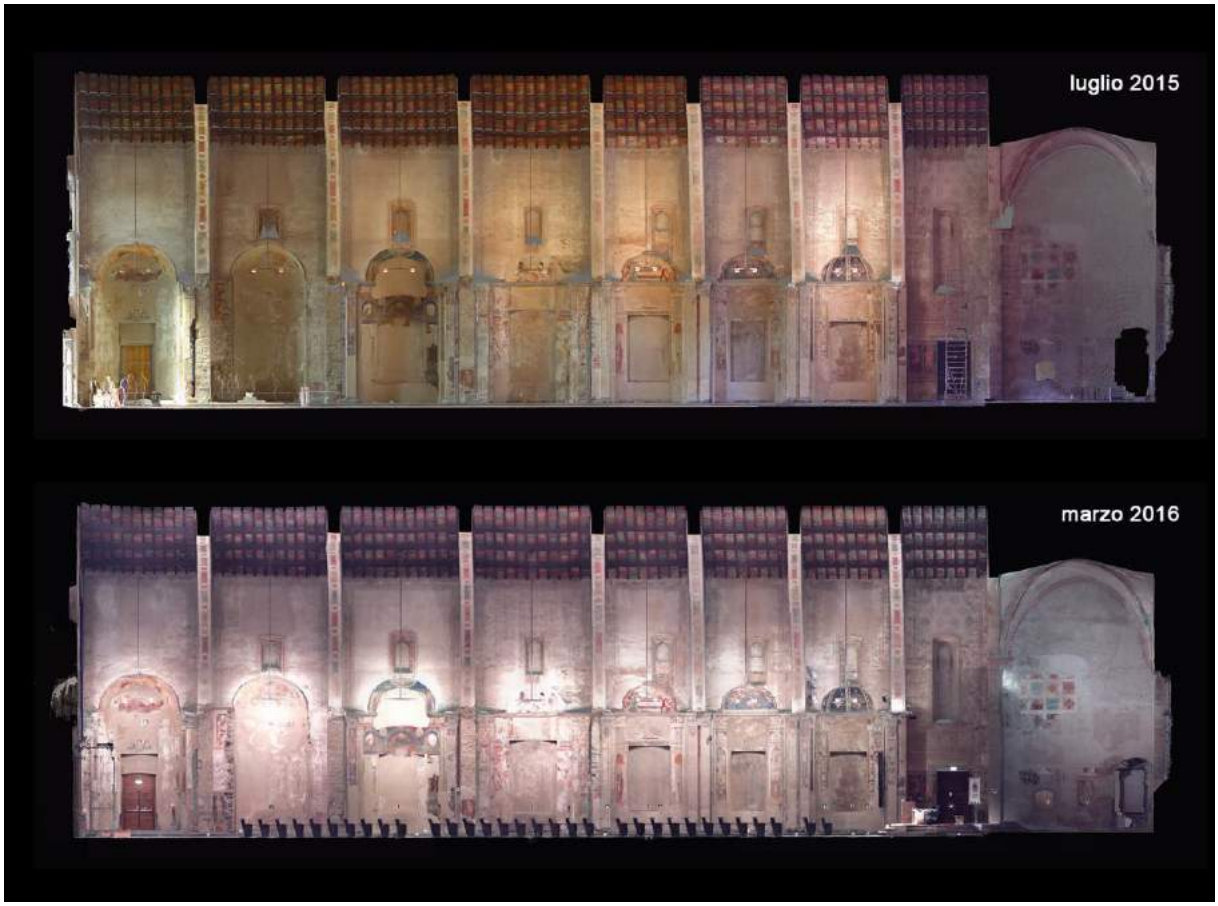

Fig. 7: The left side of the nave of the former church of *Sant'Agostino*. Comparison between the orthographic projection in the aim of the degradation evolution's monitoring (surveys carried out in July 2015 and March 2016).

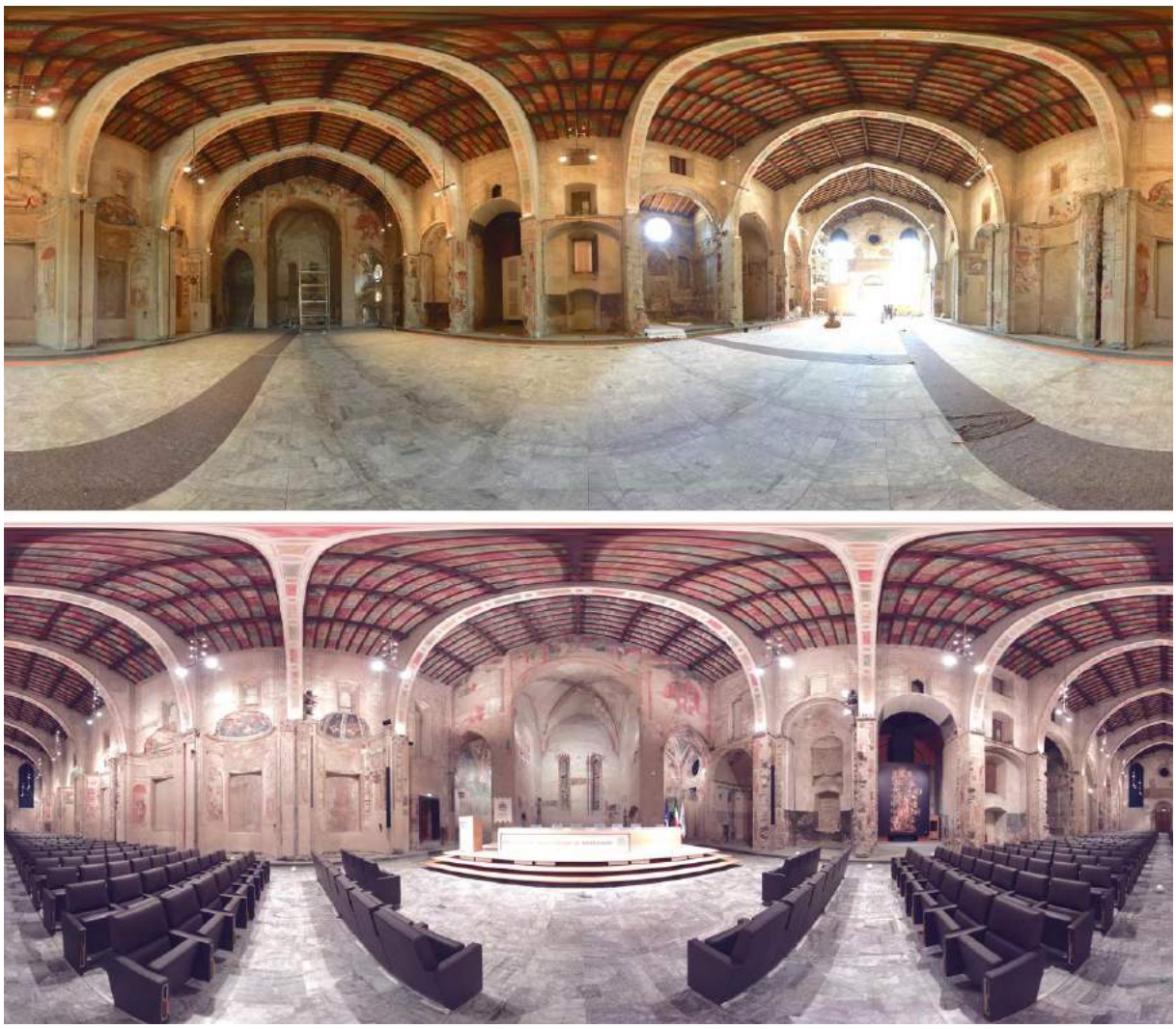

Fig. 8: Spherical image of the point cloud with the photographic mapping. Scans are a database that records the conservation status at the date of the acquisitions (surveys carried out in July 2015 and March 2016).

obtained from the first and second campaign, supplemented by hygrometric and thermographic surveys has allowed, for example, to verify the correct execution of the waterproofing works, especially on the left side of the aisle adjacent to the minor cloister.
Beyond these checks, however, the information obtained on the whole complex and interested walls, adding to the already owned historical, material-constructive and diagnostics data, made it possible to implement the structured informatics platform that it is part of the program. In addition to having provided an evaluation of the adequacy of past design decisions, the data storage on the computer system delivers a complete, regularly updated and easy to read anamnesis on the concerned artefacts' health so to be considered an effective instrument to plan maintenance operations.

4. CONCLUSIONS

The improving of policies related to the sustainable preservation and conservation of architectural heritage, today made possible because of technological innovation and updated methodological practices, is a matter of fundamental importance. The large and widespread adoption of new praxis for the planned conservation can be an important tool for cognitive development and application of such necessary activities.
Acquisitions made through 3D laser scanning and digital photogrammetric methods, even with aerial drones, when integrated with diagnostic tests by multispectral and thermal imaging sensors, allow the regular and systematic monitoring of the building's conservation status, in less time and reduced costs. Their experimental application to the structures of *Sant'Agostino* (the ramparts, the door and the former convent), currently underway, is providing solid proof of the effectiveness of small periodic maintenance actions - decided and cadenced on the basis of the monitoring - for the purposes of the limitation of risk situations and of the implementation of rapid intervention. A constant assessment of the constructions allows, therefore, to act before the damage's outbreak, with huge advantages both economic and for the cultural property protection.

However, planned conservation actions, especially when based on latest instrumentation and advanced techniques, are not particularly widespread in the domain of cultural heritage. This, not because of a lack of knowledge and researches in the field, but rather to a 'wrong thinking' that considers the restoration act much more important than the maintenance works, and its conclusion at the end of fieldwork.

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Architecture based on natural materials
Natural materials with great technological properties

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Abstract
The green architecture with its materials and traditional building techniques, also belonging to different cultures, is increasingly identified as a valid answer to the demands of architectural sustainability up to be recognized as innovative architecture. It also includes the area of urban green, efficient instrument for the construction of new cities environmentally oriented.
The new landscape approach, not only formal, but linked to the needs and performance, evolves into innovative solutions for urban green in all its many applications: from vegetable gardens to therapeutic indoor culture and natural design.
A way to build based on simple and natural materials is now possible: natural materials easy to find such as straw, bamboo, willow, clay, renewable and reversible that contemplate its peculiarity even in technological properties that characterize them.
Just think that the straw, if properly compressed, can form the closing walls of a building with several levels; the mechanical characteristics of the bamboo make it more versatile than wood both in terms of tensile strength and compression and even more resistant than concrete for compressive strength and steel for tensile strength. Finally vegetable fibers mixed with the bricks may be found in big architectures in many parts of the world.
The paper aims to show the most innovative applications of these vegetable materials in order to indicate them as a possible solution for use of renewable resources.

Keywords: green architecture, straw, bamboo, willow, clay

1. Architecture based on natural materials

The green architecture culture and sustainability of the building are issues that, fortunately, for many years enjoyed considerable attention, in this regard is already sufficient to cite just the first definition of sustainable development drawn up by the Brundtland Commission in 1987: "Sustainable development is a development capable of ensuring the fulfillment of the present without compromising the ability of future generations to meet their own needs ".
Starting from the concept of being "guests of the Earth" and not unique users of it, awareness raising campaigns aimed at protecting the environment and nature have made that not only scholars and researchers but also professionals such as architects and engineers, designers or manufacturers of building materials, were engaged to making its work on the less invasive for the Earth.
With reference to the genius loci and with a refined design it has been defined laid down a framework of design themes renovated able to meet the new structural conditions of the country, emphasizing the use of natural and local materials for the construction of environmentally sustainable architecture.
However it must be remembered that during the first years of development of the concept about sustainable architecture, nor the technical approach and the ethical approach to the ecological question brought immediately to the results of success, however, significant example of ecological

consciousness of the seventies was the ' Egyptian architect Hassan Fathy in his Architecture for the poor introduced the idea of trying to build in the most eco-efficient as possible within the confines of a region, teaching the ancient construction techniques with mud to poor villagers at order to protect them, enhance them and pass them as a cultural heritage and future economic development for their own populations.
From the earliest days of the concept of sustainability to date we have alternated different developmental stages and regressive, until conclude that placing the emphasis on sustainability means to reformulate the priorities of the architectural and engineering design with the aim of emphasizing the advantages of energy-efficient, green technologies and establish a new approach with high professionals (biologists, geologists, natural scientists) in order to have an efficient integrated design and practical eco-sustainable.
European Union, in 2004 defined the concept of "sustainable building" by promoting, within the building process, a methodological approach that takes into account the whole life cycle of the building, starting from the identification of the site, construction , management and maintenance, until the disposal of the building and the recovery of materials, with the main objective of reducing the overall environmental impact.
Environmental concerns are, therefore, inherent considerations in the design of any building and are critical to determine the typical architecture inspired balance.
As evidence of the development and the importance that the concept of sustainability has assumed in modern design, definable sensitive design, conscious and for this very innovative, it has been decided to report significant cases of green architecture, in particular architecture built with materials such as straw , bamboo, willow and raw earth in order to indicate them as a possible solution for use of low-energy renewable resources.

1.1 The straw

Agricultural waste product, mainly used as animal litter and the basis for the mushrooming, a material such as straw, having regard to the potential of its characteristics and properties, is used today as a building material to the point that the construction of straw, even going back to the end of 1800, are taking shape as the new frontier for sustainable construction.
This material, in fact, in addition to having a low environmental footprint, offers some advantages such as an improved level of thermal insulation that reduces CO2 emissions necessary to heat the house, better regulation of the humidity level, a better comfort level noise, low energy cost, low transport costs, reduced labor costs, labor requirements educated but non-specialist.
The economic benefit is known in time, saving nearly 75 of energy costs for heating and cooling systems for buildings. This is obviously simple constructions characterized by sufficiently compact environments.
In Italy the thatched buildings require the same legal process of a building constructed with materials and / or conventional techniques; the Technical Standards for Construction provide that the thatched buildings are built with a structural skeleton, Post and Beam system (beams and columns), which transfer the operating loads and dead loads to the foundations because the same rules, do not consider straw and straw bales as a building material, although these will be well-packed and tablets that may have their own compression strength. This skeleton may be made of wood, steel or concrete. The straw, however, is considered a hot material, which in contact with the so-called cold materials would inevitably lead to rot and decay to the appliance wall for which it is necessary to adopt the technical and technological devices in the installation phase of the bales inside the frame preconfigured.
The straw buildings can be found all over the world and the rules vary depending on the country, for example in the United States, despite the Post and Beam system provides certain advantages such as greater flexibility, the ability to use less dense bales or enter more frequent openings within the infill surface, the straw can be used as material with structural function (loadbearing method) as the first method is more expensive, in economic terms, of materials and manpower for the construction method with respect to load-bearing straw bale (loadbearing).In France all construction materials are allowed, and in France it is expressly forbidden to refuse a building permit for a project based on the choice of materials. This made easier the realization of thatched buildings by self-builders, by restricting the action of companies and professionals who, in the absence of a legal code on the use of straw bales, found it difficult to obtain insurance cover professional on the work. The "Professional Rules for thatched buildings" have been officially recognized at the end of 2012.

Fig. 1: Eco Pavilion straw studio 1984
The structure is made of wooden portals Douglas, foundations pine Acacia. The walls are made of straw, pressed into rectangular bales, left exposed on the outside while the interior is finished with wooden planks. A conceptual nest in form and materials.

Fig. 2: Community market by Kengo Kuma, usuhara-Japan
The main facade is iconographic, summary and complete. straw bales lining the top of the wall breaking off rhythm spread to create windows.

Fig. 3: House in the Dutch countryside in Zoetermeer
Optimal combination of straw and "canonical" plastered brick that has allowed the architect. Arjen Reas the input of extended glass cuts, capable of interrupting the compactness of the straw surface in favor of multiple views.

1.2 The bamboo

Once defined as the "poor man's timber" bamboo is a natural material that is experiencing a phase of strong and heartfelt appreciation on the part of planners and designers. Easily available and well known for its properties and characteristics in Asia, Africa and Latin America, the bamboo plant has always been used as an excellent building material and also in Europe for some time and in the rest of the world, thanks to the concept more and more spread of a design approach compatible with the nature and environmentally friendly, is conquering the peaks of the noblest building materials.

The fibrous nature of its materials gives the bamboo an extraordinary resistance, greater in both tension and compression than the wood, greater traction than steel, greater compression than the concrete. There are more than 1,300 varieties of this plant; it grows with great rapidity, even up to 60cm per day, adapting to different atmospheric conditions. The advantages of its use are manifold. Being a natural material, the entire life cycle of the product is sustainable, from the phase retrieval until his retirement. Not to mention the fact that it is a fast growing plant, its biomass can reach an annual increase of up to 30□, while that of trees generally ranges between 2 and 5□, and is able to absorb a lot of carbon dioxide.

The bamboo resistance to fungus and insect attacks can be increased thanks to specific natural treatments as well as for example, for the drying and for the protection, using the immersion in water or sand, or drying with smoke.

In the design it is critical to pay attention to the structural elements of foundations and to cover, for which must be provided for protection from water and light, so as to ensure a certain existence in time to the decreasing the perishability structures.

Fig. 4: Woven House

Sustainable architecture with ultra modern design and with a form resembling that of a bird's nest. S□ren Korsgaard aims to emphasize the special appearance that offers the art of bamboo as a sustainable material in architecture. It is demonstrating that even using natural materials such as bamboo are unable to obtain a futuristic and dynamic construction.

Fig. 5: Green School, Bali 2008

Green School is a campus-laboratories that stands at the center of a protected area on the banks of the Ayung

river, a Sibang Kaja (Bali). The campus lives through renewable energy sources. John and Cynthia Hardy with PT Bambu study, in collaboration with the Foundation Meranggi

Fig. 6: Wind and Water café
Located right next to the Wind and Water café on an artificial lake near Hanoi, the Wind and Water bar is a thatched bamboo dome that uses wind and cool water from the lake for natural ventilation. Lightweight and flexible, bamboo is the main building material for most of Vo Trong Nghia's designs, which provides an authentic experience of Vietnamese vernacular architecture amid Viet Nam's rapid modernization.

1.3 The willow

Material which offers a multitude of processing and application is also the willow, a tree species mainly used in "living architecture", architectures that are born from the knowledge of the material, from the care of the same, by the inevitable imperfections of his organic forms where it is time to define the changing and confused between the shades, lines, shadows, steps, mergers among the twisted branches of deaths and new. These architectures can configure enclosed spaces or open spaces more often born with social and cultural functions. This organic structures, such as those made in Stuttgart from Sanfte group Strukturen, Marcel Kalberer and his wife Dorothea, group Stuttgart artists-architects who guide the construction of visionary organic structures, have stimulated the emergence of many similar projects in the rest d ' Europe and the United States. The Sanfte Strukturen have made the first living willow structures in 1985; in 1988 has been developed the technique of the beams which has greatly expanded the potential of architectural constructions until arriving also to the possible use of thin pipes in non-galvanized steel which act as forms-driving around which the wire of willow rods allowing to define, in advance, the desired shapes.
In Italy research and studies in this regard were held at the Eco-Istituto of Cesena, who experiences the willow for living structures of the game such as huts, green paths and tunnels, and large buildings in parks and public spaces.

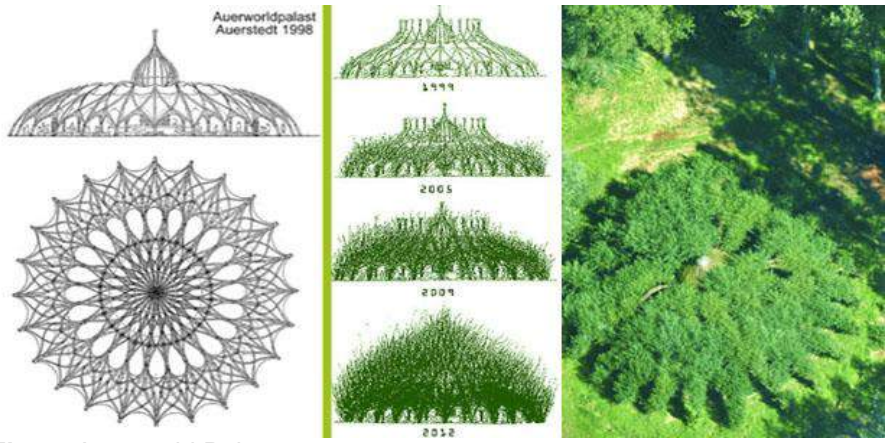

Fig. 7: Auerworld Palace
Auerworld Palace was built in March / April 1998, it is now a tourist attraction and is known as the "mother of all willow palaces."

Fig. 8: Willow Cathedral
The willow cathedral, built in 2001 at the International Exhibition in Rostock gardening, greatest living opera worldwide. Inspired by the typical pattern of the Romanesque basilica.

1.4 The Raw earth

The earthen buildings are made anywhere in the world: the mosques in Mali, Nigeria monuments, urban centers in Morocco,buildings in emen, housing in New Mexico, entire neighborhood in Macerata and large areas of Sardinia, Italy, and still others, just think of the raw tea together with wood and stones is one of the first materials used for the construction of shelters and huts and that, even today half the world's population lives in earthen houses.
As for the straw, having regard to the potential of its characteristics and properties such as: ease of processing, thermal comfort, sound insulation, on-site availability, biodegradability, reversibility, energy necessary for the realization of buildings equal to '1 of that required for the concrete and shipping cost equal to zero, the raw earth day is today one of the most used natural materials for sustainable architectures.
Extracted directly on the place in which it must be realized the construction, the raw earth should be first dried, then kneaded and then dried again according to the technique used. Are four known techniques for processing and installation of raw earth: *Adobe*, is the mixture of clay, sand, straw used for the production of green bricks. The mixture is placed in wooden armor prepared and left to dry in the sun. Subsequently the bricks are positioned to achieve the rows of masonry through the laying of the binder consists of the same material of the dough; *Pise '*- the mix of soft clay, sand and straw is laid out to dry in the armor arranged across the width of the wall to be executed. The masonry is realized for layers of 50 cm each; *Bauge* - the mixture of clay and soft sand is mixed with straw or other plant fibers and worked on site without the provision of formwork. irregular parts or excess are then eliminated. *Torchis* - the structure's frame is made of wood or bamboo and tompagnatura raw earth.
To traditional building techniques in clay are added every day new techniques for the use of this material so easily malleable, adaptable and increasingly used having regard to its high potential.

Fig. 9: Kharga Market, 1963 Egitto, H.Fathy

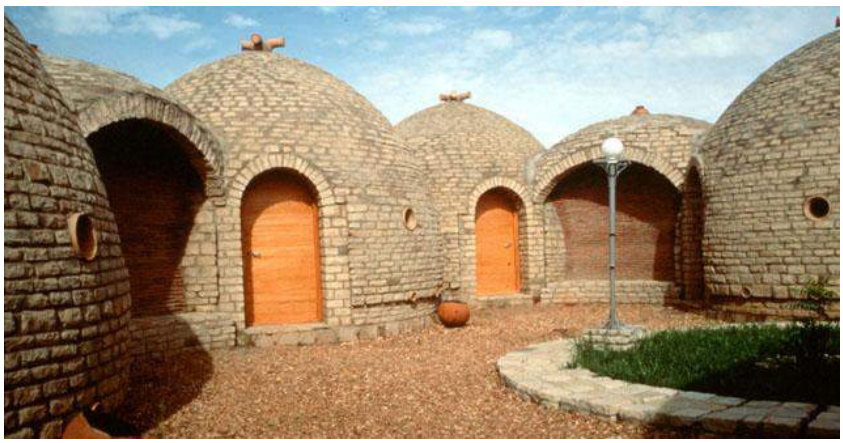

Fig. 10: Le Kambary Hotel and Restaurant Bandiagara, Mali - F.Caròla

Fig. 11: Rauch House Schlins, Österreich, 2008 – M.Rauch

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Aversa | Naples 16 - Capri 17, 18 June 2016

The reconstruction of the city of Naples in the aftermath of the World War II

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Abstract
The numerous bombardments suffered by Naples, one of the most stricken cities during the Second World War, left some voids both from architectural and social point of view. Consequently, in an attempt to get out of this crisis, the government adopted provisions, which indemnified for the war damages reported from private properties and increased construction activity. In those years in the city fermented a chaotic building market ruled at the beginning by small entrepreneurs and then by large real estate companies that came to Naples to take advantage of economic opportunity. Starting from real estate ads, extrapolated from "Il Mattino" in the 50- 60's, the aim is to identify the construction companies present in Naples in those years, outlining the key role companies played in the transformation of the city.

Keywords: Naples, Constructors, Real Estate, Landscape, Heritage

Section
When we think of the immediate postwar years, our thoughts turn immediately to the frames of the cinema defined "neorealist". A cinema able to trace the face sometimes moving of an entire nation that, architecturally speaking saw most of the Italians requiring a shelter even before a home.
The lack of light, water and food, was heard in the everyday life of Neapolitan citizens, deprived of their home because of the war debacle, the neighborhoods already overcrowded increased, thus the continuous endemic risk grew. However, the lack of a political-normative contribution in the years of reconstruction resulted in speculation and exploitation of the environment, as noted Roberto Pane, «the landscape is considered only as something that can be exploited for a better return on capital»[1].
Prophetic words in retrospect the havoc of the years 50'- 60'.
The legacy of the Second World War, brought about a new situation in Naples: Postwar boom began at first with traders in possession of capital, which finance the building constructions that with time became themselves builders. The distorted vision of the modernity, understood as deliberate opposition of the new architecture to the ancient, involved a defense of the environment discussed only theoretically.
While the plan of ' 46 died out in the bud clashing against the opposition of the monarchist right wing and the commander Lauro, the one of '39 come back in fashion and but at the same time was ignored, invalidated and falsified, to remind the collusion between public authorities and property speculation .
It was therefore customary from fifties and sixties build urban settlements in the absence of master plan or even on areas previously classified as agricultural areas.
In this way a messy process of land transformation started.
The urban fabric and consequently the environment, in horizontal and vertical direction completely changed by new volumes, by changes of the existing ones, by the alienation of green spaces. So in 1950 an article stated «[...] throughout Posillipo Alto, Via Tasso and on the whole area of the hill [...] the green is destroyed in few years because of the rise of roads»[2].

Those volumes, residences of the middle class, lacked also of a minimum urban prediction partly because of the discrepancy between the Master Plan of 1939 (in force at the time of the abuse), and the Building Regulations 1935.

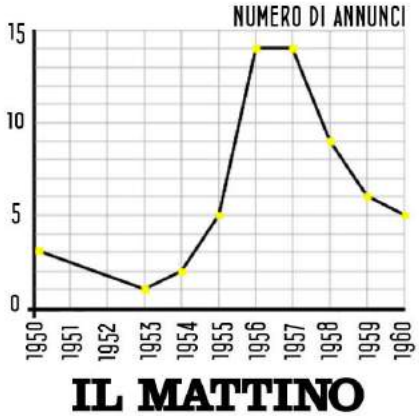

Fig. 1: Real estate advertising published between 1950 and 1960 in "Il Mattino"

Fig. 2: Estate advertising in "Il Mattino" 1958

Fig. 3: The future president of Republic Giovanni Leone out of a construction site of the society C.A.S.E.P. in the 1954. Archivio Carbone

At beginning apartments were sold at high prices depleting the request coming from the bourgeois class, but then arose the need to offer well-built affordable homes, located in central or scenic areas, notwithstanding (or almost) the regulations. Through political influences and with the detriment of society, a building areas market settled with the damage of vast scenic areas, often demolishing small and old existing houses or resorting to adjustment works.
Once chosen the area and started the construction phase of the project, the roller gear provided for the sale throughout paper documentation, through a new sales technique that depopulated between manufacturers: estate advertising.
Through the pages of "Il Mattino" between 1950 and 1960 it is not difficult to find company announcements as COFIMPRESE , who was committed to the implementation of Fossataro Park, between Via Orazio and Via Posillipo .
Those were the years in which, the object of desire of the population, was a modern house with panoramic views, the only figure able to realize this dream was the builder.
The entrepreneur became guarantor of exclusivity, someone who could bring everything to fulfillment.
With a steadily growing demand, manufacturers were delighted to accompany the property listings with tips like "no regrets", "Do not miss this opportunity", "out of your house the entire Gulf Naples", and especially "we are at your disposal for the facilities you'll ask , to advise you in the choice , to assist in the fitting"[3] .
The contradictory mechanism of ground rent helped giving a super value to every single square meter and enable the sales despite the bad and inaccurate execution. In the structure of the city,
the rent of land became a dominant element, with a growing demand for houses, the building became an irresistible seduction for both savers and entrepreneurs, and around the building gravitated not only the economic life but also the political administrative one[4].
The city in the mid twentieth approximately had one million inhabitants and would have to own about 18 million square meters of green.

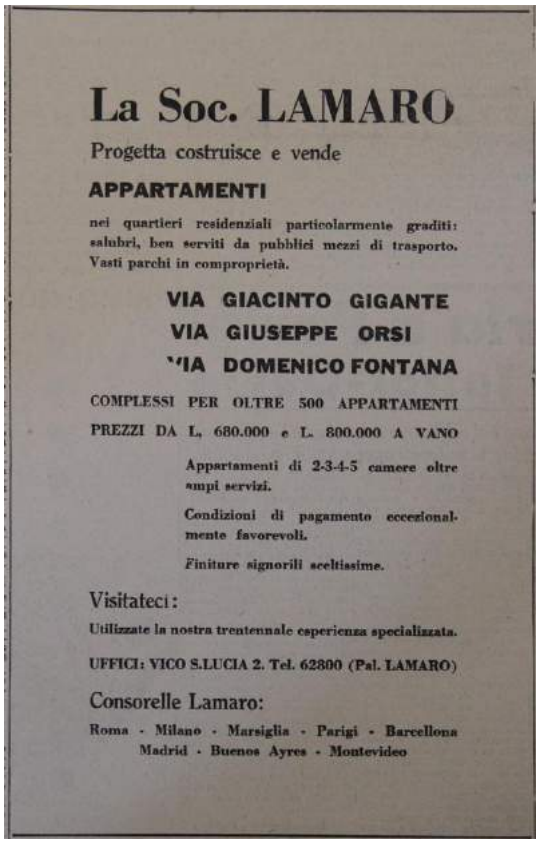
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Fig. 4: Estate advertising in "Il Mattino" 1954

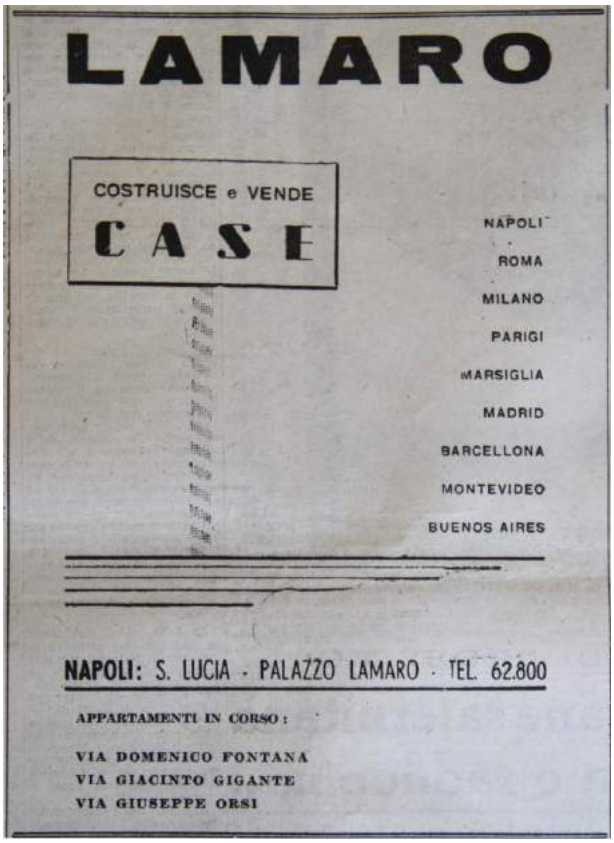
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Fig. 5: Estate advertising in "Il Mattino" 1957

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E RIFINITI DI LUSSO VENDE CON PRONTA CONSEGNA

L'IMPRESA AURELIO GENTILE

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IMPRESA AURELIO GENTILE

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Fig. 6: Estate advertising in "Il Mattino" 1956

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ANGOLO CORSO VITTORIO EMANUELE
DI FRONTE CUMANA

Fig. 7: Estate advertising in "Il Mattino" 1956

Instead of a total extension of 117.141.798 mq of urban territory, comprising 28 sections, only six possessed public green for a total of 200.529 square meters, practically already in 1950, to reach the right proportions, the city, needed about 17 million square meters of green spaces[5]. This problem was treated in the same period at the third Congress of Urban Planning. They took into account the construction activity carried out with state subsidies and ERP aid. In this conference, the Neapolitan Eng. Casaburi[6], envisaged the need for a higher unit, a High Commissioner for Urban Planning, especially for the county seat of Campania. In order to coordinate the construction activities and to avoid abuses, characterized by continuous uniform and monotonous blocks mortifying for the landscape in which they inserted, as the case of Corso Vittorio Emanuele, Via Tasso, Via Aniello Falcone, the Posillipo Alto and Posillipo.

Also if is usual to read that Naples devastation took place in the Lauro era , is less common reading that speculation and subsequent protests were already lit during the Administration of the Mayor Domenico Moscati (1948-1952). In order to demonstrate that, the question[7] of Municipal Councilors Professor Amedeo Mazzei and Alfredo Porzio, which demanded the designation of councilors and technicians representatives for the different groups, for review all building permits.

The abuses were under the eyes of all; nevertheless, it was hard to identify those who had contributory negligence. The Municipality believed its actions in line with the legislation. The Superintendent, who controlled the controller, believed that the cause of the disaster was the failure to achieve synergy between the competent units.
In fact, Professor Rusconi, Superintendent of Campania Monuments, believed that the unauthorized building to the detriment of the scenic beauties not only didn't concerned just the city of Naples but all the Italy and at any time with his office could prove the continuity, the fairness and legitimacy breakthrough to avoid further damage to the scenic beauties[8]. He explained, on several occasions, that in Naples, often happened that a draft revised or rejected by the Superintendent, was resubmitted to the municipal corps and thanks to small variations due to interference and political personalities interferences, he was able to evade the law by building permits granted without the knowledge of the Superintendent[9].

This lack of clarity in the exercise of territorial control functions by the competent units is evident in the events concerning the area of Caraja Park of Roccella in Via dei Mille. The park was included in the '39 Plan, submitted for protection of artistic and historical interest. It was bought from a construction company in 1952 to build a building for civil rooms and inexplicably both the Superintendent that the General Directorate of Fine Arts, confined to a minimum extension of the bond by giving the green light to implementation. Consequently, worse yet was made by the Municipal Housing Commission, which granted the license to build, and a year later, authorizing the construction company to take the scaffolding of the building from seven to nine.
In 1964 to target by speculation was even the seventeenth-century Caraja Palace of Roccella. The intention of the entrepreneur Mario Ottieri was to demolish it in one evening to build one of his huge building fortunately the opposition of residents he avoided the worst, even if o the stucco and the portal made of trachytic rock were destroyed.
Despite such incidents, however, manufacturers were increasingly disinclined to accept active responsibility in the landscape devastation. They had the opposite ideas, or easier, thought differently. For them it was out of question that the laws in force concerning the protection, were insufficient, it was more fair to say that in the existing municipal regulations, there were dictates that they could not apply and therefore were continually tampered with by those who should be there for enforce them. As reported by the President of the Association of Builders, Eng. Giuseppe Mascoli, «with such dictates no building of the Parco Margherita, Via Crispi, Piazza Amedeo, Via dei Mille, may exist, [...] to any building situated in that location could be granted planning permission, with the "compliance with the Regulation»[10]. So in that period, among manufacturers, born the common idea to believe themselves damaged by the city because of unclear regulations, which forced them to face a land market characterized by inequalities due the questionable nature of the suitability for building or less of funds, especially in the scenic area.

The series of images is the result of a research work at the newspaper and periodical library "Matilde Serao" and wants to highlight through the pages of "Il Mattino", the speculation that characterized Naples, mirrored with compliance from estate advertisements that builders, entrepreneurs, large corporations and property developers spread steadily. As outlined in the chart below, the advertising of dream residential real estate, with luxury finishes or no deposit and immediate delivery, they become much more constant, reaching a peak of publications in mid fifties. Moreover, the combination of data relating to the administrations of the decade that goes from 1950 to 1960 and those relating to the same period of the planning regulations of stock status, it is not very difficult to see why.

IN PIAZZA PODERICO
LA IMMOBILIARE A. GENTILE & FIGLI
VENDE APPARTAMENTI DA 2 A 5 VANI
Locali per ufficio - Negozi. Ottime rifiniture ampi accessori. — Massime facilitazioni nei pagamenti mutuo fondiario.
IN VIA ARENACCIA di fronte al Cinema Gloria
VENDE GLI ULTIMI APPARTAMENTI da 2-3 vani per consegna immediata.
PER INFORMAZIONI RIVOLGERSI:
Via S. Maria la Neve 42/a angolo Corso Vitt. Emanuele.

Fig. 8: Estate advertising in "Il Mattino" 1960

LA IMMOBILIARE
AURELIO GENTILE & FIGLI
Vende per consegna immediata gli ultimi appartamenti ben rifiniti ottima esposizione in via Arenaccia di fronte Cinema Gloria. Prenota appartamenti, negozi e locali uso ufficio in Piazza Poderico, adiacenze Stazione Centrale.
Massime agevolazioni nei pagamenti. — Mutuo fondiario.
Per informazioni rivolgersi presso Ufficio Società: VIA S. MARIA LA NEVE 42/A ANGOLO CORSO VITTORIO EMANUELE.

Fig. 9: Estate advertising in "Il Mattino" 1960

Fig. 10: Estate advertising of “Parco Mirella” in “Il Mattino” 1955

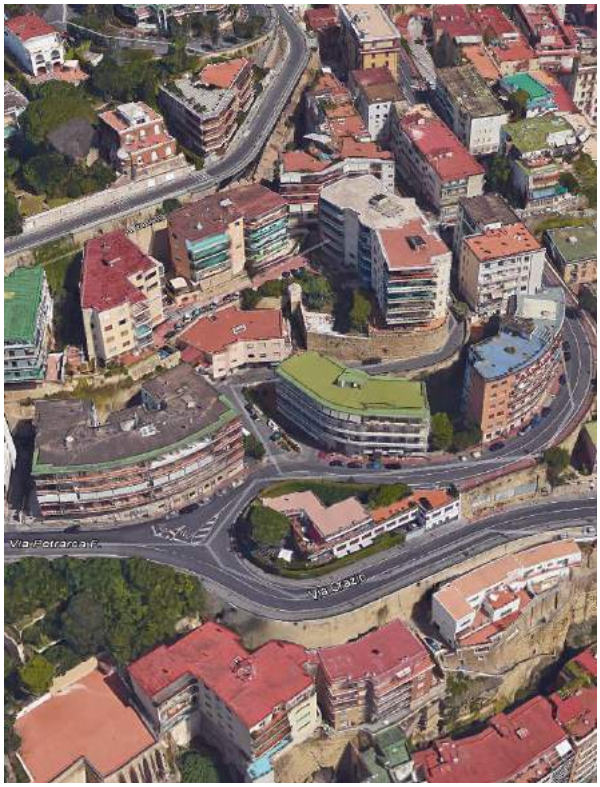

Fig. 11: View of “Parco Mirella” in Naples in 2016. Google

Fig. 12: Estate advertising of panoramic apartments published in “Il Mattino” 1957

Fig. 13: The same building in Via A. Manzoni in 2016. Google

Fig. 14: Estate advertising in “Il Mattino” 1956

Fig. 15: Estate advertising in “Il Mattino”1958

Fig. 16: Estate advertising in “Il Mattino” 1958

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ID 204
The Urban Space of the Ephemeral Heritage. Celebrations of Big Shoulder-Borne Processional Structures.

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Abstract
The text focuses on celebrations of large shoulder-borne processional structures, since 2013 part of the UNESCO Representative List of the Intangible Cultural Heritage of Humanity. In particular, the text examines the Macchina di Santa Rosa: a 30 meter high tower of light, constructed each year and transported through the narrow streets of the medieval town of Viterbo (Lazio, Italy). These installations straddling the masses serve as mediators between land and sea; they can be considered as interfaces and frontier space.
The text is accompanied by a selection of images retracing various phases in the evolution of this tradition.
The intent is to explore the various aspects of such intangible heritage both in relation to historical references and its own aesthetic and spatial dimension.
By examining iconographic material – photographs and original drawings – the essay investigates particular aspects of a cultural phenomenon that involves an entire community. This collective space in a state of constant change requires a renewal and new readings, also in light of the recent international recognition of "intangible heritage".
The study focuses on themes and methodologies for understanding contemporary expressions of immaterial cultural heritage. The "quality" of this collective space asks for new processes of surveying, archiving and historicizing; it needs to be recognised, monitored, preserved, protected and shared.

Keywords: Ephemeral Heritage - Processional Structures - Macchina di Santa Rosa da Viterbo - Temporary Architecture - Representation

The Rete delle Grandi Macchine a Spalla Italiane (Big Shoulder-Borne Processional Structures Network) comprises various traditional events belonging to local Mediterranean culture that share rituals consisting in the exhibition of intangible architectural structures transported in procession through the streets of the city.
The Network constitutes a form of international cooperation that supports the communities belonging to it, founded on reciprocal recognition despite geographic distances.
Expressions of local traditions and bearers of values of identity, the communities belonging to the Network share affinities that can be recognised in the ritual of celebrative processions involving the transportation of these large shoulder-borne "macchine". These intangible and temporary structures are the expression of extraordinary local creativity and particular elements of the local urban landscape. On the one hand they create interesting situations that emotionally involve local society and the city; on the other hand they generate sensible spaces and critically modify urban spatial conditions.
Instituted in 2006 based on the Nola Protocol from 2005, the Network includes: the Macchina di Santa Rosa (Tower of Santa Rosa) of Viterbo (Lazio) – the object of the present text – the Gigli of Nola (Campania), the Varia of Palmi (Calabria), the Candelieri of Sassari (Sardinia); in an initial phase the Network also included the Ceri of Gubbio (Umbria). The inclusion of the these "elements" on the UNESCO List of Intangible Heritage was voted unanimously in December 2013. [1]

Fig. 1: Celebrations of Big Shoulder-Borne Processional Structures. "Macchina di Santa Rosa da Viterbo". Intangible Cultural Heritage of Humanity UNESCO. Installation at Expo Milano 2015 (Photo by Antonella Salucci).

This text summarises the first results of a study of the Macchina di Santa Rosa of Viterbo, focused on the urban effects of this itinerant intangible installation expresses the wealth of local traditions in Viterbo.

The objective is to identify cognitive instruments that favour the promotion and preservation of a complex “open” cultural value whose margins are difficult to define; a value continually pursued by local communities and founded on the replication of customs that define local identity.

This intangible though vital heritage inherently comprises a number of unmistakable traits of identity whose cyclical re-presentation over the centuries evokes a specific dimension of the past. [2]

It is possible to identify various degrees of recognisability, similar to shared elements that unite all of the many shoulder-borne processional structures: the close connection with the site of their origin and specifically the cult of the Saint; a sense of belonging; the ritual of transportation; the presence of a temporary itinerant installation, known as the “macchina” (the machine); the votive offering of strength, the demonstration of sacrifice, the dedication expressed by the “Facchini” (porters); collective participation in a shared emotional experience during the procession, the effect of transportation, the festival and collateral activities; the transmission of the complexity of a traditional value passed down from generation to generation; the skills of the builders and the creativity of the architect in responding to an international competition; the economic aspects of the entire event.

This last consideration affords an observation of the degree to which the recognition of this heritage has contributed to an economic system tied to institutional funding.

The methods employed by the Network, which intensify the sharing of objectives, multiplies the information about cultural initiatives to promote tourism, with a consequent reinforcement of the identity of individual towns and cities and the entire system of traditional Italian festivals and celebrations.
The diffusion of information about these rituals – whose *mise-en-sc□ne* generates urban spatial conditions in a state of continuous modification and involves an entire city and its residents – favours a new, less familiar direction for tourism involving the artistic and cultural heritage of smaller and lesser-known Italian towns and cities.
This complex system is related to what some authors have referred to as the "poetics of the ephemeral", articulated according to a method that is undoubtedly Made-in-Italy and dating back to the Renaissance. It involves creativity, craft and inventiveness, converging toward a shared objective focused on the realisation of a complex project, and a work of art. [3] [4]
A perfect example for the present study is the relationship between the builder who translates and interprets the creative vision of the architect, by composing art and technology, tradition and innovation.
This skill set constitutes a unique example of intangible heritage that must be protected, shared and monitored. It is a legacy of know-how that requires new systematic processes of surveying and recognition, yet to be fully defined.
The Macchina di Santa Rosa is a temporary installation, the expression of religious devotion to the Patron Saint of Viterbo, the symbol of a traditional Catholic ritual begun in 1258 with the transportation and procession of a votive baldacchino.
Transported along an articulated route through the city, this imposing structure weighs approximately 5 tonnes and stands 30 meters high. It is carried on the shoulders of 113 men known as the Facchini di Santa Rosa.
Each year, on the eve of September 3, a multitude of people follow the procession, in the dark, transporting this complex and illuminated structure, participating in a unique event that has been perpetuated for centuries.
Every 5 years the City of Viterbo organises an international competition to renew the design of the Macchina. With Fiore del Cielo (2009-2014), designed by the architect Arturo Vittori and exceptionally re-proposed for 6 years, the Macchina di Santa Rosa was included on the UNESCO List of Intangible Heritage. [5]
The structure of the Fiore del Cielo (Flower of the Heavens) is the expression of a collective sentiment, of a profound respect for tradition and local cultural heritage.
This lengthy period of gestation reflects the search for a solution that respects tradition while responding to a host of different requirements.
The solution incorporates all of the principles of a virtuous contemporary project, founded on the idea of innovation and sustainability, expressed in the materials and technologies employed.
Furthermore, it offers an effective response to the problem of defining the form of the lights and colours, in their interaction with the urban context, both at night and during the day.
Observing a sketch of the project, in pen on a small piece of paper, dated 7 September 2008 – thus only a few days after the transportation of the previous structure used from 2003-2008 – it is possible to identify the principal invariants, similar to levels or conceptual layers, that the designer Arturo Vittori used to structure the concept underlying Fiore del Cielo.
The structural level consists of three parts: the Base, the Spirals and the Globes.
The Base is the interface with the Porters and the spiral structure that supports the votive statue. It is composed of elements that recall the styles and iconographies of medieval Viterbo: the stair, the fountain, the palms, the lion, and bears the inscription "FAVL", an acronym for Fanum, Arbanum, Vetulonia, Longola, the four original castles of Viterbo.
A stepping structure with the plan of a dodecagon wraps the Base that supports the entire spiral structure. In its wrapping movement it embraces the three powerful lions: two at the base of the ramp flanked by palm branches, and one at the summit. A symbol of strength and protection, each lion protects a globus cruciger with their left paw. The proportions and bearing of the lions are borrowed from those of the fountain in Piazza delle Erbe.
The shaft of the structure is composed of three spiral bands of varying sections that rise up from the fountain at the base toward the sky; at the summit of the shaft is the statue of St. Rose.
As they rise up they host, partially filtering their view, three globus cruciger in gradually decreasing colours and dimensions, symbolising three significant aspects of the figure of the Saint. Situated at the base and wrapped in a host of angels, the largest of the globes is in gold and expresses the earthly life of the Saint; the middle globe is red to symbolise the heart; the white globe at the summit expresses spirituality and physically supports the almost translucid statue of the Saint.

Fig. 2: Celebrations of Big Shoulder-Borne Processional Structures. "Macchina di Santa Rosa da Viterbo". Intangible Cultural Heritage of Humanity UNESCO. The "extraordinary stop" from Piazza Verdi to Piazza della Repubblica. Viterbo, 3 Settembre 2014. (Photo by Antonella Salucci)

Each globe is emphasised by the presence of three angels, classically styled and realised in fibreglass on an aluminium structure.
The variable distance between the Spirals favours the visual permeability of the structure and ensures that the three globes are visible from different directions, in addition to reducing the risk of an excessively heavy construction to be supported by the porters and minimising the resistance of the structure to the wind.
Seen from above the installation recalls a rose bud, a key element of the Fiore del Cielo, used here in the form of thousands of small red roses dotting the surfaces of the Spirals.
The realisation of the roses, in the form of a flower with 5 petals, was made possible by combining the technique of origami with haute couture tailoring. The 900 small roses are finished in flame retardant fabric, illuminated by a flashing LED light and accompanied by 900 small candles.
Each flower, like every other vegetal element, is obtained using the technique of “traforatura” (perforation) that cuts them directly into the sheet of aluminium with a water jet during the construction of the spirals.
The scenographic apparatus includes a sophisticated progression of effects referred to the spectacular “machines” of the Baroque era, from changing lights, sounds, colours to the emission of vapours, to the calls of the porters (Facchini) during the transportation. This complex undertaking becomes clear during the event itself and reaches its apex during the traditional 5 stops along the processional route.
There is an important phase in the procession during which the appearance of the machine changes, amplifying the level of collective participation in the event: a monumental burning “torch” that generates wonder and marvel, topped by the figure of the Saint who distributes thousands of rose petals, “one for each citizen of Viterbo”.
The brief for the competition to design and build the Macchina di Santa Rosa requires a clear description not only of the concept, but also of the materials and technologies to be employed.
The project description tells us that the bearing structure consists of an aluminium and steel frame. Clad in composite sandwich panels of wood, polystyrene and fibreglass, the structure rises up for the entire height of the tower, providing a base that is necessarily solid and lightweight.
The surfaces of the three double-curving spirals are subdivided into hundreds of horizontal bands approximately 40 cm in height, composed of 1.2 mm aluminium plate. Water jet cutting is used to realise the 900 small fabric-clad roses that cover these surfaces.
Of the three globes that decrease in height from the base up, the first two are approximated to the form of a sphere using 60 identical pentagons, each of which is perforated by elementary geometries arranged in accordance with a “Voroni Diagram” to provide a more organic appearance. [5]
The allegorical value of colour is one of the essential parameters for the control and success of the project: the base is the colour of tufa stone and travertine, both local volcanic stones; the gold used for the spirals guarantees reflections of the city during the day and pulsates with lights and candles at night.

Fig. 3: Celebrations of Big Shoulder-Borne Processional Structures. "Macchina di Santa Rosa da Viterbo". Intangible Cultural Heritage of Humanity UNESCO. The Porters (Facchini), the Masses during the "fourth stop" made in front of the Church of Santa Maria del Suffragio. Viterbo 3 settembre 2014. (Photo by Antonella Salucci).

For the assembly, which takes only a few hours, 11 different sectors were created, each of which includes the main structure, decorations and wiring; the sculptural elements of the angels, lions and palms are transported separately.
Another aspect worthy of note is the 40-meter structure (scaffolding) that houses the tower during the days leading up to the event.
The hierarchy of “actors” who partake in the urban performance tied to the Celebrations of St. Rose is both articulated and complex.
Other than the designer of the Macchina, who has the central role of creating a temporary and itinerant structure that is both effective and complex, it is also necessary to consider the builders and craftsmen, supported by traditional know-how and the latest technologies that guarantee the perpetuation of this tradition.
The porters – the Facchini – are the main actors in the procession: members of the Sodalizio dei Facchini (The Brotherhood of Porters), they are entrusted with transporting the Macchina and serve as the connections between the earth and the heavens, between the city and the body of the Saint.
There are precise hierarchies: the porters are arranged based on a preliminary operative plan that positions them beneath the Macchina based on strength, height and experience.
The Capo Facchino directs the operation, urging his brothers onward and establishing the rhythm of their actions; the Guide are the four bearers at the four corners of the Tower responsible for the most complex manoeuvres and the correct positioning of the “cavalletti” used to temporarily support the itinerant structure; the Ciuffi are the 63 expert bearers distributed in numbered positions along seven rows and nine columns. Their name derives from the characteristic leather-padded protective hats they wear. The Spallette Fisse are two rows of eight men situated long the outer edge who move inward in those sections of the route where the distance between the base of the Macchina and the façades of the homes along the street narrows to almost 20 centimetres; the Spallette Aggiuntive consist of 22 bearers, in two rows of 11 men who enter into formation during the widest and most difficult sections of the procession; the Stanghette are 12 men, 6 at the front and 6 at the back who also sport the protective “ciuffo” to compensate for the oscillations of the tower; the Leve support and stabilise the formation and enter into action during the uphill sections, pushing on four beams at the back of the structure; the Corde are 35 bearers who, together with the Leve, intervene during the final uphill section pulling on two cords attached to the Macchina as far as the Sanctuary.

The traditional route through the city followed by the Macchina di Santa Rosa re-enacts the first movement of the “uncorrupted body” of St. Rose, ordered in 1258 by Pope Alexander VI to what is now the Sanctuary of Santa Rosa.
The transportation takes place at night through the alleys and streets of the historic centre that are progressively darkened during the passage of the illuminated installation.

An additional stop was added to the 5 intermediate stops of the historic route of the procession during the transportation of 3 September 2014 – an extraordinary circumstance in occasion of the recognition by UNESCO: a passage along Viale Marconi for 400 meters, added to the 1,200 meters of the traditional route. A precedent for this exceptional circumstance can be found in the macchina designed by Rodolfo Salcini in 1952, the first to be transported after the Second World War.
The transportation is preceded by a ceremony during which the Mayor of the City and the Builder of the macchina "entrust" the Sodalizio dei Facchini and Capo Facchino with the transportation.
START – Piazza San Sisto Viterbo. The transportation begins at the Porta Romana. The structure assembled during the months of July and August is placed alongside the Church of San Sisto, concealed from view by a 40 meter high structure – also illuminated and part of the event.
FIRST STOP – Piazza Fontana Grande Viterbo. The first section of the route along Via Garibaldi concludes with the first stop in Piazza Fontana Grande, prior to the downhill section along Via Cavour. The structure of the Macchina is lowered onto the cavalletti to be admired from the street and the homes facing it.
SECOND STOP – Piazza Plebiscito Viterbo. After the complex, articulated and emotional downhill section of Via Cavour, made possible by the intelligent balancing skills of the porters, the structure makes a second stop in Piazza Plebiscito Viterbo, in front of City Hall and the Prefecture. A particular moment at this point is "la girata" (the turn): as an homage to the Saint and the city's residents the bearers execute a full 360 turn of the structure.
THIRD STOP – Piazza delle Erbe Viterbo. After travelling along the very narrow Via Roma – the distance between the base of the structure and the façades is less than 20 cm – the procession has completed half the route and arrives at the third stop in Piazza delle Erbe at the beginning of Corso Italia.
FOURTH STOP – Via del Suffragio Viterbo. The fourth stop is made in front of the Church of Santa Maria del Suffragio. The macchina is prepared for the passage along the final narrow section of Corso Italia, as far as Piazza Giuseppe Verdi. It is at this point that a few rows of porters step aside.
EXTRAORDINAR STOP – Starting in Piazza Verdi. As a special event following recognition by UNESCO, the Macchina was transported along Via Marconi, from Piazza Verdi to Piazza della Repubblica, with a stop in front of the statue dedicated to the Facchini di Santa Rosa in the Piazza by the Viterbo artist Alessio Paternesi (1937). The procession then returned to Piazza del Teatro and the traditional route.
FIFTH STOP – Piazza Verdi Viterbo. The fifth stop in Piazza Verdi precedes the final section. The Macchina is at the base of the rise leading up to the Monastery.
ARRIVAL – Church and Monastery of Santa Rosa. The steep road of the final section of the procession is approached by the bearers at a run, assisted by cords pulled from the front. The point of arrival is the Church and Monastery dedicated to the Saint and conserving her uncorrupted body. The procession terminates here with a sort of "mobile party". The Macchina di Santa Rosa remains here to be admired by visitors for days after the event.
This brief analysis is a source of a multitude of considerations.
The aspects with an effect on the evolution of this event, defining, particular, a source of identity, must be referred to two principle invariants that reside on the one hand in the temporary and itinerant nature of an event with a variable configuration and, on the other hand, in the urban space that hosts, interacts, interferes and contributes to generating wonder and amazement; in other words the creation of a spectacle, an urban performance.
Spectators, the general public, participants in the event, citizens or visitors, fixed or in transit, comprise a magmatic and kaleidoscopic crowd that comes together and moves the same direction of faith, as part of a ritual of emotional participation.
A communion of intentions, of values that as the procession moves transforms urban space and the entire space of the city and its inhabitants through a sort of "urban performance".
The emotional participation and sharing triggered by the "space of representation" – the temporary representation of the ritual of the transportation of the Macchina di Santa Rosa – is one of the aspects of the event itself.
Like any mass event, the space of representation – the spatial variable – is modelled by the temporary nature of circumstance into a continual variable process that modifies a specific place, that triggers multiple perceptive and sensory processes that nurture a component of participation, a substantial element of ritual. [6]
The space that evolves over time through the urban ritual, the urban performance, becomes a metaphoric space that continually changes in response to stimuli, whether they are produced by the installation itself – lights, colours, sounds – or whether they are referred to the reactions of the spectators who participate in the event in various ways; indeed, it is possible to identify diverse levels of participation in the event in relation to the distance of use, from the street, from the homes lining them, from the sky; this is demonstrated in the original images that accompany this text, taken during the exceptional procession of 2014.

Fig. 4: Macchina di Santa Rosa (Viterbo). The transportation takes place at night through the alleys and streets of the historic centre that are progressively darkened during the passage of the illuminated installation. Viterbo, 3 settembre 2014. (Photo by Antonella Salucci).

This brief text offers a synthesis of the complexity of a centuries-old ritual that belongs to Italy's cultural heritage. This intangible heritage belongs to that typology of activities related to live events that can be experienced only through direct participation. [7]
The result is a path of reflection open to methodologies necessary to protect, monitor, communicate and represent a heritage that, as the expression of a modification, even if temporary, of space, must be protected and investigated using the same methods employed to study any other expression of temporary architecture. [8] [9]
Habits, customs, know-how are a source of cultural wealth and the expression of a way of "inhabiting" urban space that needs to be shared and which inherently includes an aesthetic but also anthropological connotation, generated by the sharing of spaces and the conformation of constantly new spatial condition. This paves the way toward fields of elaboration that, free of the constrictions imposed by reality and permanence, open up to scenarios tied to the realm of the utopia.
The urban space crossed and modified by the movement of the Macchina of Santa Rosa, part of the Network of Shoulder-Borne Processional Structures – listed on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity – is an intangible architecture, a temporary installation that creates sensible, "performative", fluid, shifting and multi-sensory spaces.
This spectacle and collective event, a temporal singularity, whose perpetuation of a centuries-long tradition involves individuals, the masses and the city in a metaphoric ritual whose repetitions are both identical and always diverse.
It emits an intermittent flow of sounds, light and colour in a continuous interaction between tradition and innovation that involves not only cultural, but also political and economic subjects.
The expression of the vivacity of a number of traditions typical of a community – appropriately defined "conversational communities" [2] – recognised by the sharing of values that contribute to defining a common identity.

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Urban Transitional Spaces and Sustainability. The Environmental Design Approach of Shopping Arcades in the Historic Centre of Nicosia

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Abstract
Shopping arcades initially appeared in Paris in the late 18th century and became widespread in European countries, North America and Australia. Developed mainly in the first half of the 20th century in Cyprus, shopping arcades represent a historical, cultural and social phenomenon of the westernization and modernization era in the island. Allowing shopping under weather-protected conditions, that is protection from rain, intense solar radiation and cold winter winds, arcades represent genuine architectural expressions of bioclimatic design. Despite their significant environmental qualities, in recent years arcades have fallen into decline, diminishing their role as climatic modifiers in the public domain. This paper investigates the bioclimatic design aspects of these urban transitional spaces in the context of the walled historic centre of Nicosia. It analyses aspects of arcade typology, level of enclosure in relation with the surrounding urban fabric, orientation, number of storeys and roof construction in order to evaluate the daylight, solar penetration, shading and natural ventilation potentials and limitations. This survey is carried out through the examination of architectural drawings, archival material and on-site observation of more than 30 arcades in the walled historic centre of Nicosia. The main aim of this study is to provide a better understanding of the role of arcades in achieving comfort conditions for the users. Furthermore, it aims to raise awareness about their preservation and revitalisation as authentic urban bioclimatic elements.

Keywords: shopping arcades; Nicosia; bioclimatic design; Mediterranean climate; preservation

1. Introduction

Arcades initially appeared during the late 18th century in Paris in order to create shopping areas under weather protected conditions. In parallel, these spaces offered access to the underdeveloped interior of the urban blocks and provided a passageway and short-cut. These urban transitional spaces, which were widely developed throughout the 19th century in many European countries, North America and Australia, reflected the specific needs and desires of the industrial society. More specifically, they responded to the need for public spaces protected from traffic and extreme climatic conditions and the search for new means of marketing luxury goods [1]. These spaces share many similarities with the Eastern bazaar, known as *sou*, although, according to Geist (1989) [1], there are no direct links of influence to the arcade prototype. The Eastern Bazaar is developed along irregular streets covered by straw mats or has the form of a covered archway with small skylights to provide illumination and protection against heat.
Set in the heart of urban blocks, arcades not only contribute to an increased permeability of the urban fabric but they further enrich the environmental diversity (thermal, visual and sound diversity) of the city. This is a key element in achieving a non-homogenous urban environment, where a variety of microclimatic conditions is available and allows a more fulfilling occupancy [2]. Being in the transition between indoor and outdoor space, as well as between private and public domain, arcades are associated with a number of bioclimatic aspects, such as protection against rain, shield from cold winter winds, shade, protection from the high summer sun and progressive thermal adaptation to a

new environment to avoid discomfort [3]. The arcade type, which does not depend upon mechanical means of thermal control, exploits to a great extent passive design strategies embodying the complex concept of sustainable environmental design.

In the European context, the arcade type initially became widespread in high latitude Northern European countries (cold climates). Then, it worked its way into low latitude Southern European countries (hot climates) where it was not as popular. The architectural models that were initially developed, which mainly offered protection from cold and rain, did not find a useful application in low latitude countries. To address this issue, local architects adopted new “hybrid” architectural forms which offered climatic adaptation and responded to the challenges of hot climates that are characterized by high summer temperatures and intense solar radiation.

Surprisingly, even to this day, arcades have not received sufficient attention by architects and historians, despite their aesthetic, environmental, social and practical values. Related literature in the field is rather scarce, while many arcades remain unknown and unrecorded. The limited number of research conducted in the field mainly focuses on the typological, morphological and stylistic aspects of arcades [1, 4, 5]. However, the environmental qualities of these spaces, especially those located in low latitude countries, form an object of study that has not yet been explored in detail.

The present research attempts to provide a better understanding on the environmental behaviour of arcades in the context of the Nicosia walled city centre, which exhibits a Mediterranean climate. This study seeks (a) to identify the passive design strategies inherent in the design of arcades, (b) to show how their architectural design correlates with microclimatic dynamics and (c) to demonstrate how the high latitude arcade prototype evolved and developed adapting to hot and sunny climates. The aim of this research is to focus on all the existing arcades in Nicosia city centre, belonging to various historic periods, as well as on contemporary examples, to raise awareness about their significance as authentic urban bioclimatic design elements and to promote a policy for their environmental refurbishment on a neighbourhood and district level.

2. Methodology

In the framework of this study the historic development of shopping arcades in Nicosia is initially examined, based on national newspapers (dating back to 1878) and photography archives. Archival material constitutes the only source of information in the field, due to the absence of relevant literature on shopping arcades in the context of Cyprus. The study then focuses on a qualitative investigation of the design characteristics and, more specifically, on the environmental features of arcades. To this end, the study investigates the correlation of arcade architectural design —including (a) arcade typology, (b) degree of enclosure, (c) orientation, (d) number of storeys and (e) roof type and materiality— to environmental performance. For this purpose, a sample of 36 arcades in the Nicosia walled historic centre has been selected for further investigation (Fig. 1). This sample was surveyed through architectural drawings, on-site observations, photographic documentation and registration of

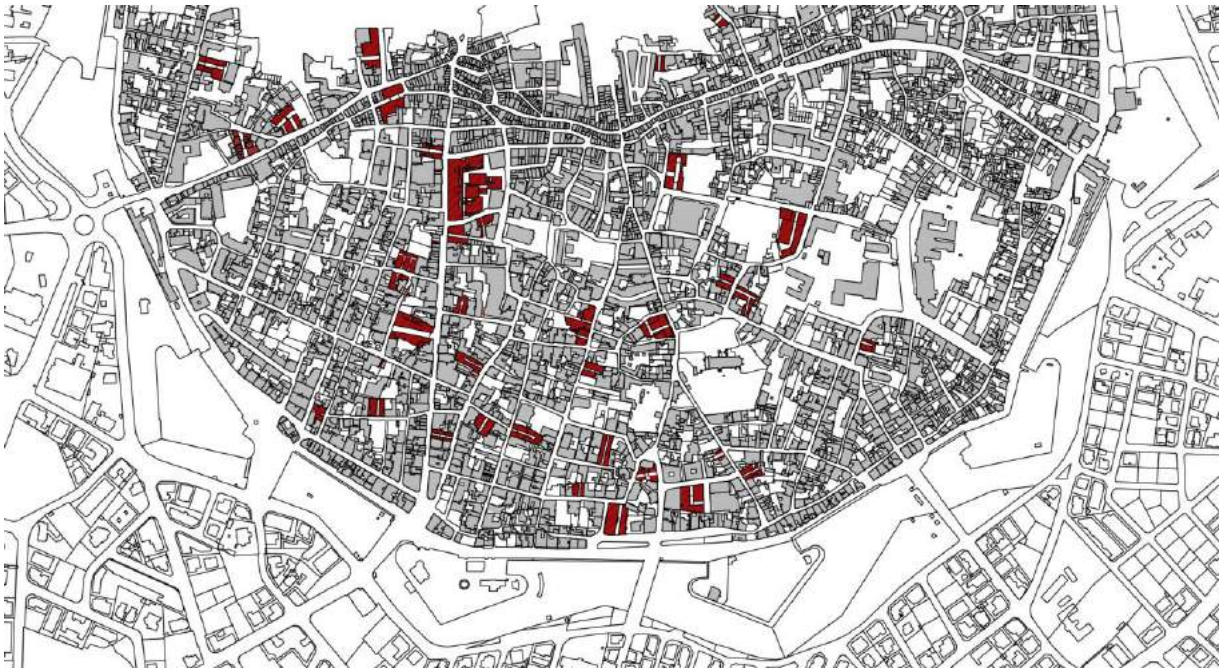


Fig. 1: Map of Nicosia featuring the shopping arcades under examination

the relevant environmental data which were then tabulated. This investigation was followed up by an evaluation of arcades, in terms of their potential in moderating the local microclimate by creating intermediate conditions throughout the year. Out of the 36 arcades under study, 13 arcades (36□) are still in operation today, while the rest remain underutilized or abandoned. With a few exceptions, the arcades under study are associated with poor maintenance, absence of sitting facilities, inefficient lighting at night and unclean conditions.

3. A throwback to Nicosia's arcades

Throughout antiquity, and especially during the 16th–19th centuries, shopping activities in Nicosia were carried out in the many and varied medieval bazaars along irregular streets. These structures, *devoid of an□ attempt at monumental embellishment*, were commonly covered with mats and linen rugs that offer protection from hot sun and admit daylight [6]. According to the descriptions of the traveller Archduke Louis Salvator, who visited the island in 1873, the bazaars of Nicosia constituted the centres of social life of the city [7]. In early 20th century, the concept of the shopping arcade was introduced in the island and gradually replaced the medieval bazaars, long after the arcade type of shopping had fallen out of fashion in Europe. The shopping arcade constituted a more sophisticated building type offering luxury shopping destinations. Its development expresses the modernization, westernization and urbanization processes that took place in the island during the British rule (1878–1960) and implies that the European modes of life influenced the lifestyle of the locals. Nicosia arcades are located at the main commercial district of the walled city centre, namely, along, and to, the proximity of Ledras, Onasagorou, Ermou and Aishylou Street. These "openings" into the densely built city centre played the social role of a square that was almost an unknown design element in Cypriot historical urban centres. The arcade buildings were of smaller size compared to the European examples. One reason is that they were used together with the markets, which developed in the same period as the arcade type. The erection of Women's Friday Market in 1924 [8] and the Nicosia Municipal Market in 1932, for instance, coincide with the emergence of the arcade type in the walled city centre (Fig. 2).
The Cypriot architect Theodoros Fotiades (1878–1952) was probably the first architect who introduced this "new building type" in the walled city of Nicosia in the 1920s. Two of the oldest and most significant arcades —*Stoa Tarsi* (built in the 1920s) and *Stoa □lo□□ari* (built in 1932)— located at the main commercial thoroughfare of the walled city of Nicosia, i.e. Ledras street, are his own works (Fig. 2) [9]. In his designs, direct references to neo-classicism can be identified. Fotiades was influenced by neo-classicism in Athens and popularised it not only in arcade buildings, but also in town villas, schools, municipal markets and libraries [9, 10, 11]. In this context, arcades of the 1920s–1930s exhibit influences from this particular architectural style. The arcades of this period were characterized by symmetry, monumentality of architectural expression (e.g. high ceilinged spaces) and ornamented façades. In parallel though, British colonial features, as well as local design elements, and materiality which expressed the character and spirit of the local people, were often implemented on arcade façades. For instance, a systematic introduction of the bay window on the street façade and the use of the local yellowish stone known as *pouropetra*, which was ingeniously combined with concrete, can be observed. The *pouropetra* and bay window created continuity with the surrounding traditional urban fabric. The arcades of this period are characterized by a linear configuration, i.e. they followed the simple corridor plan, and had a limited length.
The period between 1930s and 1950s, reflects a number of experimentations of Cypriot architects and the transition from neo-classicism to modernism (Fig. 3). This transition generated "hybrid" forms and thus classical symmetry, balance, rhythm and a monumental effect are evident in some cases. The entrance shops exhibit quadrant curved or flat arched shop window façades emphasizing the entrance to the arcade. This distinctive feature which creates a sense of welcoming and attracts the attention of

A. B. C. D.

Fig. 2: A. Women Friday Market, now demolished (PIO Archives), B. Nicosia Municipal Market, C. *Stoa Tarsi*, D. *Stoa □lo□□ari*

the passer-by is quite common worldwide. In very few cases, the standard linear plan development of the arcade transformed into L-shaped and T-shaped forms. It is interesting to note that, in certain examples, an effort to create a transparency effect at ground level is evident, achieved by the extensive use of glazing. The void-dominant ground floor emphasizes the load bearing structure and comes in contrast with the solid-dominant upper levels. The local yellowish stone, in combination with the concrete, continues to be the main building material used. Further, the cast mosaic was introduced in a number of arcades for the bearing structure, a new technique that prevailed in Cyprus in the period 1940–1960 [12].

During the 1960s, the arcade type clearly reflected the modern culture which had abandoned vernacular design elements and materials (Fig. 3). The plans were simple and the façades were plain in most cases. Concrete remained the prevailing material for the construction of arcades, while the use of the local stone was seldom applied. Of particular interest are the (unrealized) planning proposals of the Cypriot eminent architect Odysseas Tsaggarides (1904–1974) for the regeneration of the walled Nicosia city centre during the late 1960s. As the architect of the arcade *Stoa Papadopoulou*, in 1967, he proposed a revitalisation scheme for the central area of Nicosia. His proposal included the creation of entirely new arcades and streets to resolve the traffic congestion which conflicted with pedestrian circulation. Tsaggarides wrote in 1972: "*The arcades will provide safet□ to pedestrians* (from vehicular circulation) *and will protect from the summer heat and winter rain...The construction of new arcades will greatl□ contribute to cross-ventilation, will allow better visibilit□ to Ledras Street, Onasagorou Street* (main commercial thoroughfares in the walled Nicosia city centre) *and to other parallel streets and will provide better accessibilit□ through the large continuous urban bloc□s, which are unsightl□ and constitute significant ph□sical barriers to pedestrian circulation along the above mentioned streets. B□ a fortunate coincidence, all the above mentioned streets, which are oriented along the south-north a□is, will allow the opening of arcades from east to west. This will contribute to the penetration of the* (prevailing) *cool western winds during summer. □ ind penetration will reduce the unbearable heat of this central old Nicosia commercial area, which needs to "breathe" and fully revive*" [13]. Considering that before the 1960s and 1970s discussions on climate-responsive and bioclimatic architecture attracted little attention in national and international debates, it can be argued that Tsaggarides' planning proposals for Nicosia were a breakthrough and still reflect the timely concern for the introduction of environmental factors into the planning process. Apart from the bioclimatic advantages of arcades, Tsaggarides identifies other benefits that these spaces have to offer: (a) they facilitate open visibility and perspectives to major streets, (b) they enable a pedestrian-only route that provides a pleasant walking environment, it offers an incentive for people to walk rather than drive and provides safety from vehicular circulation and (c) they form a convenient passageway and short-cut to the densely built historical city centres. These design principles of arcades embody the complex concept of sustainability that aims to improve the quality of human life and well-being.

After the 1970s, most of the newly built arcades were of no particular significance, architecturally

Fig. 3 Images representing the development of arcades from the 1930s to 2000s (from left to right)

speaking. Ultimately, by 1980, the arcade type fell into decline due to the removal of the contemporary trading centre out of the walled city and the change of the busy pedestrian flows. These conditions diminished the viability of arcades in financial terms and led to their abandonment.

During the 2000s, a new arcade, namely the *Ledra Arcade*, was built on the site of the demolished arcade *Stoa Stavrinidi* (Fig. 3). *Ledra Arcade* re-introduced the retail arcade concept after a couple of decades of absence. Its form, that is, a corridor which widens in the middle into a larger space covered by a hipped and glazed roof, constitutes direct references to the European models. Nowadays, the efforts of local planning authorities for an integrated revitalization of the walled city centre stimulated interest on a few privately owned arcades (e.g. *Stoa □lo□□ari*, *Stoa Papadopoulou*, *Stoa Lef□osias*). These arcades, with their restaurants, cafes and retail shops, provide day and night entertainment. Further, in the framework of the Nicosia Master Plan, the Phaneromeni Rehabilitation Project included the restoration of the façade of one arcade (*Stoa Tarsi*) which accommodates shops and artisan workshops.

Despite the recent interest on arcades, some questions remain: What measures can be taken for the numerous arcades which still remain neglected□ Could these examples be revived in order to improve the microclimatic conditions in public spaces, especially during the hot, summer period□ Which are the bioclimatic elements which are worth preserving□ What particular design guidelines should be implemented in their rehabilitation to maximize their environmental potential□

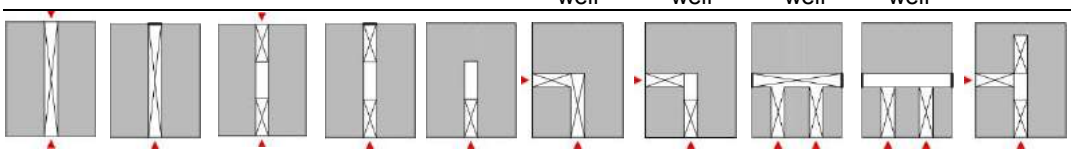
4. Environmental concerns

4.1 Typology

Based on the typological classification of Geist (1989) [1], the simplest type of arcade is formed by a linear straight passage which links two streets. Other more complex types are more spread in the urban block, forming parallel arcades, intersecting or developing in diagonal axes (and thus L-shaped, T-shaped, H-shaped, □-shaped plans are formed.). In the historic centre of Nicosia, the linear straight arcades prevail at a percentage of 82□ whereas the L-shaped, T-shaped and the U-shaped plan configurations are limited to 9□, 3□ and 6□ respectively (Table 1). The predominant linear arcades, due to their uninterrupted and relatively limited length, favour effective cross-ventilation (breezeways) during the hot, summer period, while their narrow entrance opening produces a cooling effect by wind acceleration. Due to the compact planning of the historic centre of Nicosia many arcades are built on land-locked sites. As a result, the option of entrances at both ends of arcades (44□ of the sample) is restricted and the possibility of cross-ventilation is rather limited. Nevertheless, the rear boundary of such arcades is often configured by low walls or vertical glazing systems in order to allow adequate air flow and better daylight penetration and distribution.

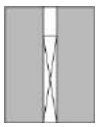
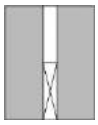
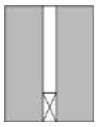
According to MacKeith (1986) [4], there is another type of arcade, the light-well arcade which is formed by a rectangular or square space surrounded by shops. In Cyprus, the light-well arcade plan is found on a relatively large percentage of the above mentioned types of arcades (straight, L-shape, T-shape, U-shape) (33□) and always in a linear arrangement (Table 2). Generally, light-wells are incorporated in the form of central or rear voids allowing daylight penetration from above and solar passive heating during winter. In a more detailed analysis, light-well arcades were classified with

Table 1: Bioclimatic aspects related to arcade typology

	I-shape □**82**□ □					**L-shape** □**9**□ □		**U-shape** □**6**□ □		**T-shape** □**3**□ □
	without a light-well (58□)		with a light-well (24□)			without a light-well	with a light-well	without a light-well	with a light-well	with a light-well
										
	25□	**33**□	**9**□	**6**□	**9**□	**6**□	**3**□	**3**□	**3**□	**3**□
Cross-ventilation	□	±	□	±	-	□	□	-	-	□
Natural daylight	±	±	+	□	□	±	□	±	□	□
Protection against rain	□	□	±	±	±	□	±	□	±	±
Shading	□	□	±	±	±	□	±	□	±	□
Solar passive heating	-	-	±	±	±	-	±	-	±	±

□, applied; □, partly applied; -, not applied

Table 2: Bioclimatic aspects related to the light-well arcade type

	Opening to Roofing area ratio		
	□30□	30%≤Opening to roofing ratio≤60%	□60□
			
	27□	**64□**	**9□**
Shading	±	±	-
Protection against rain	±	±	-
Solar passive heating	-	±	□
Natural daylight	±	□	□

□, applied; □, partly applied; -, not applied

respect to their opening-to-roofing area ratio, i.e. the ratio of the area of the light-well to the whole area of the roofing (solid and void). This analysis indicates that the opening-to-roofing area ratio is estimated between 30–60□ for the large majority of arcades under study (64□). It is probable that light-wells will have a significant impact on the environmental performance of arcades due to their large surface area.

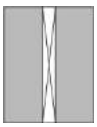
During the on-site observation, it was established that the central voids in three of the examined arcades (e.g. *Stoa Dra□ou, Stoa □lo□□ari*) had been covered by fixed lightweight roofs, most probably to address problems caused by rainwater and intense solar radiation. This shows the desire to adapt the arcades to the different climatic conditions. In order to achieve this, in some cases, more flexible solutions were applied by the use of movable features. In this way, the arcades acquire the ability for adaptation to different seasonal and daily climatic variations. In the case of the arcade *Stoa □lo□□ari* for example, a retractable roof, installed in its central void, can be closed during a rainy or hot summer day while it can be open to the outdoors in a sunny winter or mid-season day. Furthermore, the installation of movable transparent panels at the opposite open ends in the two arcades under study (*Stoa Papadopoulou, Stoa □lo□□ari*) can control the local microclimate, through protection against low temperatures and draughts during winter, whilst they maintain visibility to the street. Other design solutions, i.e. glazed doors, —applied in the recently refurbished arcade, *Stoa Lef□osias*— could possibly create a psychological barrier to entry [5].

4.2 Enclosure

Due to their varied typologies and proportions, arcades can be divided into different categories with respect to their exposed surface to the outdoor environment. Steemers et al (2004) [14], introduced the Degree of Enclosure (DoE) which represents the ratio of the sum of all surface areas (solid and void) of a semi-open space to the sum of its opening areas. The same authors proved that higher DoE is associated with smaller temperature fluctuations and lower maximum temperatures. Potvin (1997) [3] proposed the O/E ratio, i.e. the Opening-to-Envelope ratio, expressed in □ which is defined as the ratio of the opening areas, including clerestory and louvers, to the sum of all surface areas (solid and void). DoE and O/E ratio can be used as tools to correlate semi-open form with thermal performance.

To provide a better understanding on the thermal conditions of the Nicosia arcades, the O/E ratio was calculated. 8□ of arcades exhibit an O/E ratio below 5□, 28□ of arcades between 5 and 10□ and 63□ of arcades present an O/E ratio greater than 10□ (Table 3). It was observed that lengthy arcades or arcades with complex plans, e.g. T-shaped and L-shaped, exhibit a small O/E ratio, whereas

Table 3: Bioclimatic aspects related to arcade O/E ratio

	Opening to Envelope to ratio		
	□5□	5%≤O/E ratio≤10%	10□
			
	8□	**28□**	**63□**
Moderation of temperature extremes	□	±	±
Thermal stability	□	±	±
Natural ventilation	±	+	+

□, applied; □, partly applied; -, not applied

straight arcades of limited length or light-well arcades present higher O/E ratios. From the analysis above, it can be argued that arcades with complex plans and without light-wells, are the least exposed to outdoor conditions (small O/E ratio) and thus, exhibit a greater potential for thermal stability, i.e. small temperature fluctuations, and moderation of temperature extremes. In fact, arcades with small O/E ratio exhibit a thermal performance which shares similarities to the performance of an indoor space. Nevertheless, it is demonstrated that the cooling effect of air movement has a greater influence in arcades with a larger O/E ratio since they are more exposed to ambient conditions [15].

4.3 Orientation

Depending on the orientation of their open ends, arcades, especially the linear ones, can be divided into two categories: the north-south and east-west oriented arcades. Due to the high sun angle, a north-south oriented arcade prevents undesirable direct solar heat gains during hot summer, except at midday hours for a limited time [3]. On the contrary, an east-west arcade, due to the low sun angle, allows a large amount of sun penetration, increasing the risk of overheating. Steemers et al (2004) [14] found that a change in the orientation of a semi-open space, with the same opening area, has a significant impact on temperature fluctuations. More specifically, it has been established that an east-west oriented semi-open space results to the highest diurnal temperature fluctuations while a north-south to the lowest. Considering the harsh summer climatic conditions of the island, north-south oriented arcades could provide better environmental potential, in terms of solar protection. As far as arcades in Nicosia are concerned, it is noted that the criterion for their orientation was not dictated by environmental parameters. Other factors, such as the urban block size, shape and orientation, and more importantly, the orientation of major commercial thoroughfares, seem to have contributed to the positioning of the arcades. While the major commercial thoroughfares are most commonly developed from south to north, arcades —as was expected— exhibit a trend of 44□ towards an east-west orientation, followed by a north-south orientation (36□) (Table 4). It is noted that the prevalence of the east-west orientation does not form an obstacle for the environmental perspective because: (a) the surrounding dense urban tissue contributes to significant solar blockage which protects east-west arcades from undesirable low summer sun and (b) the east-west oriented arcades benefit from the prevailing western winds of Nicosia during summer afternoon and night-time hours.

Table 4: Bioclimatic aspects related to arcade orientation

	North-south	East-west
	36□	**44□**
Shading	+	±
Summer breezeways	-	□
Thermal stability	□	±

□, applied; ±, partly applied; -, not applied

4.4 Number of storeys

Based on the taxonomy of Geist (1989) [1] arcades can be of one, two, three or four storeys. These structures may be simply perpendicular or setback in one or two levels forming balconies (Table 5). The large majority of the examined Nicosia arcades are single-storeyed (94□). In very few cases however, i.e. *Stoa Lef□osias* and *Stoa Papadopoulou*, arcades were developed in two and three storeys respectively. In these examples, the higher floor levels were setback a few meters in one level enabling corridors around a central vertical void. This configuration creates a multiple-height effect within the arcade. Apart from allowing view upwards, and creating a spacious ambience on the lower levels, the multiple-height configuration has the ability to decrease the negative thermal effect of the roof on the spaces below during the hot, summer period. It further allows enhanced passive ventilation through the stack effect, causing a reduction of daytime heat gain. Due to the large difference in height between air inlets and outlets, the warm air can be extracted through the skylights or clerestories of the roof (outlets), and thus the cooler air is forced to enter the building from the outside through the low openings (inlets). In this design scenario, stack ventilation (vertical air pathway) is combined with cross-ventilation (horizontal air pathway). It is noted however, that the success of the entire concept is highly dependent upon user behaviour. For example, it was observed that skylights are commonly left closed by their users, cancelling the passive natural ventilation potential through the roof.

Table 5: Bioclimatic aspects related to the number of storeys of the arcades

	1 storey	2 storeys 1 setback balcony	3 storeys 1 setback balcony
	94□	**3□**	**3□**
Protection against solar heat	±	□	□
Stack ventilation	-	□	□

□, applied; ±, partly applied; -, not applied

4.5 Roof construction

A number of bioclimatic concepts —such as protection against rain, shade from high summer sun, mitigation of extreme heat or cold waves— are encountered in the design of arcade roofs. However, the level of climatic response is highly dependent upon the roofing material and its transparency as well as on the roof type, i.e. flat, vaulted etc.

4.5.1 Materiality

The arcade roofs can be divided into two main categories based on their materiality — the glazed roofs and the fully or partially opaque roofs. Glazed roofs, which allow solar passive heating, are very common in high latitude countries [1] whereas heavyweight and fully or partially opaque roofs, i.e. roofs with limited glazed area, are more common in the low latitude arcades where protection against summer heat is a design priority. The environmental benefits of fully or partially opaque roofs in hot and sunny climates concern the minimization of solar heat gains and the possibility for insulating the roof to assure maximum protection from outdoor weather extremes. In terms of natural lighting, the opaque roof can contribute to the indirect, reflected light of the space. A roof with 20–30□ of glazed area would provide sufficient levels of natural daylight [16]. As expected, the analysis of Nicosia arcades has shown that the heavyweight and fully opaque roofs dominate, at a percentage of 81□, the partially opaque roofs are limited to 14□ and the glazed-dominant roofs are restricted to 6□ (*Ledra Arcade, Stoa Papadopoulou*). The prevalence of solid-dominant roofs highlight that local architects addressed issues of climate adaptation in their arcade buildings successfully by avoiding large glazed surfaces which would probably cause overheating.

4.5.2 Type

According to the arcade roof classification, four general types can be identified in such structures — the saddle, barrel and arched roof construction commonly applied in many European examples, and the flat roof. The general absence of glazing, as a roofing material, in the examined Nicosia arcades led to the preference of flat roofs, a less sophisticated, design solution. The Nicosia arcades under study comprise mainly of flat roofs (92□), while vaulted opaque and saddle roofs with rectangular skylights are rather limited (3□ and 5□ respectively) (Table 6). The vaulted roofs, as they are partly shaded during sunlight hours, receive less solar heat. Furthermore, their increased floor-to-ceiling

Table 6: Bioclimatic aspects related to arcade roof construction

	Flat □92□ □			**Vaulted □3□ □**	**Saddle □5□ □**
	under an upper storey	no skylights	incorporated small rectangular skylights	under an upper storey	incorporated large rectangular skylights
	72□	**6□**	**14□**	**3□**	**5□**
Protection against solar heat	□	±	±	□	-
Shading	□	+	+	□	-
Solar passive heating	-	-	-	-	□
Thermal insulation	□	±	±	□	±
Natural ventilation	-	-	±	-	+
Natural daylight	-	-	±	-	+
Thermal stability	□	±	±	□	-

□, applied; ±, partly applied; -, not applied

height allows thermal stratification and decreases the transfer of heat gains through the ceiling. Although this roof type is rather sparse in Nicosia, it can be appropriate for hot and sunny climates, as demonstrated by its extensive application in the Middle Eastern *souqs*. The results of the on-site observation indicate that protection against cold or heat waves was mainly achieved through the upper floor spaces; the examined arcades, extending beneath an upper storey, account for a 75%, and thus are thermally insulated by the building itself. To allow better illumination of the arcade interiors, a percentage of 14% of flat roofs is configured by small rectangular skylights.

5. Discussion and conclusions

This study has revealed that Nicosia shopping arcades do not simply offer a new means for marketing luxury goods but also constitute fine examples of sustainable architecture. The high latitude arcade prototype developed in such a way to offer adaptation to the hot and sunny climate of Cyprus. Hence, opaque and heavyweight roofs instead of glazed roofs prevail, to offer better protection against solar radiation and minimize the risk of overheating. Additionally, arcades are usually thermally insulated by the upper storeys of the building which contribute to the cooling of the space. In terms of typology, the large majority of Nicosia arcades follow a linear corridor plan layout of limited length, allowing efficient cross-ventilation during the summer period. Of special interest is the light-well arcade often applied in the context of the Nicosia walled city centre. This type allows daylight to penetrate and distribute deeper into the space. Nevertheless, it may not provide sufficient protection against solar radiation and rain. The multiple-height arcades which take advantage of cross-ventilation and stack ventilation and thus enhance the cooling effect of the semi-open space, are limited in the cases under study.

Another key design feature in the environmental performance of arcades is the Degree of Enclosure or Opening to Envelope ratio. Lengthy arcades, arcades with complex plan layouts and without light-wells, generally exhibit smaller O/E ratio, increasing the potential for providing thermal stability and moderation of temperature extremes. The results obtained with regards to orientation indicate a trend towards the east-west facing arcades which allows the penetration of the west prevailing winds. Considering that the Nicosia walled city centre is densely built, shading from the surrounding urban fabric can offer the east-west facing arcades adequate protection from the morning and afternoon sun.

It is interesting to note that arcades —as intermediate places— are not static structures. Being in the transition between indoor and outdoor space, they allow a more dynamic approach which can respond to the seasonal and daily environmental variations. Specifically, the response of these urban transitional environments to the different climatic conditions can be supplemented by semi-fixed and movable elements on arcade light-wells and/or side openings.

Overall, the design of arcades reveals a bias for addressing summer conditions more than winter ones, due to the extended periods of high temperatures and insolation in the climatic cycle of the island. Because of their bioclimatic concept, arcade environments have the potential of achieving well performing urban passive semi-open spaces, enriching the overall experience of the city dweller. They create a design possibility of cooler spaces for pedestrians who can come across places for comfort amelioration. It is thus highlighted that the preservation and re-use of these environments is imperative not only for their possible architectural and historic value, but also for the environmental qualities associated with them. A re-evaluation by the local planning authorities of these structures and their role in the future is needed. Issues of repair and maintenance, accessibility, security and adaptive re-use need to be carefully addressed. In this way, local planning authorities could implement an effective policy in order to enable arcades to become significant elements of new social activities.

The environmental assessment of arcades could be enriched by a quantitative analysis of their environmental performance including on-site air and globe temperature, relative humidity, wind speed and solar radiation measurements. A quantitative study, in combination with the results of this research, can form a valid basis for the formulation of environmental refurbishment design guidelines for arcades. Further, future studies concerning the arcades' social value could be implemented using the method of behavioural mappings in order to identify human behaviour, track participant movement etc. The correlation of the environmental parameters to the data gathered on the basis of behavioural surveys would enable a more holistic approach on the socio-environmental aspects of these urban transitional environments.

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Le Vie dei Mercanti XIV International Forum
WORLD HERITAGE AND DEGRADATION
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Social Design Collection: International Competition LANDesign on *care for our common home*[1]

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Abstract
The Applied Research Project [Diaeta Mediterranea: LANDesign/ali-ment-azione], scientific directors Sabina Martusciello/ Maria Dolores Morelli, Department of Architecture and Industrial Design Second University of Naples with BENECON Scarl Regional Competence Centre for Cultural Ecology Economy SUN, Department of Pharmacy and Department of Social Polictics and Communication UNISA, Europe and Foreign Department National Council of Architects, Landscape Planners and Conservationers, with the Campania Region and the General Directorate Ministry of Education Campania, welcomes the " joyful and dramatic reflection" of the Holy Father, Laudato Si, indicate "International Competition LANDesign per *la cura della casa comune*" aimed at schools of all levels and universities, for concrete actions "in the search for sustainable and integral development" answers the call of Pope Francis: "I extend an urgent invitation to renew the dialogue on how we are building the future of the planet. We need a comparison that unite us all, because the environmental challenge that we live and its human roots, affect us and affect us all". The main objectives of the International Competition are: a "new human ecology" since "everything in the world is intimately connected"; "other ways of understanding the economy and progress"; "the culture of waste and the proposal of a new life style" with creative processes orientated towards the welfare of people and conservation of the territory.
Keywords: Landesign, Laudato si, care, common home, territorial surveying, sustainable development

1. International Competition LANDesign on *care for our common home*[1]

International Competition LANDesign on *care for our common home* is in according on the theme of the XIV Forum Le Vie dei Mercanti, "an international discussion on the disciplines of architecture, design and landscape through the presentation of research and operational projects on the conservation and valorisation of World Heritage and "smart" regeneration of degradation, with analyses and proposals ranging from the design at all scales, to architectural assets, the territory, infrastructures and the landscape"[2].

"International Competition LANDesign on *care for our common home*" is a part of the Applied Research Project LANDesign, indicate aimed at schools of all levels and universities, for concrete actions "in the search for sustainable and integral development"[3] answers the call of Pope Francis: "I extend an urgent invitation to renew the dialogue on how we are building the future of the planet. We need a comparison that unite us all, because the environmental challenge that we live and its human roots, affect us and affect us all"[4].

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[1] Cfr. Holy Father Francis, *Laudato si Encyclical. Letter on care for our common home*, may 24, 2015.
[2] XIV Forum Le Vie dei Mercanti.
[3] Laudato si, n. 14
[4] idem

The Applied Research Project LANDesign, scientific directors Sabina Martusciello/Maria Dolores Morelli, Department of Architecture and Industrial Design Second University of Naples with BENECON Scarl Regional Competence Centre for Cultural Ecology Economy SUN, Department of Pharmacy and Department of Social Polictics and Communication UNISA, Europe and Foreign Department National Council of Architecs, Landscape, Planners and Conservationers, with the Campania Region and the General Directorate Ministry of Education Campania, welcomes the "joyful and dramatic reflection"[5], of the Holy Father, LAUDATO SI' Enciclica on care for our common home.
The main objectives of the Internazional Competition are: a "new human ecology"[6] since "everything in the world is intimately connected"[7]; "other ways of understanding the economy and progress"[8]; "the culture of waste and the proposal of a new life style"[9] with creative processes orientated towards the welfare of people and conservation of the territory.
The Applied Research Project LANDesign is selected for the ADI COMPASSO D'ORO INTERNATIONAL AWARDS 2015, a testimonial of "The University for EXPO 2015" and "School Project EXPO 2015", winner of the "Special Participatory Planning Award" and the "On-line Award - Section realised works" of the X Contest IQU 2015 (Innovation and Urban Quality) promoted by the Gruppo Maggioli; second place at the International Design Contest promoted by POLI.Design the Politecnico di Milano "The 5 seasons 2015" III Award at "Ars. Art that creates social employment" with special mention of the Accenture Foundation MIBACT Ministry of Cultural Heritage and Tourism in 2013; "OSCAR GREEN" Award Coldiretti in 2011.
"We can all work together as God's instruments for the care of creation, everyone with their own culture and experience, their own initiatives and ability"[10] says Pope Francis and says with conviction that "every change needs motivations as well as an educative path"[11].
The participants of the schools of all levels and universities in the Competition LANDesign on care for our common home, in order to "unite the whole human family [...] because we know that things can change"[12], must constitute heterogeneous project groups belonging to the virtuous chain [University School Family Institutions Companies].
The "Competition LANDesign on *care for our common home*" urges the participants of the schools of all levels and universities, in heterogeneous project groups, the "pursuit of sustainable and integral development"[13] with one or more of the CONCRETE ACTIONS described below:
−SHORT VEGETABLE GARDENS redevelopment of an abandoned space of the School or University, for example: a green area to be converted into a vegetable garden or orchard, an unused enclosed space prepared for new use, a road, a garden, a square close to the school or university;
− LONG VEGETABLE GARDENS monitoring and maintenance of an area that has already be redeveloped by the school or university; for example: the area converted into a vegetable garden or orchard, an enclosed space prepared for a new use, the street, the garden, the square near the school or university;
−SOCIAL DESIGN OBJECT the design, while respecting the environment and the welfare of the people, of a product and its logo: FOODesign, design of containers, tools, supports and furnishings on the theme of ali-ment-azione aimed at the presentation and storage of food, with particular attention to the tools and procedures of production, preparation, distribution, of the origins of the food, the traditions and the market; ACTIVEMODesign, the design of accessories, clothes, containers, supports and furnishings for fashion aimed at the cosmo-ethical, or to the beneficial actions and processes related to people and the environment; GIOCODesign, the design of toys/games, even large for about 40 participants on the theme of ali-ment-azione, for use in areas of the schools or public green spaces as temporary street furniture; PHARMAFOODesign, the design of containers, supports or furnishings and logos for the nutraceutical: foods, cosmetics, medicine and supplements, marketing strategies and languages of pharmacologically, sanitary spaces which have an important therapeutic action on human health and on the growth or directed at disabled people; INFODesign, the design of Communication Plans, Visual identity, merchandising, signs inside/outside of the casa comune;
−SOCIAL DESIGN COLLECTION the design, while respecting the environment and the welfare of the people, of a product and its logo: FOODesign, design of containers, tools, supports and furnishings on the theme of ali-ment-azione aimed at the presentation and storage of food, with particular attention to the tools and procedures of production, preparation, distribution, of the origins of the food, the traditions and the market; ACTIVEMODesign, the design of accessories, clothes, containers, supports

[5] Holy Father Francis, Premise, Laudato s Encyclical. Letter on care for our common home, may 24, 2015.
[6] Laudato s, n. 15
[7] idem
[8] idem
[9] idem
[10] Laudato s, n. 14
[11] Laudato s, n. 15
[12] Laudato s, n. 13
[13] idem

and furnishings for fashion aimed at the cosmo-ethical, or to the beneficial actions and processes related to people and the environment; GIOCODesign, the design of toys/games, even large for about 40 participants on the theme of ali-ment-azione, for use in areas of the schools or public green spaces as temporary street furniture; PHARMAFOODesign, the design of containers, supports or furnishings and logos for the nutraceutical: foods, cosmetics, medicine and supplements, marketing strategies and languages of pharmacologically, sanitary spaces which have an important therapeutic action on human health and on the growth or directed at disabled people; INFODesign, the design of Communication Plans, Visual identity, merchandising, signs inside/outside of the casa comune.
Participation in the "Competition LANDesign on care for our common home" with one or more CONCRETE ACTIONS is open to pupils and students from schools of all levels and universities in heterogeneous project groups belonging to the virtuous chain [University School Family Institutions Companies], for example: - Kindergarten children and their teachers with the support and help of parents, grandparents, siblings, friends, experts, businesses and organizations that will have to give their support and contribution in the planning, execution and maintenance stages;
- Primary school children and their teachers with the support and help of parents, grandparents, siblings, friends, experts, businesses and organizations that will have to give their support and contribution in the planning, execution and maintenance stages; - Middle school students and their teachers with the support and help of parents, grandparents, siblings, friends, experts, businesses and organizations that will have to give their support and contribution in the planning, execution and maintenance stages;
- Secondary school students and their teachers with the support and help of parents, grandparents, siblings, friends, experts, businesses and organizations that will have to give their support and contribution in the planning, execution and maintenance stages; - University students and their teachers with the support and help of parents, grandparents, siblings, friends, experts, businesses and organizations that will have to give their support and contribution in the planning, execution and maintenance stages.
For "short vegetable gardens" and "long vegetable gardens" the main evaluation criteria, in accordance to the themes-objectives are: creativity, sensitive and coherent approach to the issues, level of detail, experimentation, originality.
For "social design object" and "social design collection" the main criteria of evaluation, in accordance to the themes-objectives, are 3F 3E: - Form, outward connotation, result of a clear and conscious design development; Function, proper use of the product in the man/environment relationship; - Feasibility analysis of the structure necessary and sufficient for the conformation of the product; - Economics, from "oixonomia" or appropriate distribution of the parts, with respect to a cost-benefit analysis of the product; - Ecology, benevolent relationship between man and the environment arising from the use of the product; - Emotion, intense emotional reaction intended to induce healthy eating habits.
The Applied Research Project LANDesign from June 2010 to March 2016 has promoted 11 editions of the competition LANDesign with the following results: 400 schools of Campania of all levels involved in the Project; 1,380 university students of the Department of Architecture and Industrial Design SUN Project tutors in schools; 47,500 schools; 45,000 families; 307 vegetable gardens set up in schools; 550 design prototypes on the theme of LANDesign by students of Design, SUN and school pupils as co-designers.
The XIV Forum has got "the aim of conserving and recovering, valorizing and regenerating, managing and designing (or re-designing), for the more general improvement of the quality of life, in an innovative and contemporary relationship between man and the environment, through "beauty", while respecting the history, traditions, identity and principles of sustainable development, as well as being attentive to the needs of our and future generations"[14], "International Competition LANDesign per la cura della casa comune" shows the goals in order on this meaning of beauty: beauty as an integration of creativity and order, skill based on volue of necessity (Zecchi, 2016).

[14] XIV Forum Le Vie dei Mercanti.

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Specialisti esterni: Massimo Ammendola (laureato in lettere), Piero Pastore (padre di un amico), Alessandra D'Atri (maesta), Maria Gabriella Gallo (maestra), Carla Longobardi (maestra), Rosaria De Rinaldis (maestra), Carmela Mauriello (maestra) Miriana Esposito (amica), Gianfredo (padre di Lucrezia).

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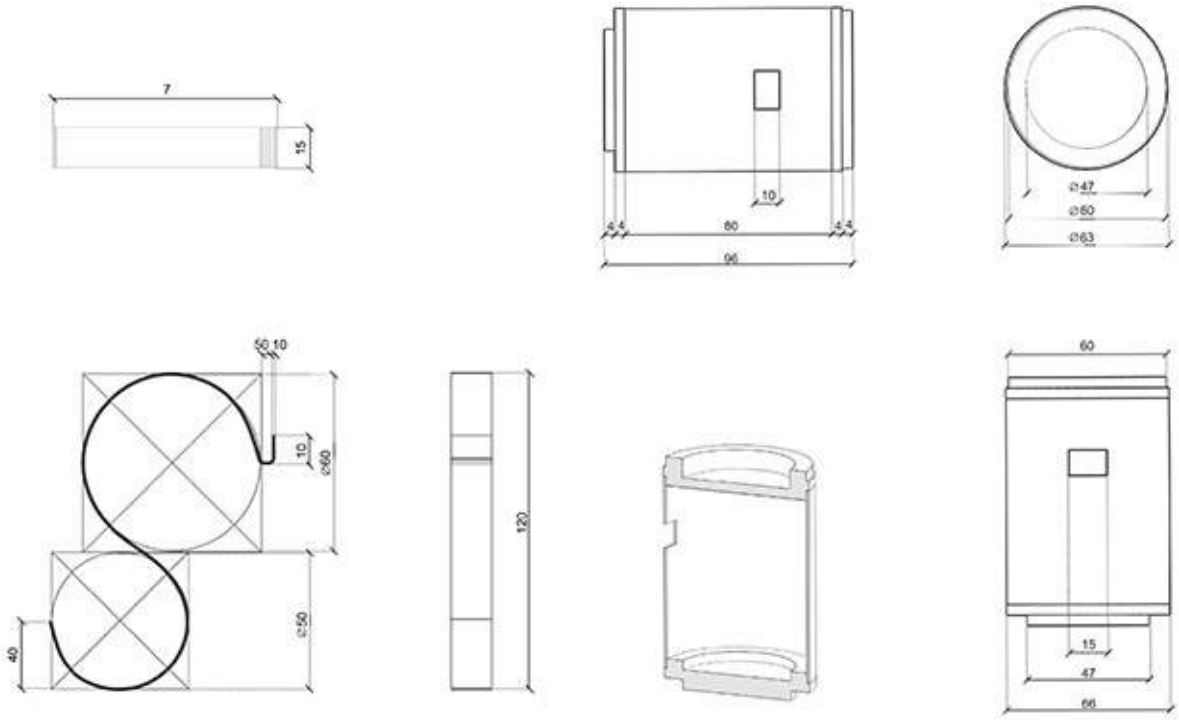

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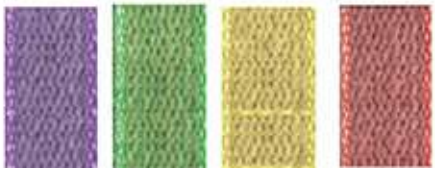

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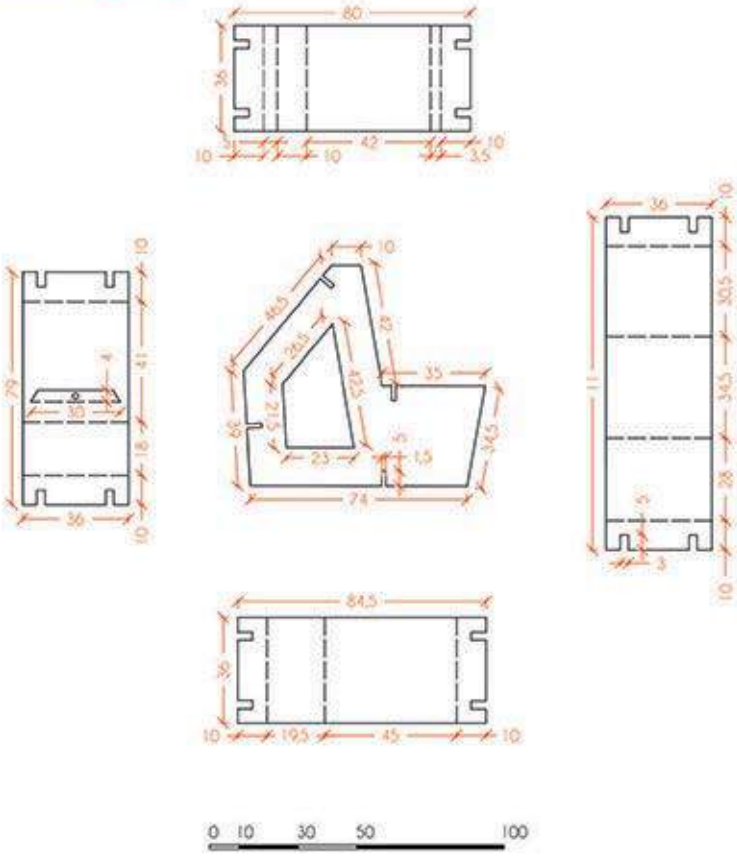

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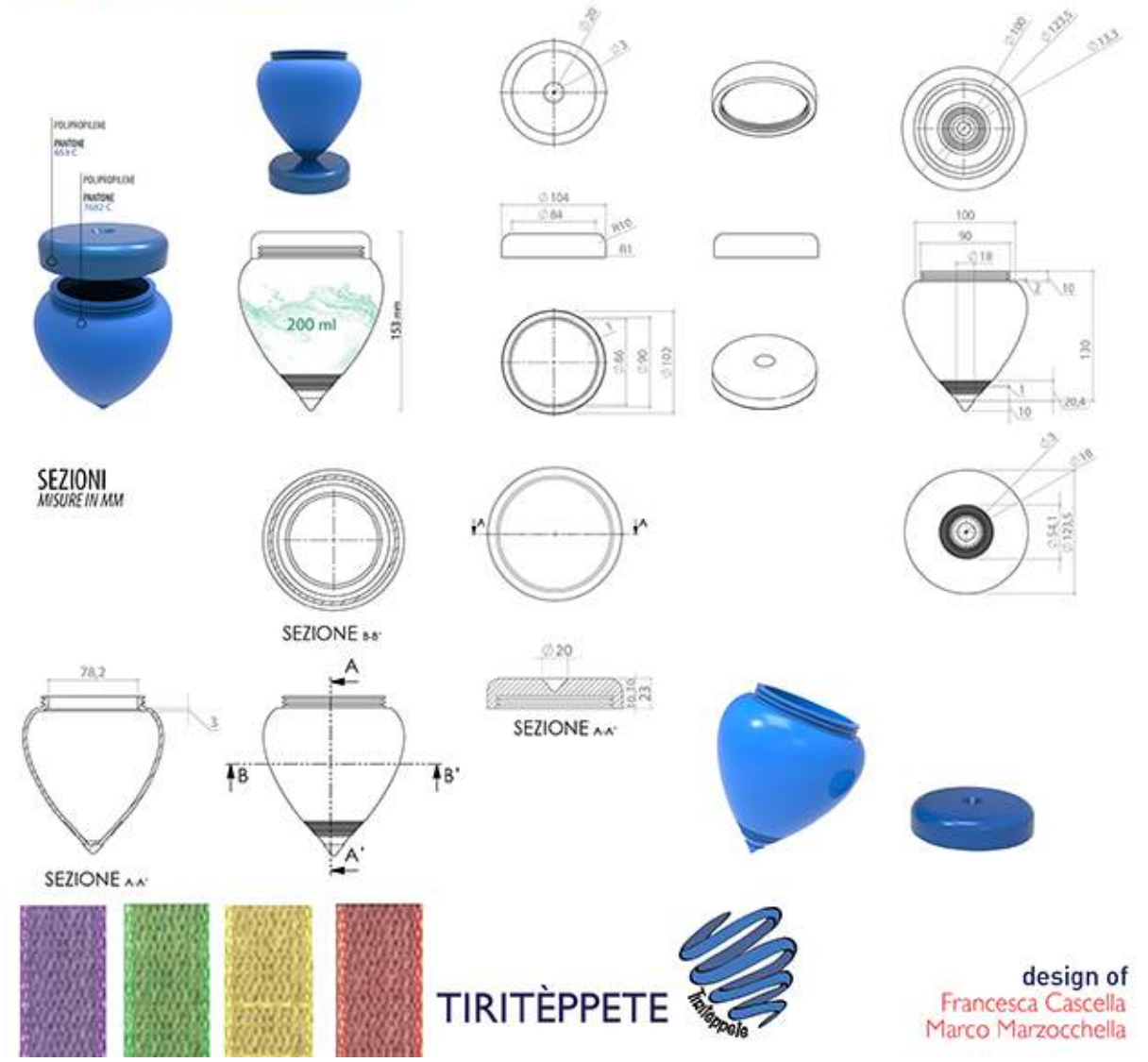

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ORTO INAUGURATO IL 24/11/2015

PROTOTIPO DI SOCIAL DESIGN

"MiColtivo" consta di una superficie quadrangolare con lato 1600 mm, suddivisa a sua volta in 16 quadrati 400x400. Tale superficie può essere utilizzata, oltre che per la sua funzione predominante, ovvero come gioco di gruppo, anche come una sorta di tappeto per attività libere a contatto con il verde, quando aperta, e come contenitore a forma di cubo quando richiusa. Sulla faccia superiore sono dipinte 180 mani (60 blu, 60 gialle, 60 verdi) e al centro due mani più grandi da poter utilizzare come jolly nel corso del gioco. Sul retro, leggibile alla chiusura, sono invece segnati i tre regolamenti delle varie modalità di gioco, le istruzioni di chiusura, le informazioni relative al gioco da tavolo, che diviene anche "dado", e i 30 valori.

responsabili scientifici
Prof. Sabina Martusciello
Prof. Maria Dolores Morelli

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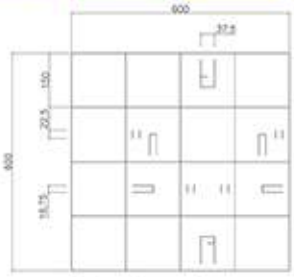
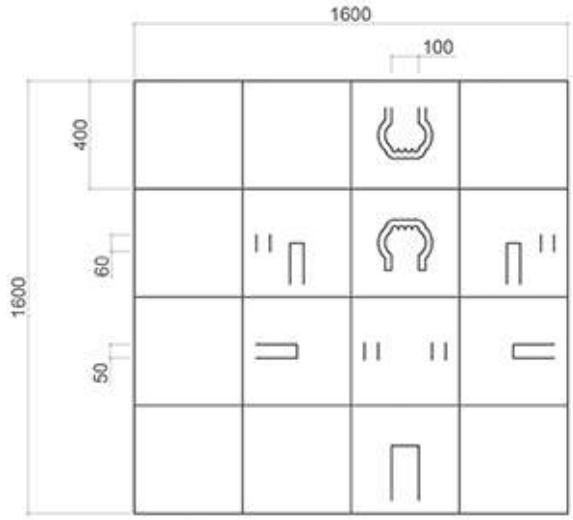
Dado+Gioco da tavolo



Vista Frontale

Grafica Fronte

Grafica Retro

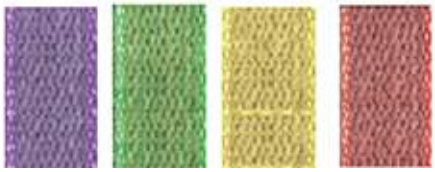


Vista Frontale

Grafica Fronte

Grafica Retro

Gioco MiColtivo



MiColtivo

design of
Salvatore Cordato
Francesca Panzariello

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DIPARTIMENTO DI ARCHITETTURA E DISEGNO INDUSTRIALE SUN
CORSO DI LAUREA IN DESIGN & COMUNICAZIONE
CORSO DI LAUREA IN DESIGN PER LA MODA

LABORATORIO DI INDUSTRIAL DESIGN II
LABORATORIO DI DESIGN PER LA MODA
LABORATORIO DI DESIGN PER IL GIOIELLO
Prof. Sabina Martusciello | Prof. M.Dolores Morelli

GRUPPO DI PROGETTO
Studenti: Angelo Barone, Claudia Culotta
Giulio Giordano, Antonio Illiano
Specialisti esterni: Nicola Lanzolise (Perito botanico),
Monica Esposito (Coldiretti)

CON LA SCUOLA
38° Circolo didattico "Quarati", Napoli

ORTO INAUGURATO IL 07 gennaio 2016

PROTOTIPO DI SOCIAL DESIGN

Gira e guardo il cielo. I bambini hanno la possibilità di interagire con l'oggetto come se fosse un vero e proprio punto di riferimento col quale relazionarsi in diverse modalità. Stendersi, rilassarsi, sedersi, scrivere, giocare, raccogliere emozioni e ricordi. Il tutto parte dalla forma circolare per accentuarancora di più il concetto di condivisione.

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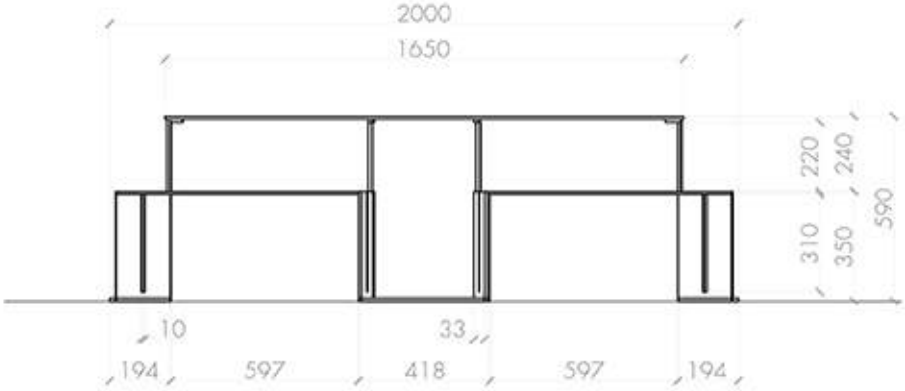

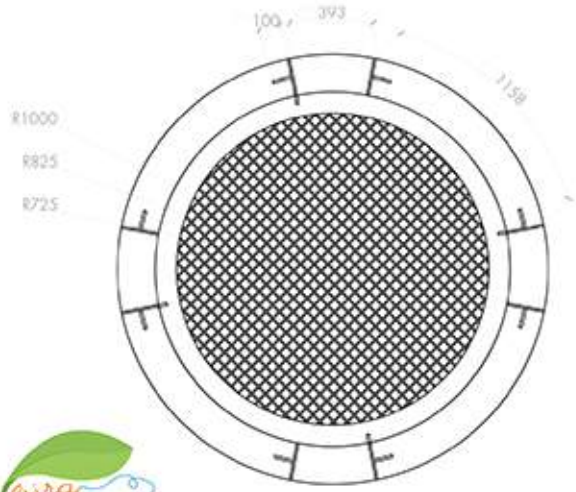

design of
Angelo Barone Claudia Culotta
Giulio Giordano Antonio Illiano

Concorso Internazionale

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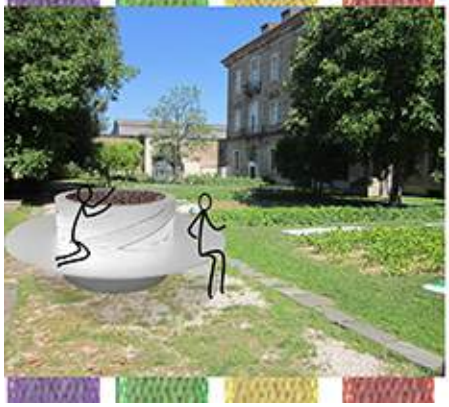
CON LA SCUOLA
38° Circolo didattico "Quarati", Napoli

ORTO INAUGURATO IL 07 gennaio 2016



PROTOTIPO DI SOCIAL DESIGN

Gira e guarda il terreno. Il progetto nasce dalla voglia di riavvicinare i bambini alla terra ed allontanarli dal mondo della tecnologia al quale spesso si avvicinano preturamente. L'oggetto ha la possibilità di trasformarsi da seduta a tavolo con la semplice rotazione, resa possibile dalla collaborazione dei bambini che dovranno utilizzarlo. Esso è un vero e proprio gioco educativo col quale i bambini imparano a prendersi cura della natura con dei semplici gesti descritti direttamente sull'oggetto.

responsabili scientifici
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Prof. Maria Dolores Morelli

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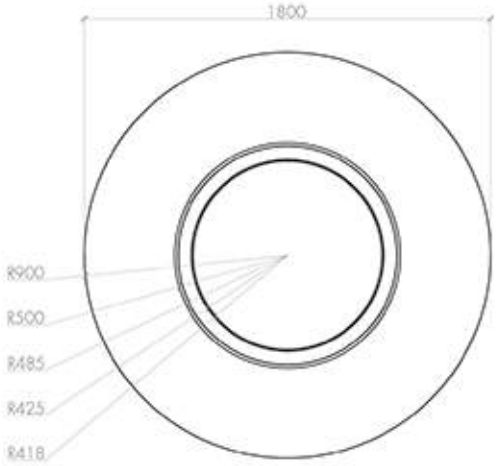

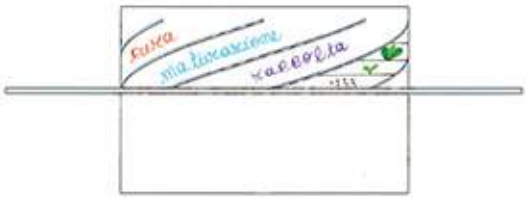

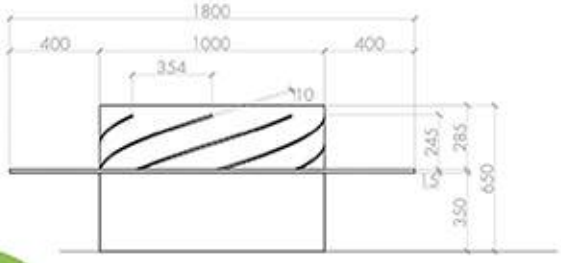

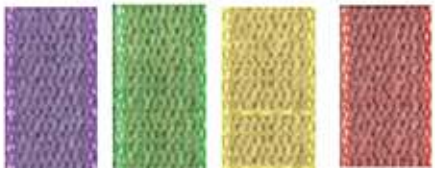

Angelo Barone
Giulio Giordano

design of
Claudia Culotta
Antonio Illiano

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Prof. Sabina Martusciello | Prof. M.Dolores Morelli

GRUPPO DI PROGETTO
Studenti: Raffaele Izzo, Fabrizia Marra

CON LA SCUOLA
I.C. "F. Collecini - Giovanni XXIII",
Via Concezione, Caserta (CE)

ORTO INAUGURATO IL 20/12/15

PROTOTIPO DI SOCIAL DESIGN "Socius Plum"

Il progetto nasce dall'osservazione di un comportamento comune di molti bambini: l'unire con le mani tanti colori per realizzare scarabocchi e disegni.
Il gioco dell'assemblaggio ad incastri, unito al disegno e al colore, ha dato vita a "Socius Plum", una collezione di pennarelli da poter assemblare tra loro per utilizzare più colori insieme e/o composizioni date da infinite possibilità di combinazione.

responsabili scientifici
Prof. Sabina Martusciello
Prof. Maria Dolores Morelli

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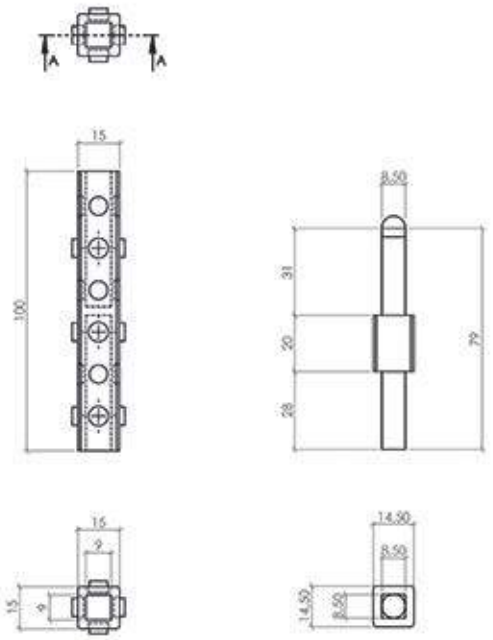
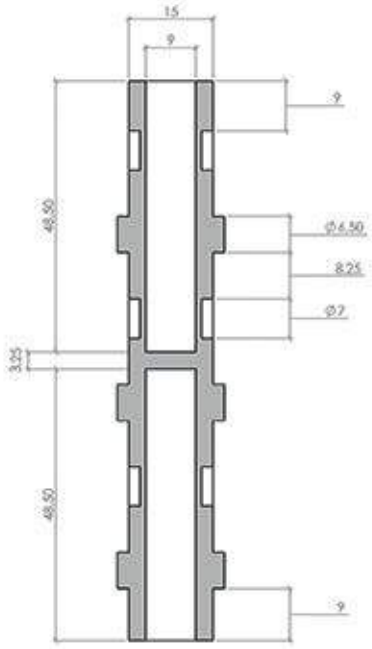
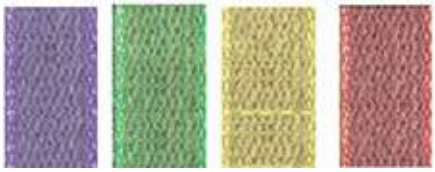
LANDesign® per la cura della casa comune

VISTE
SCALA 1:2



SEZIONE A.A.
SCALA 1:1





design of
Raffaele Izzo
Fabrizia Marra

Concorso Internazionale

LANDesign per *la cura della casa comune*

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Prof. Sabina Martusciello | Prof. M.Dolores Morelli

GRUPPO DI PROGETTO
Studenti: Guida Cinzia, Giuseppina Russo
Specialisti esterni: Nicola Leccia, Vincenzo Cacciapuoti
(collaboratori scolastici)

CON LA SCUOLA
VII Circolo didattico, Salvatore di Giacomo
Giugliano in Campania, Napoli
Classe 2° B - a.s. 2015/2016

ORTO INAUGURATO IL 14/01/16

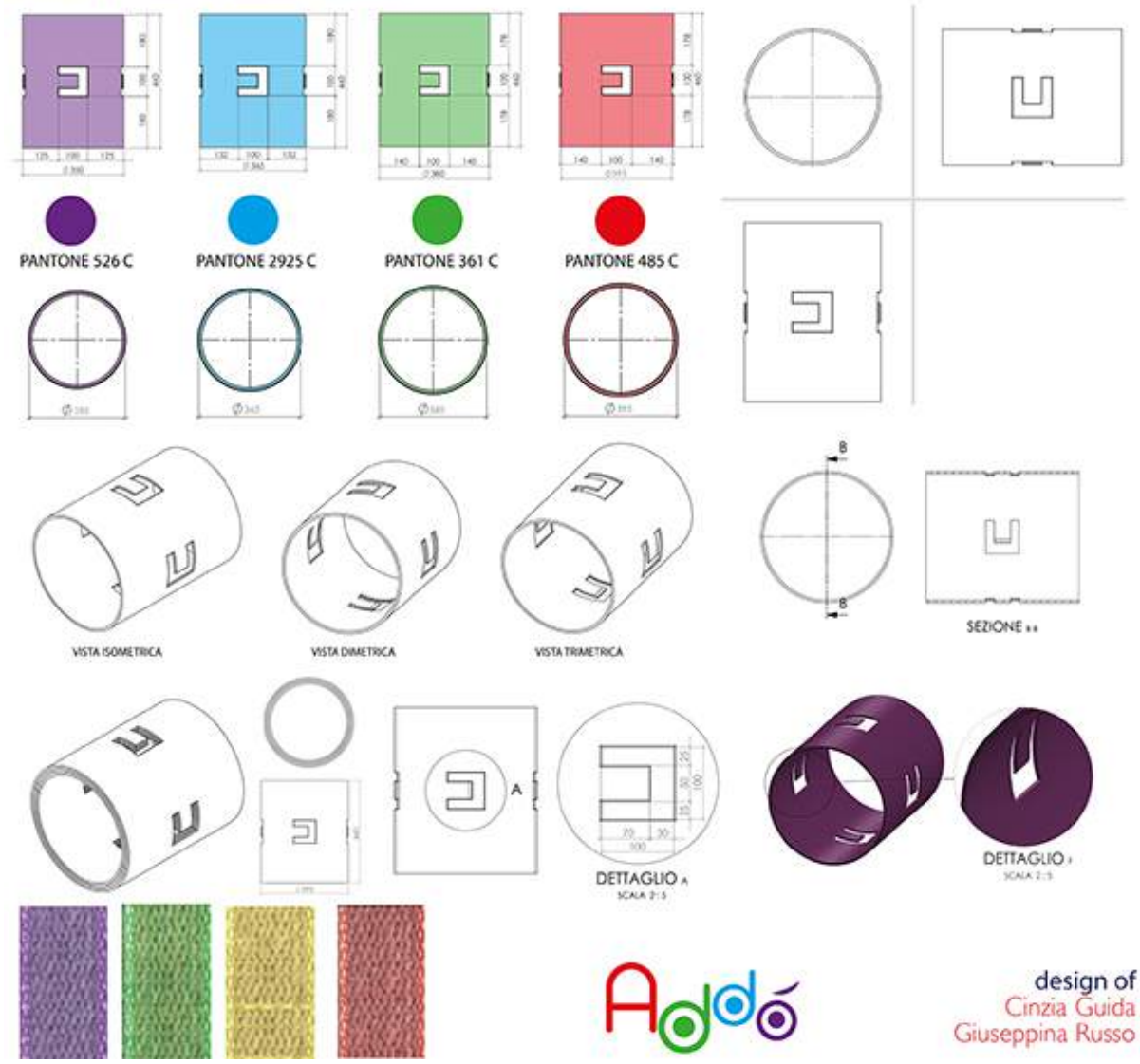
PROTOTIPO DI SOCIAL DESIGN ADDÒ

Addo nasce dalla necessità dei bambini di trovare una giusta collocazione al proprio zaino. Il dinamismo con cui è strutturato stimola continuamente la loro creatività. La possibilità di assemblaggio, inoltre, consente di instaurare un'interazione attiva, volta alla collaborazione e alla condivisione poiché ogni contenitore è in grado di svolgere la propria funzione solo se connesso agli altri componenti.

responsabili scientifici
Prof. Sabina Martusciello
Prof. Maria Dolores Morelli

Concorso Internazionale

LANDesign® per *la cura della casa comune*



design of
Cinzia Guida
Giuseppina Russo

Concorso Internazionale

LANDesign per *la cura della casa comune*

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Prof. Sabina Martusciello | Prof. M.Dolores Morelli

GRUPPO DI PROGETTO
Studenti: Mariagiovanna Troiano, Francesca Scotto
Specialisti esterni: Gerardo Tano (acciaista), Giuseppe Colella (fidanzato di Francesca, musicista), Teresa Girletti (mamma di Mariagiovanna, docente), Antonio (giardiniere)

CON LA SCUOLA
Secondo circolo Moscati Maglione, Casoria, classe IV B

ORTO INAUGURATO IL 10/02/2016

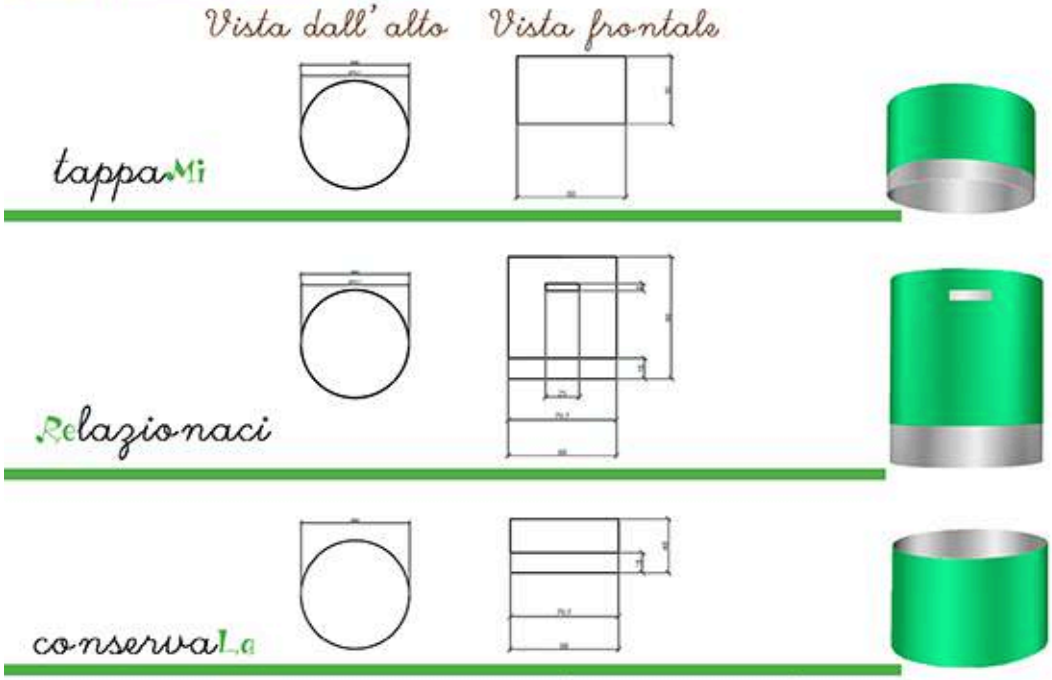
PROTOTIPO DI SOCIAL DESIGN

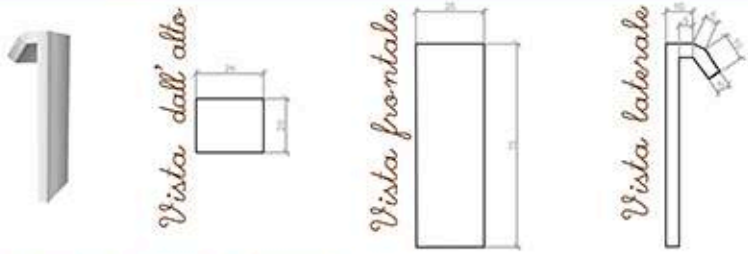
Prodotto di Social Design, contenitore da merenda composto da tre moduli: un tappo, un corpo centrale e uno posto alla base al fine di contere l'esubero alimentare. Il corpo centrale è il vero protagonista del progetto che se assemblato ai moduli centrali degli altri contenitori, si trasforma in uno strumento a percussione dal suono chiaro e cristallino, ottenuto mediante una bachetta di metallo a superfice lavagna agganciata lateralmente grazie ad un semplice incastro.

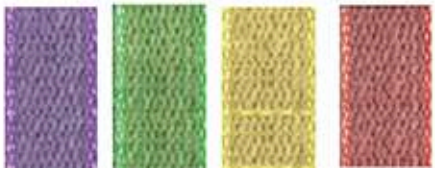
responsabili scientifici
Prof. Sabina Martusciello
Prof. Maria Dolores Morelli

Concorso Internazionale

LANDesign® per la cura della casa comune







design of
Mariagiovanna Troiano
Francesca Scotto

Le Vie dei Mercanti XIV International Forum
WORLD HERITAGE AND DEGRADATION
Smart Design, Planning and Technologies
Aversa | Naples 16 - Capri 17, 18 June 2016

Smart week design: International Competition "LANDesign on *care for our common home*[1]"

Maria Dolores MORELLI[1]
Department of Architecture and Industrial Design, SUN Aversa, Italy
(1) mariadolores.morelli@unina2.it

Abstract
The Applied Research Project [Diaeta Mediterranea: LANDesign/ali-ment-azione], scientific directors Sabina Martusciello/ Maria Dolores Morelli, Department of Architecture and Industrial Design Second University of Naples with BENECON Scarl Regional Competence Centre for Cultural Ecology Economy SUN, Department of Pharmacy and Department of Social Polictics and Communication UNISA, Europe and Foreign Department National Council of Architects, Landscape Planners and Conservationers, with the Campania Region and the General Directorate Ministry of Education Campania, welcomes the " joyful and dramatic reflection" of the Holy Father, Laudato Sì, indicate "International Competition LANDesign® per *care for our common home*"" aimed at schools of all levels and universities, for concrete actions "in the search for sustainable and integral development" answers the call of Pope Francis: "I extend an urgent invitation to renew the dialogue on how we are building the future of the planet. We need a comparison that unite us all, because the environmental challenge that we live and its human roots, affect us and affect us all". The main objectives of the International Competition are: a "new human ecology" since "everything in the world is intimately connected"; "other ways of understanding the economy and progress"; "the culture of waste and the proposal of a new life style" with creative processes orientated towards the welfare of people and conservation of the territory.
Keywords: Landesign, Laudato si, care, common home, territorial surveying, sustainable development, smart

1. International Competition "LANDesign on *care for our common home*[1]"

International Competition LANDesign on *care for our common home* is in according on the theme of the XIV Forum Le Vie dei Mercanti, "an international discussion on the disciplines of architecture, design and landscape through the presentation of research and operational projects on the conservation and valorisation of World Heritage and "smart" regeneration of degradation, with analyses and proposals ranging from the design at all scales, to architectural assets, the territory, infrastructures and the landscape"[2].

"International Competition LANDesign on *care for our common home*" is a part of the Applied Research Project LANDesign, indicate aimed at schools of all levels and universities, for concrete actions "in the search for sustainable and integral development"[3] answers the call of Pope Francis: "I extend an urgent invitation to renew the dialogue on how we are building the future of the planet. We need a comparison that unite us all, because the environmental challenge that we live and its human roots, affect us and affect us all"[4].

The Applied Research Project LANDesign, scientific directors Sabina Martusciello/Maria Dolores Morelli, Department of Architecture and Industrial Design Second University of Naples with BENECON Scarl Regional Competence Centre for Cultural Ecology Economy SUN, Department of Pharmacy and

[1] Cfr. Holy Father Francis, *Laudato s Enc clical. Letter on care for our common home*, may 24, 2015.
[2] XIV Forum Le Vie dei Mercanti.
[3] Laudato sì, n. 14
[4] idem

Department of Social Polictics and Communication UNISA, Europe and Foreign Department National Council of Architecs, Landscape, Planners and Conservationers, with the Campania Region and the General Directorate Ministry of Education Campania, welcomes the "joyful and dramatic reflection"[5], of the Holy Father, LAUDATO SI' Enciclica on care for our common home.
The main objectives of the Internazional Competition are: a "new human ecology"[6] since "everything in the world is intimately connected"[7]; "other ways of understanding the economy and progress"[8]; "the culture of waste and the proposal of a new life style"[9] with creative processes orientated towards the welfare of people and conservation of the territory.
The Applied Research Project LANDesign® is selected for the ADI COMPASSO D'ORO INTERNATIONAL AWARDS 2015, a testimonial of "The University for EXPO 2015" and "School Project EXPO 2015", winner of the "Special Participatory Planning Award" and the "On-line Award - Section realised works" of the X Contest IQU 2015 (Innovation and Urban Quality) promoted by the Gruppo Maggioli; second place at the International Design Contest promoted by POLI.Design the Politecnico di Milano "The 5 seasons 2015" III Award at "Ars. Art that creates social employment" with special mention of the Accenture Foundation MIBACT Ministry of Cultural Heritage and Tourism in 2013; "OSCAR GREEN" Award Coldiretti in 2011.
"We can all work together as God's instruments for the care of creation, everyone with their own culture and experience, their own initiatives and ability"[10] says Pope Francis and says with conviction that "every change needs motivations as well as an educative path"[11].

2. Smart week design

The participants of the schools of all levels and universities in the Competition LANDesign on care for our common home, in order to "unite the whole human family [...] because we know that things can change"[12], must constitute heterogeneous project groups belonging to the virtuous chain [University School Family Institutions Companies].
The "Competition LANDesign on *care for our common home*" urges the participants of the schools of all levels and universities, in heterogeneous project groups, the "pursuit of sustainable and integral development"[13] with one or more of the CONCRETE ACTIONS described below:
−SHORT VEGETABLE GARDENS redevelopment of an abandoned space of the School or University, for example: a green area to be converted into a vegetable garden or orchard, an unused enclosed space prepared for new use, a road, a garden, a square close to the school or university;
− LONG VEGETABLE GARDENS monitoring and maintenance of an area that has already be redeveloped by the school or university; for example: the area converted into a vegetable garden or orchard, an enclosed space prepared for a new use, the street, the garden, the square near the school or university;
−SOCIAL DESIGN OBJECT OR SOCIAL DESIGN COLLECTION the design, while respecting the environment and the welfare of the people, of a product and its logo: FOODesign, design of containers, tools, supports and furnishings on the theme of ali-ment-azione aimed at the presentation and storage of food, with particular attention to the tools and procedures of production, preparation, distribution, of the origins of the food, the traditions and the market; ACTIVEMODesign, the design of accessories, clothes, containers, supports and furnishings for fashion aimed at the cosmo-ethical, or to the beneficial actions and processes related to people and the environment; GIOCODesign, the design of toys/games, even large for about 40 participants on the theme of ali-ment-azione, for use in areas of the schools or public green spaces as temporary street furniture; PHARMAFOODesign, the design of containers, supports or furnishings and logos for the nutraceutical: foods, cosmetics, medicine and supplements, marketing strategies and languages of pharmacologically, sanitary spaces which have an important therapeutic action on human health and on the growth or directed at disabled people; INFODesign, the design of Communication Plans, Visual identity, merchandising, signs inside/outside of the casa comune.

Participation in the "Competition LANDesign® on care for our common home" with one or more CONCRETE ACTIONS is open to pupils and students from schools of all levels and universities in heterogeneous project groups belonging to the virtuous chain [University School Family

[5] Holy Father Francis, Premise, Laudato sì Encyclical. Letter on care for our common home, may 24, 2015.
[6] Laudato sì, n. 15
[7] idem
[8] idem
[9] idem
[10] Laudato sì, n. 14
[11] Laudato sì, n. 15
[12] Laudato sì, n. 13
[13] idem

Institutions Companies], for example: - Kindergarten children and their teachers with the support and help of parents, grandparents, siblings, friends, experts, businesses and organizations that will have to give their support and contribution in the planning, execution and maintenance stages;
- Primary school children and their teachers with the support and help of parents, grandparents, siblings, friends, experts, businesses and organizations that will have to give their support and contribution in the planning, execution and maintenance stages; - Middle school students and their teachers with the support and help of parents, grandparents, siblings, friends, experts, businesses and organizations that will have to give their support and contribution in the planning, execution and maintenance stages;
- Secondary school students and their teachers with the support and help of parents, grandparents, siblings, friends, experts, businesses and organizations that will have to give their support and contribution in the planning, execution and maintenance stages; - University students and their teachers with the support and help of parents, grandparents, siblings, friends, experts, businesses and organizations that will have to give their support and contribution in the planning, execution and maintenance stages.

The project activities can also be combined in weeks workshop at school “Smart week design”, from Monday to Friday dedicated to specific themes and wings landesign.

In the example illustrated by tables, children of primary school level I “La Ginestra”, Torre del Greco (Napoli) have been guided on a visit to the Abbey Benedictine Abbey of San Lorenzo at Septimum, Aversa, and Creative workshop at the school through process E-DUCO / PRO-DUCO: E-DUCO (breeding, feeding, food, extract, draw) and PRO-DUCO (promote, create, build), in a laboratory, construction site and meeting place between assets and arts for the reception, to relationships, to share, to the ongoing dialogue on the knowledge and care of the ENVIRONMENT through three stages. The first phase STORICAMENTE the knowledge of history and of the places from the small-scale structure (school) to large scale (the territory); the second phase NATURALMENTE the sensory experience of the environmental characteristics of our territory and its natural products; the third phase CREATIVAMENTE la realization, using the material collected during the visit to the Abbey of St. Lawrence and in the School of MAP and an ORCHESTRA ENVIRONMENTAL. Pupils through these three phases are driven by a staff composed of academics, experts in education for children, research doctors, farmers, young graduates of our territory (Arch. Carmela D’Ambrosio, Arch. PhD Cristina Magliulo, Arch. PhD Rossella Bicco, Dott. Federica Amazio Dott. Annunziata Cirillo, Dott. Annalisa Gaglione, Dott. Enrica Pagano, Dott. Licia Santonastaso, Ciro Menale con Salvatore Cordato, Mariarosaria De Martino, Francesca Esposito, Francesca Panzariello, Laura Spina students Design SUN)
For these actions the main criteria of evaluation, in accordance to the themes-objectives, are 3F 3E: - Form, outward connotation, result of a clear and conscious design development; Function, proper use of the product in the man/environment relationship; - Feasibility analysis of the structure necessary and sufficient for the conformation of the product; - Economics, from “oixonomia” or appropriate distribution of the parts, with respect to a cost-benefit analysis of the product; - Ecology, benevolent relationship between man and the environment arising from the use of the product; - Emotion, intense emotional reaction intended to induce healthy eating habits.

The XIV Forum has got “the aim of conserving and recovering, valorizing and regenerating, managing and designing (or re-designing), for the more general improvement of the quality of life, in an innovative and contemporary relationship between man and the environment, through “creativity”, while respecting the history, traditions, identity and principles of sustainable development, as well as being attentive to the needs of our and future generations”[14], “International Competition LANDesign® on *care for our common home*” shows the goals in order on this meaning of creativity "Keep the spirit of childhood within themselves for life, it means to preserve the curiosity to know the pleasure of understanding, the desire to communicate”, (Bruno Munari, 1986), not only clearly expresses his philosophy of life, but is one of the most important objectives they pursue the workshops to help children not to lose the sense of curiosity. "Today's children are tomorrow's adults," he repeated often Munari, stating that his most important work are the workshops for children. But why so much interest in the world of childhood I respond with his words: "We can not change the adults, I chose to work on children because they grow better. It 'a revolutionary strategy to work on and with children as future men. "

[14] XIV Forum Le Vie dei Mercanti.

SECONDA UNIVERSITÀ DEGLI STUDI DI NAPOLI

DIPARTIMENTO DI
ARCHITETTURA E DISEGNO INDUSTRIALE
Luigi Vanvitelli

SMART WEEK LANDesign®
"LA GINESTRA"

Responsabili scientifici Prof. Arch. Sabina Martusciello Prof. Arch. Maria Dolores Morelli

23 MAGGIO 2016 ore 9.00|14.00
Abbazia di San Lorenzo ad Septimum- Aversa

25|26 MAGGIO 2016 ore 9.00|13.00
Scuola "La Ginestra"- Torre del Greco

coordinamento didattico Arch. Carmela D'Ambrosio
Arch. PhD Cristina Magliulo, Arch. PhD Rossella Bicco

tutor Dott. Federica Amazio designer Dott. Annunziata Cirillo designer
Dott. Annalisa Gaglione geologo Dott. Enrica Pagano sociologo
Dott. Licia Santonastaso musicista Ciro Menale agricoltore

work group Salvatore Cordato, Mariarosaria De Martino, Francesca Esposito,
Francesca Panzariello, Laura Spina studenti di "Design" SUN

STORICAMENTE

Mappa Campania Felix

CLASSE 5ª

L'abbazia di S.Lorenzo sorge in una località che già in epoca antica rivestiva caratteri di grande interesse: ad Septimum, al settimo miglio della città di Capua, sull'antico percorso della via Consolare Campana, si articola intorno a tre principali strutture spaziali: la chiesa con il giardino ad oriente, il chiostro maggiore con il giardino della clausura, gli appartamenti dell'abate con il giardino annesso. Si può ipotizzare che nei primi decenni dell'XI secolo si sia organizzata una struttura monastica articolata, sorta in relazione alla chiesa che, in origine, presentava un impianto comune alle chiese campane a schema basilicale, con tre navate. Con il terremoto del 1456 l'intera struttura subì rilevanti danni e rimase in abbandono fino agli inizi del XVI secolo.Gli spazi posti intorno al chiostro maggiore vennero occupati dalle nuove strutture conventuali: il refettorio, il quarto dell'abate e il giardino della clausura. Nuovi imponenti lavori si registrano alla fine del XVIII secolo.

se il mandarino vuoi mangiare prima devi coltivare

Mariagrazia 10 anni

impara a riciclare pezzo di maiale

Gennaro M. 10 anni

ciao natura c'è lui che ti cura così avrai una vita più pura

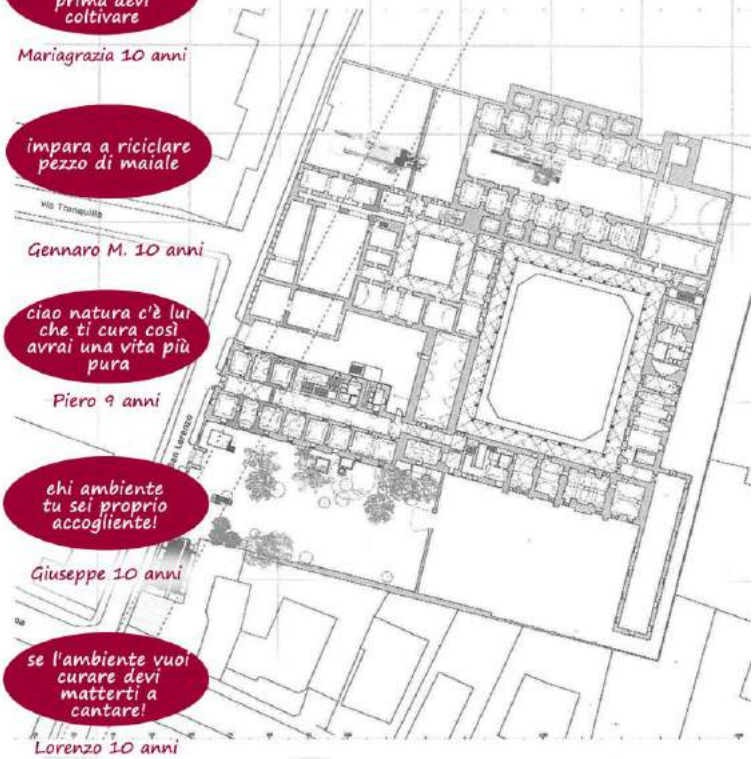
Piero 9 anni

ehi ambiente tu sei proprio accogliente!

Giuseppe 10 anni

se l'ambiente vuoi curare devi matterti a cantare!

Lorenzo 10 anni



"saper osservare"

sulla piramide alimentare ti devi basare se il pancino vuoi sgonfiare

Carlotta 10 anni

non gettare a terra lo zucchero filato se non ti mette in croce Ponzio Pilato

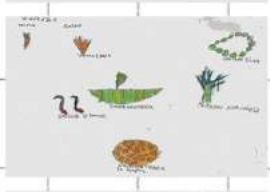
Aldo 10 anni

noi odiamo la paura ma adoriamo la natura!

Sofia 10 anni

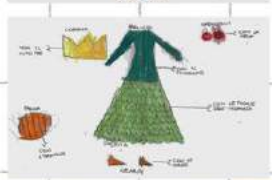
se rispetti la natura, la tua vita sarà più pura

Vincenzo 10 anni



mai parlare sempre! ascoltare e rimanere a guardare

Federica 9 anni



la natura semplicemente fa bene all'ambiente ma soprattutto alla mente

Maria Laura 10 anni

Francesca 10 anni

la piramide alimentare riesce sempre a far male

Ferdinando 11 anni

Gennaro 10 anni

ehi figlio sai che per me sei proprio un figlio!

Francesco 10 anni

Luigi 10 anni

Da tale periodo cominciarono i lavori di ristrutturazione del complesso monastico con la fondazione, fino agli inizi del XIX secolo, delle attuali strutture conventuali. La chiesa venne ampliata con la costruzione, secondo lo schema post-tridentino, delle cappelle della navate laterali e del nuovo campanile e il complesso monastico dotato di nuove strutture: il chiostro maggiore, rinascimentale e il chiostrino barocco. In seguito alle lesioni apparse nel braccio annesso al chiostro maggiore, destinato ad ospitare le celle conventuali, venne costruito un nuovo corpo occidentale: il quarto nuovo dell'abate, realizzato, a partire dal 1776, su progetto dell'architetto Ferdinado Fuga. In relazione a tale nuova struttura venne riorganizzato anche lo spazio a esso annesso, con la *realizzazione del giardino dell'abate, recintato da un basso muro esterno chiuso da cancelli.*.

Pasquale 10 anni

per ascoltare il profumo delle foglie
e non sentire il rumore del clacson
per gustare il racconto di una lattuga
e non mangiare un codice a barre
per respirare il colore della natura
e non odorare l'ignoranza dell'incuria
per osservare il sapore del verde
e non vedere il nero dei rifiuti
per toccare il suono della terra
e non cliccare il mouse di un computer

Manifesto "LANDesign"

NATURALMENTE

che bello raccogliere pigne e foglie!

Francesca 6 anni

che bello annusare le piante!

Giulia 6 anni

che bello ascoltare gli uccellini!

Letizia 6 anni

che bello piantare i pomodori!

Vittoria 6 anni

INFANZIA CLASSE 1ª

mi piace cercare pietre e pinoli

Miriam 6 anni

mi è piaciuto annusare il rosmarino

Serena 6 anni

che belle le maracas!

Alba 6 anni

belli gli alberi con la frutta!

Federica 6 anni

che bello disegnare la scuola!

Ginevra 5 anni

«Conservare lo spirito dell'infanzia dentro di sé per tutta la vita, vuol dire conservare la curiosità di conoscere, il piacere di capire, la voglia di comunicare»
Bruno Munari

"saper respirare"

Matteo 9 anni

Cristian 8 anni

Cristina 7 anni

Viola 7 anni

LO SPAZIO DELLA MIA CASA

I bambini sono stati guidati, nella visita all'Abazia Benedettina di San Lorenzo ad Septimum, Aversa e nei Laboratorio creativo presso la scuola Scuola La Ginestra , Torre del Greco attraverso il processo E-DUCO/PRO-DUCO: E-DUCO (allevare, nutrire, alimentare, estrarre, trarre) e PRO-DUCO (promuovere, generare, realizzare), in un laboratorio, cantiere e luogo d'incontro tra le attività e le arti destinati all'accoglienza, alle relazioni, alla condivisione, al dialogo permanente sulla conoscenza e cura dell'AMBIENTE attraverso tre fasi. La prima fase STORICAMENTE _la conoscenza della storia e della struttura dei luoghi dalla piccola scala (scuola) alla grande scala (territorio); la seconda fase NATURALMENTE _l'esperienza sensoriale delle caratteristiche ambientali del nostro territorio e dei suoi prodotti naturali; la terza fase CREATIVAMENTE _la realizzazione , utilizzando il materiale raccolto durante la visita all'Abazia di san Lorenzo e a Scuola di una MAPPA e di un' ORCHESTRA AMBIENTALE . Gli alunni attraverso queste tre fasi sono guidati da uno staff composto da docenti universitari, esperti in didattica per l'infanzia, dottori di ricerca, agricoltori, giovani laureati del nostro territorio, chef.

Syria 9 anni

Paula 7 anni

Pasquale 7 anni

Francesca 7 anni

CREATIVAMENTE

CLASSE 2ª
CLASSE 4ª

"per gustare..."

alimentazione®

“saper toccare”

Alessandra 9 anni

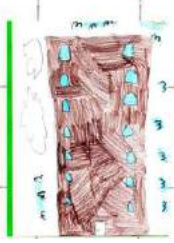
Angela 9 anni

Claudia 9 anni

Elvira 9 anni

Alessia 9 anni

Simone 9 anni



Simone 9 anni

Carlotta
8 anni

Caterina
8 anni

Manuel
8 anni

Vittorio
8 anni

Giuseppe
8 anni

Marta
8 anni

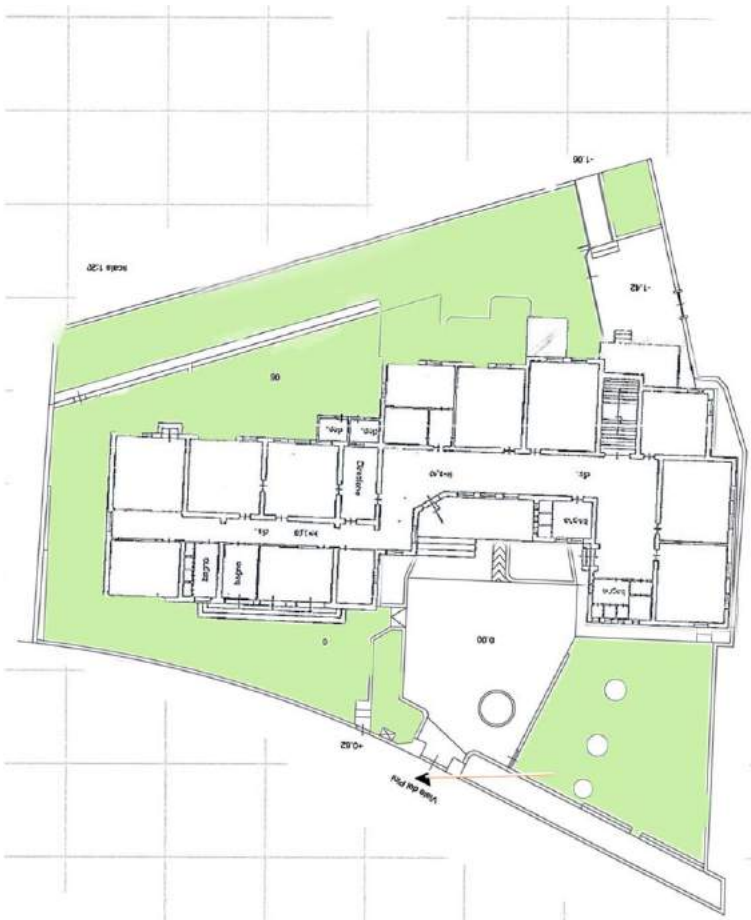
Manuela
8 anni

Emanuela
8 anni

Ludovica
8 anni

LO SPAZIO DELLA MIA SCUOLA

CREATIVAMENTE



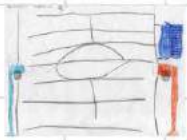
"saper ascoltare"

Sophia 8 anni

Martina 8 anni

Giammarco 8 anni

Caterina 8 anni



Francesca 8 anni

Benedetta 8 anni

CLASSE 3ª

Il Progetto di Ricerca Applicata [LANDesign/ali-ment-azione]® ha ottenuto i seguenti riconoscimenti: testimonial de "Le Università per EXPO 2015" e "Progetto Scuola EXPO 2015", selezionato ADI COMPASSO D'ORO INTERNATIONAL AWARDS 2015, vincitore del "Premio Speciale Progettazione partecipata" e del "Premio on line - Sezione opere realizzate" del X Concorso IQU 2015 (Innovazione e Qualità Urbana) promosso dal Gruppo Maggioli; Il Premio al Concorso Internazionale di Design promosso da POLI. Design del Politecnico di Milano "Le 5 stagioni 2015"; III Premio al Concorso "Ars.Arte che realizza occupazione sociale" Fondazione Accenture con Menzione speciale del MIBACT Ministero dei Beni e Attività Culturali e del Turismo nel 2013;Premio "OSCAR GREEN" Coldiretti nel 2011.

Le Vie dei Mercanti XIV International Forum
WORLD HERITAGE AND DEGRADATION
Smart Design, Planning and Technologies
Aversa | Naples 16 - Capri 17, 18 June 2016

Naples 1884. Urban transformations and debate about the city

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Abstract
The debate featuring redevelopment's intervention in Naples for the accommodation of the city takes shape, thanks to the program designed and implemented by engineers Gaetano Bruno (leader of technical direction IV office plumber) and Adolfo Giambarba (Responsible for drafting and leader of the technical office of the first municipalities of the City of Naples), intended as, industrial development in the East and the West Coast toward accommodation of Chiaia. It was intended to create a network of connections to incentivize the sanitation of the neighborhoods most affected by the cholera epidemic. The project was immediately converted from public intervention at a colossal private speculation objective of the research will be analyze the intersections that have marked the urban settlements to specify the configuration of the current city.

Keywords: Naples, Legge Pel Risanamento, Adolfo Giambarba, Legge 2359

Section
From the 18th century the housing urban plan were a matter of great interest to policies of many European cities.
The huge expansion of urban centres had imposed radical changes in the structure and organization of the city. With the enactment of the law of 13 April 1850 of the prefect Peter Haussmann in Italy was established in 1865 the law number 2359 which provided interventions aimed at improving the hygiene conditions of the town due to the overcrowding of the population.
In Naples, The project for the Risanamento (redevelopment) started after f the outbreak of the cholera in August 1884 with the promulgation on 15 January 1885 of the law for the development of the city of Naples. The health emergency, justified a program of major demolition and reconstruction. The reclamation of "slums", aimed at the implementation of major sectoral works: the creation of a network for the inflow and outflow of water, opening new arteries to allow an easy connection between the different parts of the city caused the unhealthy districts evisceration and the demolition of ancient stores (fondaci).
In this context, the Chief Engineer Adolfo Giambarda and the fourth municipal Technical Director, Gaetano Bruno represent very important figures.
Their project provided a new road layout; with the need to raise the road level of 3.50 m for accomodation of sewer.
The work began in 1889 and was entrusted to a single company. Rehabilitation works were intended to give the city a new look through remedial and many demolitions. Sixty churches were demolished, were shot down many stores (fondaci) and unhealthy neighborhoods to prevent any future epidemics, were built many main arteries and was given to the sewage system, a more important role. The general project was to restore the buildings in Mercato, Porto and Pendino neighborhoods, expropriating entire section of these areas and the realization of a main artery; the so called “Rettifilo” or Corso Umberto that should make connected the central station to Piazza Borsa.

Fig. 1: view from Piazza della Borsa to Corso Umberto I.

Further investigations were performed in the historical archive of the city of Naples in order to reconstruct in detail the birth and the development of the remediation project and to have a wider and more comprehensive overview about the topic.
The entire series consists of three categories, and is characterized by the boards identified:

- Fiscal consolidation slums;
- Consolidation in sheets containing details of the plot of land and new streets with relative altitude;
- Reclamation. Execution project.

The boards componing the whole series represent the inclusive extension between Piazza Mercato, la caserma della cavalleria, Maddalena bridge and via Arenaccia in a direction, the area of the port up to the inferior part of street Foria in the other direction.
All the works were represented in scale 1:200, to define in detail the new road layouts, the soils and the properties concerned. This cartography is still are of great quality, clarity and precision, while not always been preserved appropriately.
The works were performed at since 1887 and used in all subsequent operations until 1904. Each group of tables that belong to each category, has a cover page indicating the legend colors of interventions.
For project was used the yellow color indicating total expropriations, orange for additional expropriation areas and colour bistro soils where wasn't possible to build.
In attachement a, were shown in yellow, areas relating to the expropriation, in celeste expropriation for filled, and in green a connected area.
In attachement b is used the red line that portray the extent of remaining work, with the color amaranth represented the engravings, in pink building soils with slugs and shipwrecks and with orange all soils where wasn't possible to build.
In sheets containing details of the plot of land and new streets with blue numbers were identified new avenues while with the neutral color sidewalks, in black represented the elevation of the road network remained unchanged on sea level, in red for the new altitude above sea level and finally were represented with yellow – red areas where wasn't possible to build.
Of 220 sheets, was analyzed the surface which include board 86 and 87.
In the board number 86 are present, vico Maso, vico Sempreviva, vico Fantasia, vicoletto Fantasia e vico San Giovanni and the Church of Sant'Arcangelo all'Arena.
In the board number 87 are present, via Colonne a Loreto, vico Orticello, vicoletto San Giovanni e via San Giovanni.

All plants of the two sheets have been placed in the folder that contains the sheets from the number 51 to 100 for each category of intervention, the attachments have been placed in the folder that contains the sheets from 39 to 57 number.

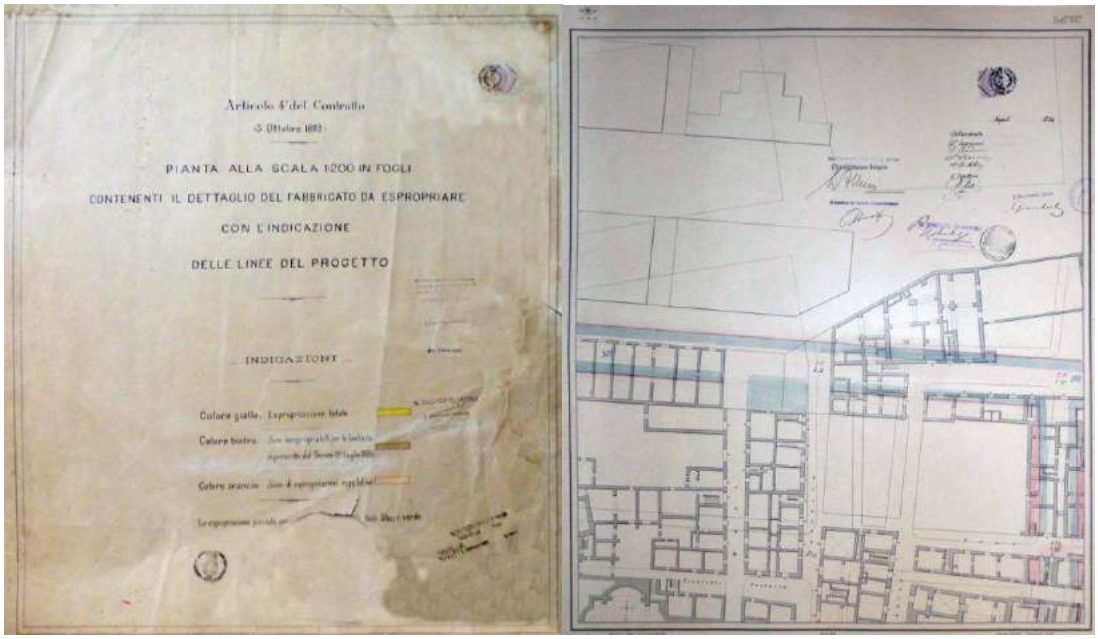

Fig. 2: Board n. 86. Cover page indicating the legend colors of interventions with lines of project.

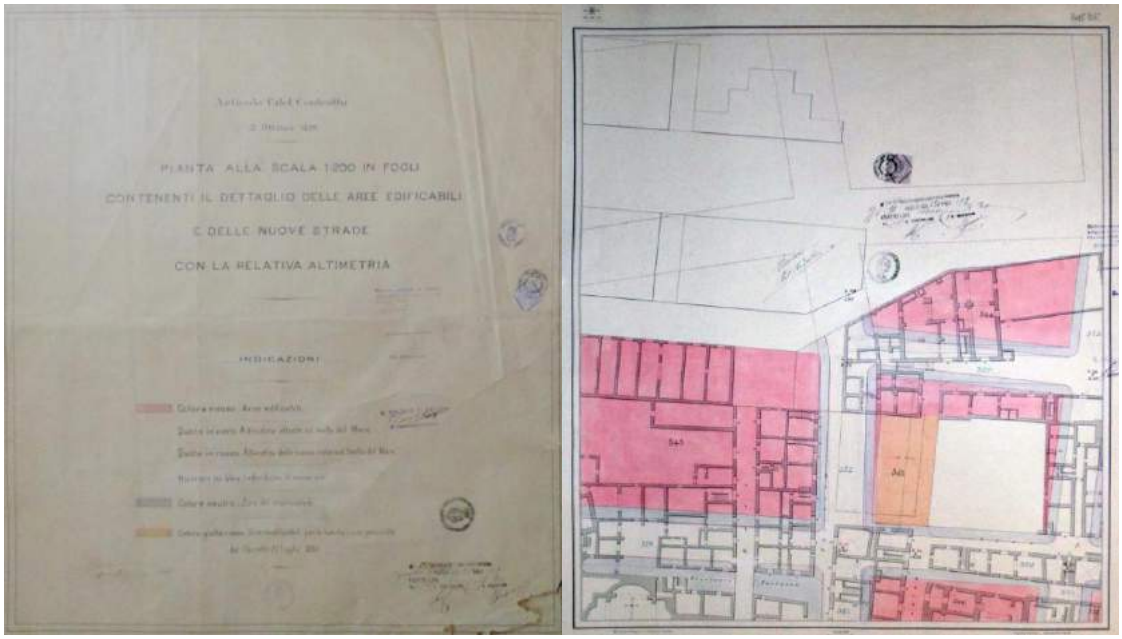

Fig. 3: Board n. 86. Cover page indicating the legend colors of interventions with execution project.

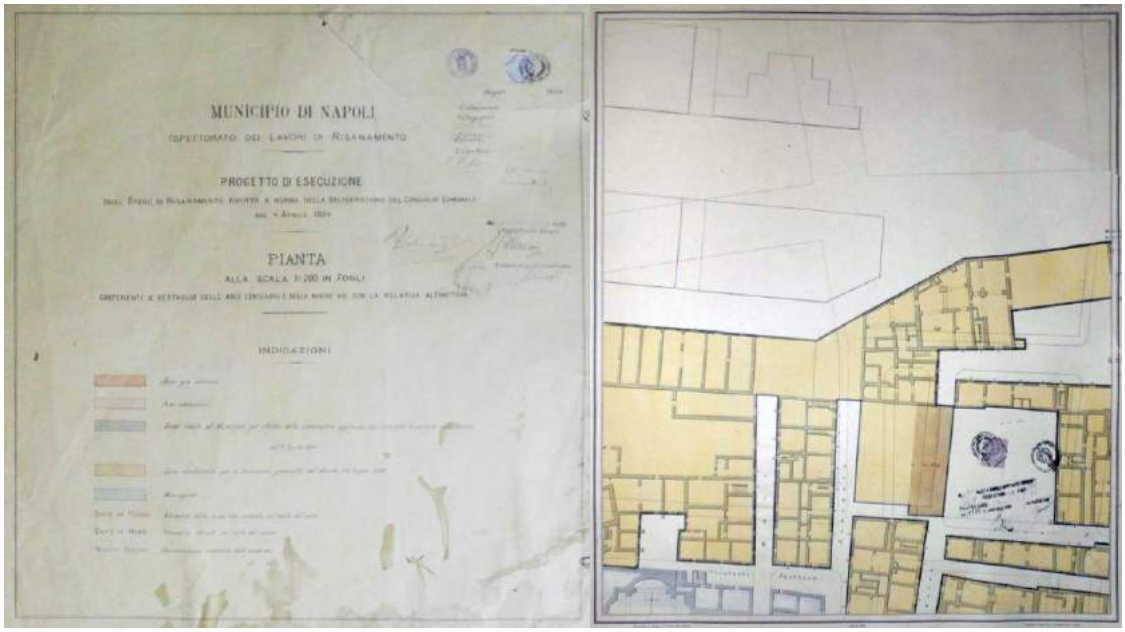

Fig. 4: Board n. 86. Cover page indicating the legend colors of interventions with new streets and relative altitude.

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Le Vie dei Mercanti XIV International Forum
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Plans of communication for cultural and landscapes assets

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Abstract

The phases of analysis and multidimensional survey on heritage are directly related to the action plan that, in the case of the territory, culminates in the concept of the Knowledge Factory. More knowledge you put in the transformation of raw material resources of the territory, more you will have two major outputs: competitive products and work with Art. This is the challenge because human capital can express the talent generated by a continuous training process, which is the innovative appropriate measure of heritage, identity and roots.
In the current era characterized by the knowledge, the cultural identity of the sites has a value much larger than that related to the income of tourism because it is an indispensable asset in educational processes to maximize human capital and to make competitive and attractive the territory.
The identity of places is the result of the memory of ancient traditions and knowledge as well as of the material evidence of the past that have shaped its physical form. To preserve historical continuity by ensuring to men a better living environment, we must create a balance between the spaces of the past and the present needs, offering innovative solutions to meet the different needs in optic of sustainability.
This paper presents case studies related to personal experiences of the author and in the framework of the methodological approach described below.

Keywords: Communication, Cultural Heritage, Landscape, Planning, Architecture

The methodological approach

The cognitive method, intended as a preparatory phase for each project activity proposed by the research is related to the principles of multidimensional (multi-criteria) and multidisciplinary approach, which "allows to investigate from the landscape – territorial scale to the architectural work, to the object minutes - regardless of the date of the object of study - the human and natural phenomena understood as complex and continuing realities through a careful process of discretization and measures. This process studies in the essence each of their individual connotative value. "
The monuments, landscapes, architectural artifacts, through this methodological criterion, are analyzed, interpreted, discretized by the integral of knowledge - the different disciplines of study - not only to measure the formal and geometric aspects, but those intangibles too that can give signs about the history, the environmental, sociological, cultural context in which that monument, landscape and architectural artifact is born and has been configured.
The phases of analysis and multidimensional survey on heritage, in this sense, are directly related to the action plan that, in the case of the territory, culminated in the concept of the Knowledge Factory. "More knowledge you put in the transformation of raw material resources of the territory, more you will have two major outputs: competitive products and work with Art. This is the challenge because human capital can express the talent generated by a continuous training process, which is the innovative appropriate measure of heritage, identity and roots."

Plan of Comminication for the 'Basso Volturno' area

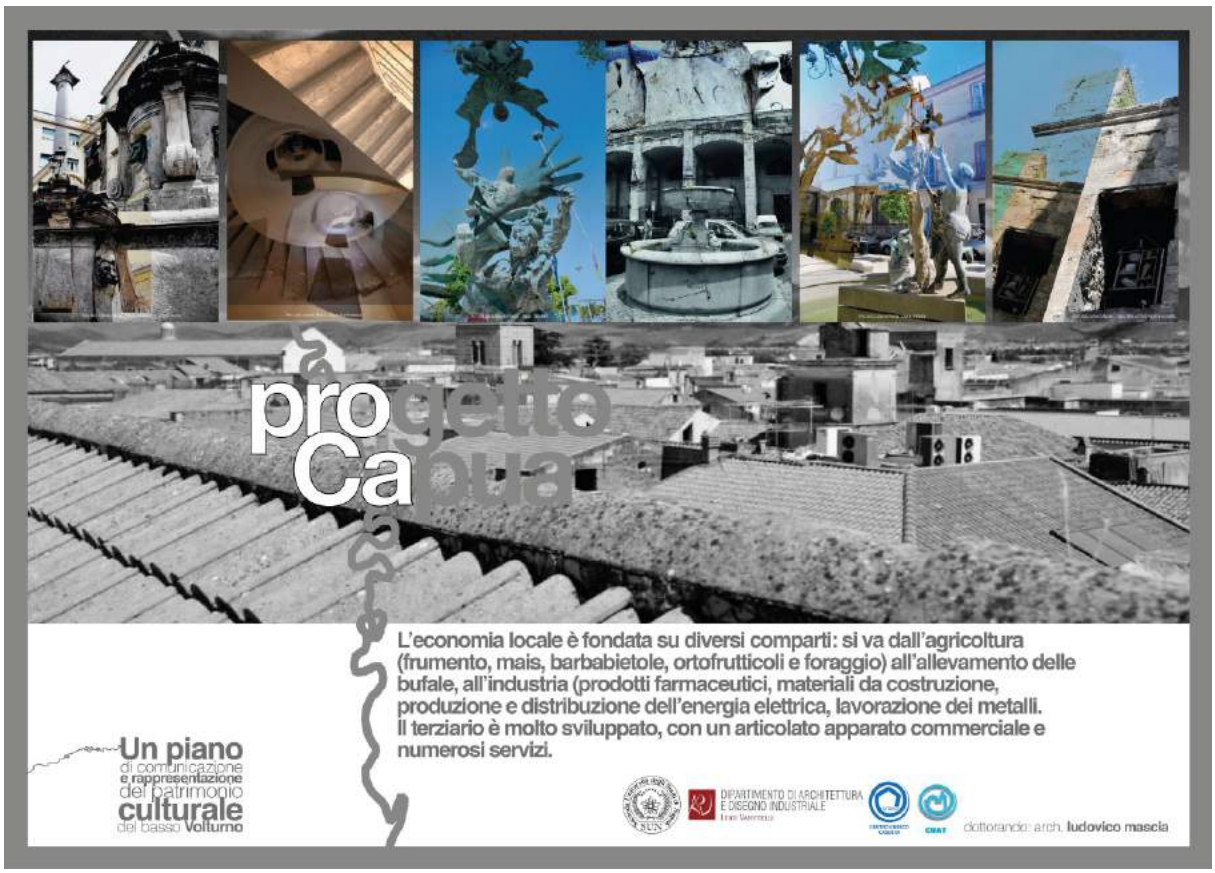
It is just in search of identity matrices of places and enhancing the human capital of the territories, which we investigate the possible actions for the protection and enhancement of heritage, designed as part of a collective process and project, coordinated and concerted, among the institutions responsible - at different territorial levels - Universities, Research Centers and local communities, represented by the major players in the world of associations and enterprises.
History, understood as knowledge, is therefore memory. It is the basis of every project that respects the traditions and contemporary needs of local communities. Historians, philosophers and sociologists have shown that over the centuries, the concept of historia magistra has been abandoned, where the past feeds and provides models and examples for the present, with it being replaced by the concept of historia memoria that today explodes and branches on and off. The evolution of the doctrines and content of the World Heritage reflect these changes. The affirmation of a common humanity, which accepts and encourages cultural and biophysics diversity in the world, also supports the growing diversity of sites and landscapes worthy of being considered and protected. There is no longer a reason for the historia magistra to exist due to every territorial context bringing into itself new elements, which cannot only refer to past experience or knowledge that has already been acquired.

Cultural tourism and networking

"In the current era characterized by the knowledge, the cultural identity of the sites has a value much larger than that related to the income of tourism because it is an indispensable asset in educational processes to maximize human capital and to make competitive and attractive the territory.
The identity of places is the result of the memory of ancient traditions and knowledge as well as of the material evidence of the past that have shaped its physical form. To preserve historical continuity by ensuring to men a better living environment, we must create a balance between the spaces of the past and the present needs, offering innovative solutions to meet the different needs in optic of sustainability."
Cultural tourism can be an option, although not the only one, for the cultural and economic development of territories with strong international appeal, precisely because they are guardians of significant historical presences. These have marked the evolution, traditions and defined the landscape, always if careful integrated within planning strategies and management of natural and built as well as intangible assets.
Cities and whole regions in Europe and North America as well as emerging countries are developing strategies to promote tourism for its economic development. The impact of culture on local communities is not limited only to tourism but extends to other activities. In an increasingly globalized society, the protection and enhancement of cultural heritage can become a powerful tool for social, religious, ethnic and economic integration within communities, and contribute to a more equitable and sustainable development.
The World Trade Organization, the United Nations World Tourism Organization and UNESCO, as confirmed by statistical data, identified tourism as one of the fastest growing business sectors, with very marked attention to cultural one. The latter is particularly interested in the rediscovery of local traditions and authenticity of places. In this logic, Countries that have special historic, architectural and landscape assets, are vigilant in preserving their cultural heritage, and they focus on cultural tourism, for its capacity of attract visitors, in order to obtain economic and social benefits for local people and territories.
Tourism is one of the most important sectors for the world economy with about three trillion economic income worldwide and an expansion, on average, of five per cent per annum. It can generate a set of benefits including the development of economic opportunities through both the increase in jobs and the creation of local and regional markets.
It can also ensure the protection of cultural and natural heritage through the provision of interpretive and educational values associated with the valence and the historic significance of places, besides contributing to the development of researches by studying best practices for environmental protection. It can also contribute to improving the quality of life through the development of an infrastructure system for the territory of reference, or it helps the cross-cultural understanding within a community.
It is also true that, if it is not integrated into a careful planning strategy and properly managed, tourism can irreversibly alter the state, integrity and authenticity of places, for example, through the creation of services not integrated into the landscape, including parking , shops, hotels, roads and airports.
Among the physical and environmental impacts, we highlight the acceleration of erosion, pollution and the gradual, partial or total degeneration of the ecosystem. Among the social impacts, mass tourism may reduce the quality of life of local communities and create tension in everyday relations between visitors and residents. The main goal for who is involved in the heritage management, therefore, is to plan a balance between protection and promotion, including local knowledge, open to the widest

Plan of Comminication for the City of Capua

audience possible, and protect assets from excessive and unsustainable human pressure, which might alter, as often happens, the authenticity of those places.
We wonder then, in times of global economic crisis, when tourism is one of the possible areas for development for the development of territorial economies, social integration and improvement of quality of life for local communities, as may be possible to combine economic development needs related to cultural tourism with the necessary strategies of heritage's protection and enhancement in a sustainable way.
If the local people do not feel the landscape, the city, the natural context in which they live, as their own, not only in the cultural and identification aspects, but also as the place where they can live their lives with dignity, then it is difficult to feel involved in a collective project aimed at the protection, preservation and enhancement of the environment around them.
"Tourism has to be a resource for the area, but in respect of local identity. We should therefore plan it in all its components, to achieve a positive final outcome also in terms of emissions or noise pollution, which could be caused by poor planning of accessibility and mobility for the enjoyment of sites of interest."
Tourism and project, as a rediscovery of the identity of the territories, of their vocation as well as participatory process shared by the local community, are key factors of best practices worldwide for heritage's protection. In consequence, the fundamental international comparison to share virtuous examples of management of monuments, sites and historic environment, in which conservation and development coexist as positive models, which can be transferred to other contexts.
The strategy of protection and enhancement of heritage, thus understood, faces the possibility of transferring management policies from one environment context to another. Contemporary research on local development in a global context show that examples of successful development in a region, city or industry, however, are hardly to re-propose, in the same way in different areas. The local development, in fact, depends on environmental conventions, models of reference, habits and social conventions that cannot be recreated but only built.
It is also true that best practices are all characterized by constant and key factors that cannot take in consideration the condition of the territory. In asset management, in a logic of sustainable tourism development, concepts such as cultural identity, integration of tourists with the local community, cultural tourism, economic development, tourism management, participatory processes in the appropriation and knowledge of the identity of the territory's values, are synonymous of successful policies , and therefore can become a stimulus for planning and management strategies to be adopted elsewhere.
The full participation of communities in heritage management for the definition of its local identity is, in fact, as much a duty as a responsibility for governments and citizens, in order for that development to be oriented to the real expectations and needs of the inhabitants of the territory.
In a collective project in which tourism becomes a component of the broader process of regenerative preservation of heritage, the methodological approach, multidisciplinary and multi-dimensional, structures the knowledge of the area and directs its management as "Knowledge Factory."
"The governance of the production cycle, understood in its regenerative action and in its role of modifying infrastructure, landscape products, it will be realized only if the complexity of local identity values are measured by knowledge, in their dual multi-dimensional understanding of the physical activity produced and to be produced, and returned as a heritage to citizens and stakeholders of the territory to take up economic activities at different scales of sustainable investment. The result will be that the products will have the more valuable the higher the degree of knowledge that we will be able to transfer in any part of the production cycle."
In this sense, the depth of realities that are considered management model for the real involvement of local people, it becomes spin off for reflection on strategies, which could be adopted, as advocated by the World Heritage Convention (1972) and the Budapest Declaration on World Heritage (2002).
Particular attention, for the international importance which they invest and for the specific legislature related to them, should be reserved for those sites that for their typological characteristics, historical, or natural assets are considered emblematic and of excellence for a Country or for the world community. This is the case of properties included in the World Heritage list, which, for their Outstanding Universal Value, become an attraction for cultural tourism on a global scale.
Although formal data was not collected, the inclusion of a site in the UNESCO list matches, most of the time, with a significant increase in the number of visitors to this site. For example, after the designation of World Heritage property, the number of tourists in the Galapagos has grown from nine thousand in 1978 to one hundred forty-five thousand in 2006; Petra in Jordan from three hundred and sixty thousand in 2006 to five hundred eighty thousand in 2007; the National Park Los Glacieres in Argentina, from thirty thousand in 2002 to seventy thousand in 2007; Le Havre, France, in a single year since its inscription, in 2005, has increased by twenty five percent the number of visitors.
The analysis of data of the UNESCO Periodic Report and Action Plan, Europe 2005-2006, shows that the fifty-four percent of managers of World Heritage sites has shown economic benefits due to



Plan of Communication for the City of Capua and Sant'Angelo in Formis

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recognition of property in the World Heritage list, while the forty-seven percent indicated social benefits. Inclusion is viewed favorably by those countries wishing to attract more tourists. The presence, on the national territory, of a property inscribed in the UNESCO list, is also a source of pride and assertion of national identity.

In the framework of the research proposals, there is no intention to submit a predominant or hierarchical position to the World Heritage in comparison to other cultural and natural assets.
We sustain the idea that "UNESCO is a place of debate, a collective laboratory where some positions, doctrines and theories are dealt with in order to reach an agreement, more or less consensual, and conventions, more or less shared. In this sense, the UNESCO, as international, if not universal, organization, can be considered as a motor and simultaneously as a mirror of the cultural (and geo-politic) dynamics sustained by public institutions (States and their representatives) and society (experts and associations invited to furnish some advices and to participate in the debates and the elaboration of guidelines)."
It is necessary to observe, however, that the inclusion on the list, that commits evidently States in which the enrolled site is located, is only for Countries who adhere to the Convention.
This distinction is clearly not neutral. In fact, only sites and landscapes to which the State intends to devote instruments of protection (the management plan is compulsory since 2005) are recognized for enrolment.
We underline a sensitive point: recognition is not provided if there is no predisposal, national and international, devices of management for the potential sites to be included in the World Heritage list. This means that the enrolment cannot take place except through management tools that allow for the protection and enhancement of assets? It is a really fundamental criterion that particular sites become World Heritage only if endowed with management tools?
The debate is open. One of the sensitive issues of international comparison at the beginning of the twenty-first century is what is generally called generalized interference.
The more developed countries, in fact, in the name of humanitarian and democratic principles, and often on behalf of the economic and social development, invoke the need for management tools and the respect for international legislation of reference for heritage.
In practice, however, only the most influential and powerful Nations can put these principles into practice, and can face some economic investments for the inclusion of a site in the UNESCO list.
Regardless of the ongoing debate and the ethical issues concerning the inclusion of a property in the World Heritage list, it should be noted that, increasingly, brands of the sites of excellence, above all that of UNESCO, are used - at different spatial scales - from governments, tour operators, chambers of commerce, tourism bodies and private entrepreneurs, as a powerful tool to attract tourists from throughout the world. We just think, for example, at the channels of communication provided by UNESCO, by the website of the World Heritage Centre, to the World Heritage magazine as well as to the citations in scientific publications, catalogs, newspapers and magazines to promote culture and tourism.
The spirit of exceptionality of the UNESCO site "creates" a heritage that deserves to be seen and "consumed." The development of tourism, from the largest to the smallest, cannot be rejected, since in many cases it is the only source of support for economic and social development.
It is also often the main resource for the protection of these sites. This uniqueness is also reflected in the very limited number of assets on the World Heritage list in respect to the national heritage. One need only look to the example of France, where more than forty-five thousand monuments or sites, and about fifty national and regional parks are protected by the State.
The character of Outstanding Universal Value attributed to the World Heritage properties is a rare gift, although increasingly open to different points of view, larger and larger and heterogeneous (historical, artistic, scientific and ecological).
About half of it has been included in the World Heritage list since 1995. The number of natural and mixed sites - which account for about one quarter of the total included properties- has seen a strong increase in the last fifteen years, especially in developing Countries. The recent developments highlight the international interest for the traditions, cultural and landscape areas often re-explored, as well as for the ecological dimensions of the natural environment.
At the same time, the classification criteria evolved: the notions of representation and exemplary tend to be added, if not replace, those of uniqueness and authenticity. In fact, the intangible traditions, as well as specific categories of assets, were added to the field of natural and cultural sites exclusively covered by the Convention of 1972.
Many are the cultural network that through the release of a label - often recognized by the Ministries for culture, ecology or sustainable development in different Countries - witness the status of "excellence" for that property, not only for its state conservation and the intrinsic historical, artistic or landscape heritage that it represents, but also increasingly for the achievements related to the proper management adopted for it, over time.

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Tourism, from the above, can ensure sustainable development, if integrated in targeted planning strategies that demonstrate an in-depth knowledge of the area and its tangible and intangible values. These policies must not only be shared by an intellectual elite, scientific Research Centers and Universities, but also by local communities, which are both involved in the learning process of these values, and in the strategic choices for the territorial governance and heritage management. The cooperative and synergic project has regard the historical matrices that identify the places and, from these, should propose policy of planning for the future. This not only for landscape, artistic and monumental assets, but mainly for the educational development, social and cultural integration, which are the indispensable base for a general improvement of living conditions of citizens in respect of the material and intangible values of that community.

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Structural failures due to anthropogenic sinkholes in the urban area of Naples

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Abstract
The heritage in masonry fits in any type of intervention both from the point of view of morphology than from the point of view of the material. The ability to find a new equilibrium configuration after each variation corresponds to a real capacity for adaptation. In current terms it could be said that masonry buildings embody the prototype of resilient structures. As known, the only problematic able to put in crisis a huge masonry building is the failure of the subsoil. In this sense the work aims to analyze, by relating the planimetric layout of the underground cavities of Naples with some recent collapses of structures that occurred in the city, highlighting collapse mechanisms in static terms. By analyzing the structure per macro elements, starting from individual structural components that constitute it, it is possible to trace to the global mechanism of the entire collapse and to attribute, with certainty, the cause to the corresponding existing empty. Another aspect of the problem concerns the triggering joint cause of these structural failures which generate the fragility of the subsoil. In other words, the accidental cause that induces the collapse of the structure, the same structure which has been standing for decades on the same cavity. This work intends to bring to light an already known issue to which a solution is not immediate (unless filling the cavity) but the awareness of the existence of these cavities should lead to more attention to future planning.

Keywords: masonry, structural failures, subsoil, underground cavities, collapse

1. Introduction. The case study of the Faculty of Veterinary Medicine of Naples
Constructions in masonry, contrary to what you think, are structures that provide a high level of safety in function to the strength of materials and construction techniques adopted, together with the fact that they are able to settle and to find a new equilibrium configuration after each variation in the presence of failures; in other words they embody the prototype of resilient structures. There is just a problematic that is able to put in crisis a masonry building: the failure of the subsoil; the structure reaches the collapse for the creation of cavities or chasms under it, which literally remove the support surface of its foundation.
This work relates to the collapse of two buildings of the Faculty of Veterinary Medicine of Federico II, that occurred in Naples in December 2015. Starting from a real case of the collapse of a masonry building, the research aims to correlate this collapse with one of the cavities present in the subsoil of Naples and to attribute with certainty the cause of the collapse to the corresponding pre-existing empty (or to a newly formed) below the concerned building.
Therefore, we go on to illustrate below all studies carried out with the goal of determining the dynamics of the collapse and the causes that led up to it.

1.1 The building collapse
On December 9, 2015 collapsed two buildings located between Via Federico Delpino and Santa Maria degli Angeli alle Croci, namely the Department of Parasitology and Avian Pathology of the University Federico II of Naples. [1,2] The two buildings, built in the 60s and 70s, belonged to the largest complex of the Faculty of Veterinary Medicine commissioned by Ferdinand IV and that took seat in the ex Franciscan convent of Santa Maria degli Angeli alle Croci, already between 1798 and 1815,

erected to the north-east of the old center of Naples, on the slopes of the hill on which stands the Astronomical Observatory next to the Botanical Garden [4].

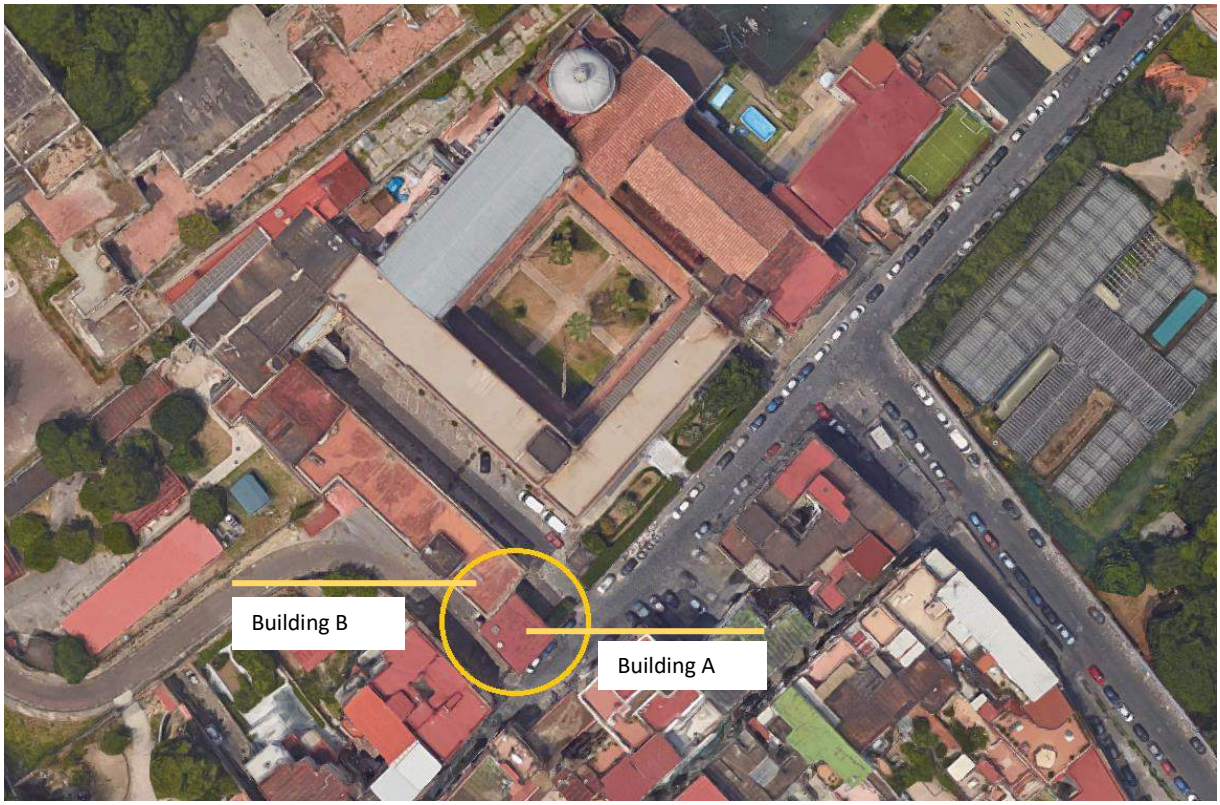
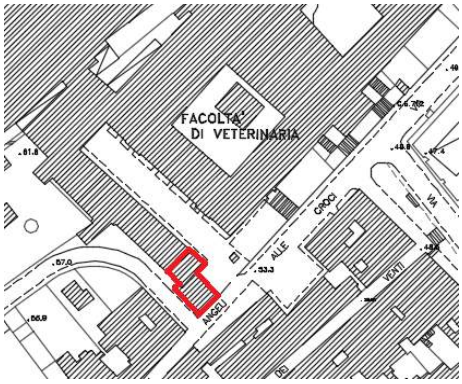


Fig. 1: Orthophoto with identification of the buildings before the collapse.

The two edifices in question, were probably built at different times according to their construction characteristics; in fact, a building (which, for simplicity of identification, we'll call "building A") has a load-bearing tuff masonry structure and the other one (which we'll name "building B") presents a framed reinforced concrete structure and tufa walls.



a)

b)

Fig. 2a: Site plan with identification of the two buildings. **Fig. 2b**: Picture of the buildings before the collapse.

The first claim crunches have occurred at 4.30 am on 9 December; at 13.30 the collapse and fortunately no victims. [1] The building A, collapsing, dragged with it also part of the neighboring building B. The area was immediately impounded by the court for appropriate measures and this has contributed to the impossibility of carry out, to date, site inspections and investigations.

a)

b)

Fig. 3a: State of places after the collapse. **Fig. 3b**: State of places at the beginning of study activities.

In Figure 3b) high up, you can see the places object of the collapse as found at the beginning of the study activities and search conducted. From the picture you can see how the collapsed building has completely been knocked down for the safety of the people living the area; currently the area has been released from seizure but the rubble has not yet been removed.

2. Studies carried out [5]

Starting from the analysis of lesions, visible by photographic shots immediately before the collapse, it was possible to reconstruct the phases of the collapse. [6] In Figure 4, shown below, four phases of the process have been identified:

- a first phase, concerning the junction of the failure and the formation of the lesions;
- a second phase, in which, increased the thickness of the lesions, you can note the detachment of portion of the building (A) and the rotation of the same that impacts on the adjacent building (B);
- the collapse of the portion of the building (A) affected by the disruption;
- the collapse of part of the adjacent building (B) that suffered the impact.

1

2

3

4

Fig. 4: The phases of the collapse from the formation of the lesions to the crash.

The crack pattern mapping, being a masonry building, allowed to obtain the necessary information to determine the causes that generated the damage. [7] In figure 5, a first step of analysis and considerations has been schematized with drawings of the building A in plan view and elevation:

a) in plant the walls P1 and P5 have been identified in red: characterized by the presence of lesions, as it will be seen later, they will lead to collapse;
b) the wall P1, in load-bearing masonry, without openings, had probably lesions with variable trend both vertical and horizontal localized till the buttress;
c) the wall P5, also it in load-bearing masonry, had inclined lesions located on a vertical strip around the openings, that is, in the areas of least resistance.

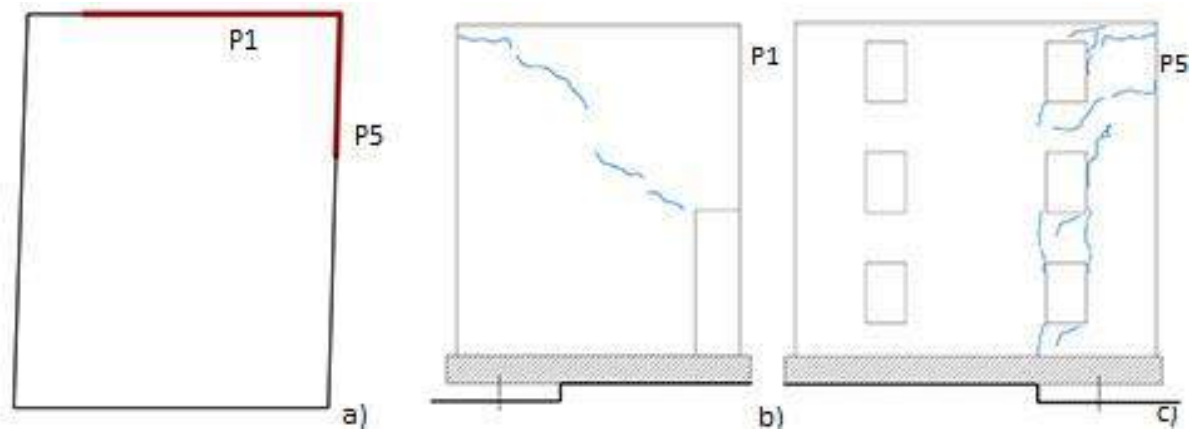


Fig. 5: Study graphs of the lesions

From the study of the crack pattern detected, it is clear that almost all lesions were caused by a subsidence of the foundation. Infact, they generally are diagonals and sometimes semi-parabolic, pendants in the same direction and that go to shut down, showing phenomena due to a particular kind of failure. So we are in presence of differential subsidence of land. [8,9]
So, it has been observed that, the building (A) has undergone a seabed subsidence and a rotary movement in the direction of the other one (B) which, as a result of the thrusts due to the strong impact, collapses in turn for a part.

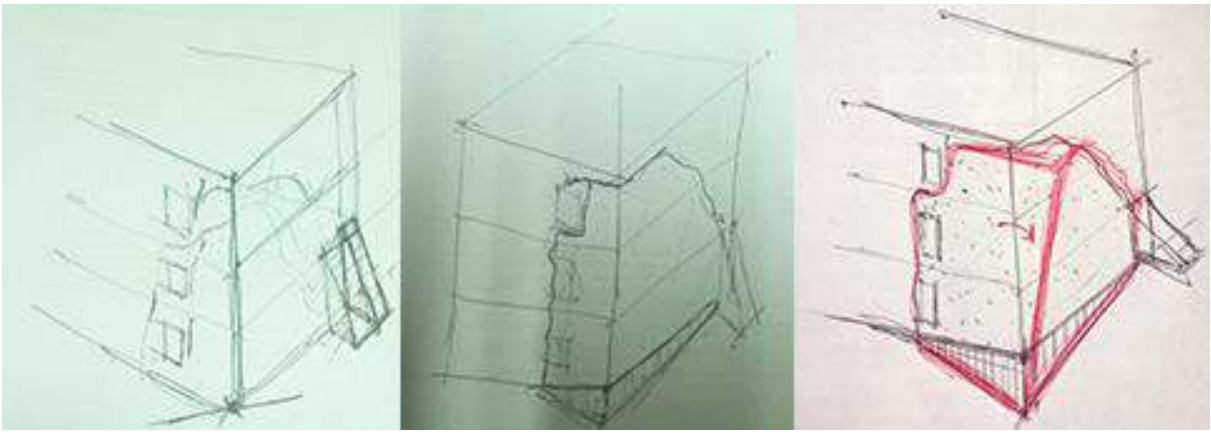
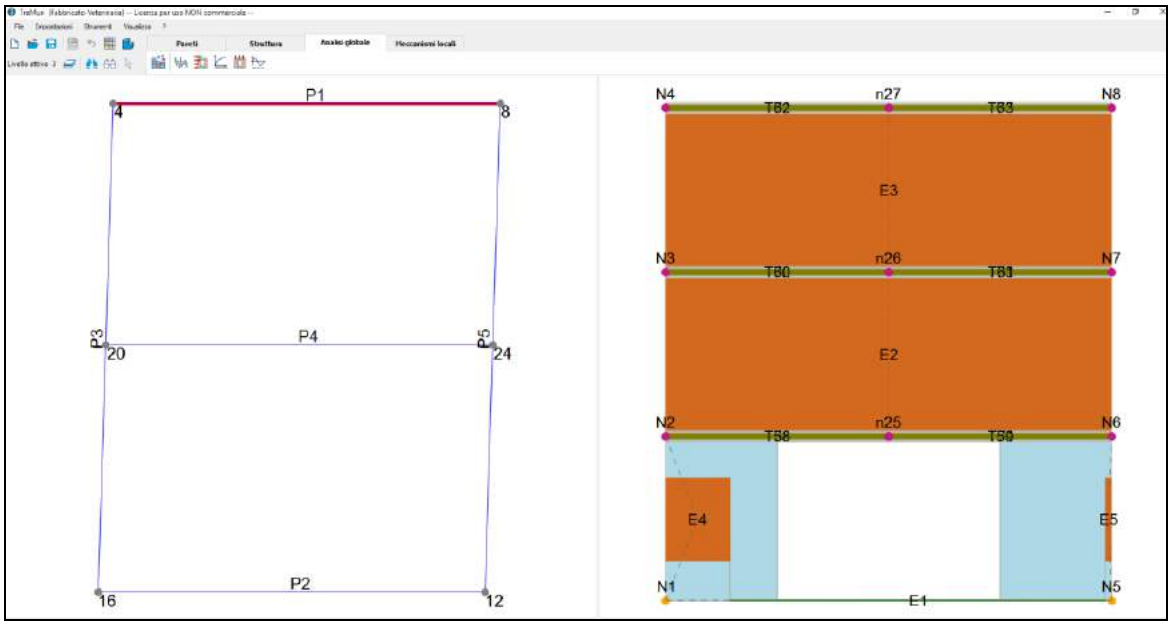


Fig. 6: Drawings on the hypotheses of the collapse.

2.1 Application of the software 3Muri [10]
After all these considerations made until now, it has been undertaken the verification of the assumptions carried out by using of the analysis and calculation program of masonry structures: "3Muri".
First of all we proceeded, in 3Muri, to the automatic construction of the geometrical model and the mechanical characteristics of the structure have been defined. Completed the input of data, it was possible to proceed with the analysis of the entire structure; starting from the geometry and from the

inserted structural objects, the information for the analysis were obtained, according to the model 3Muri that automatically determines the equivalent frame.



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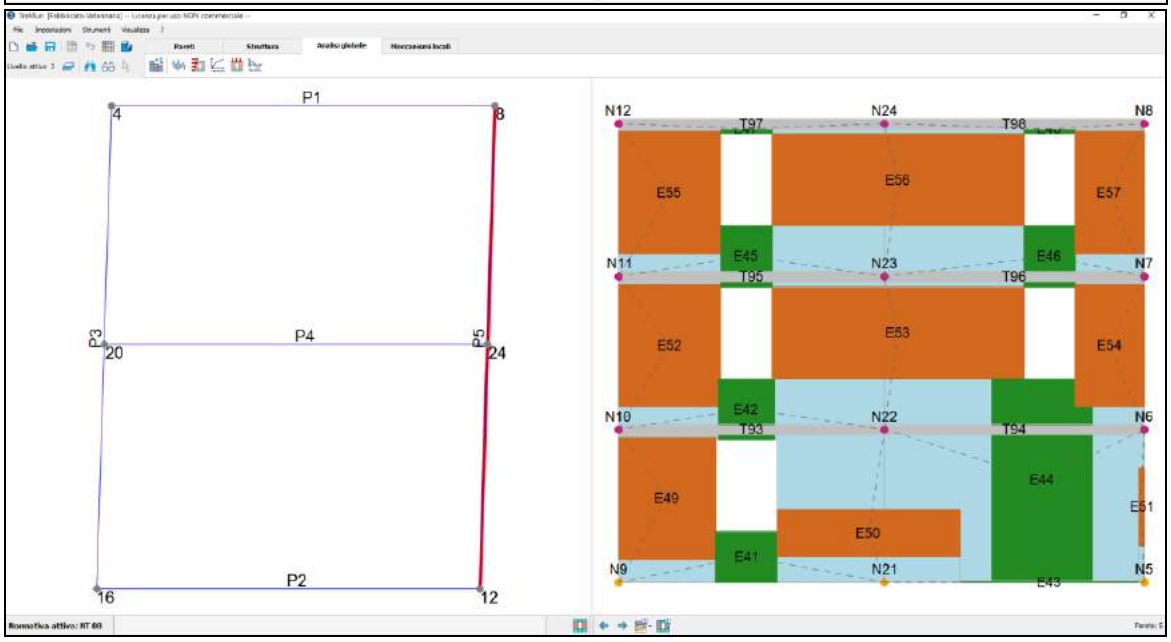

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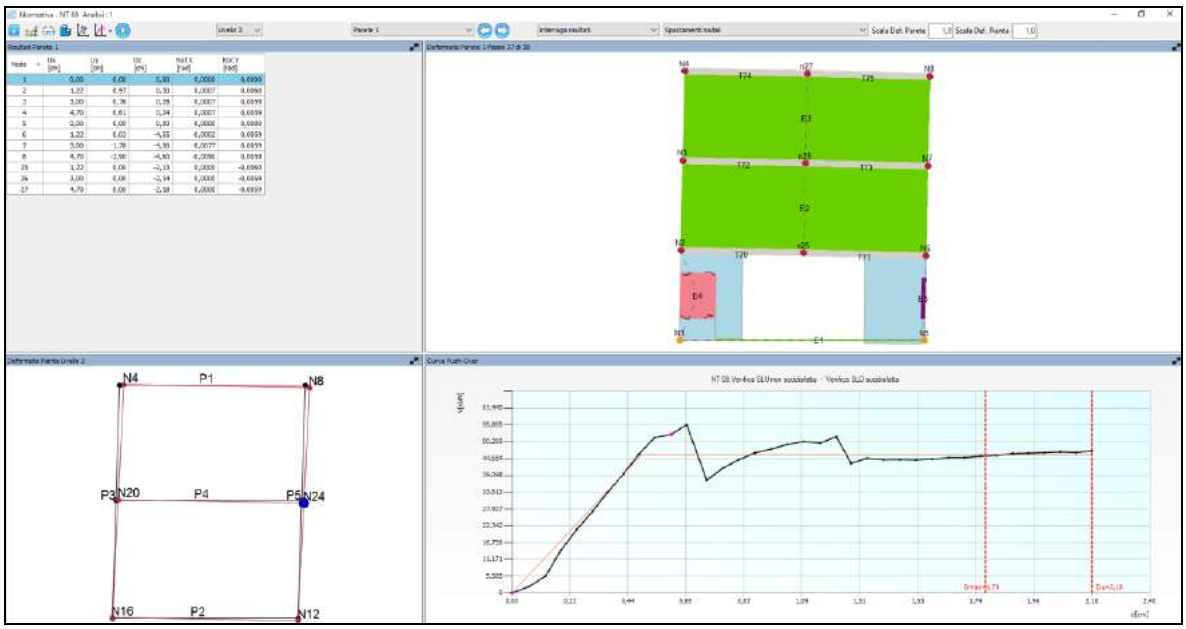
Fig. 7 a, b: Geometrical model introduced and, as a result of automatic meshing, presentation of the equivalent frame - with reference to the wall P1 and to the wall P5 respectively

This led, finally, to the calculation with an analysis of push-over type. [11, 12, 13]
3 Muri returned the results in a space, split into four windows (Fig. 8):

- area 1: is visible the elevation view of the concerned wall;
- area 2: shows the numerical results;
- area 3: it is presented the general plant deformed according to the load; also shows the wall indicated in area 1;
- area 4: it is presented the stress-strain curve relative to the whole structure.



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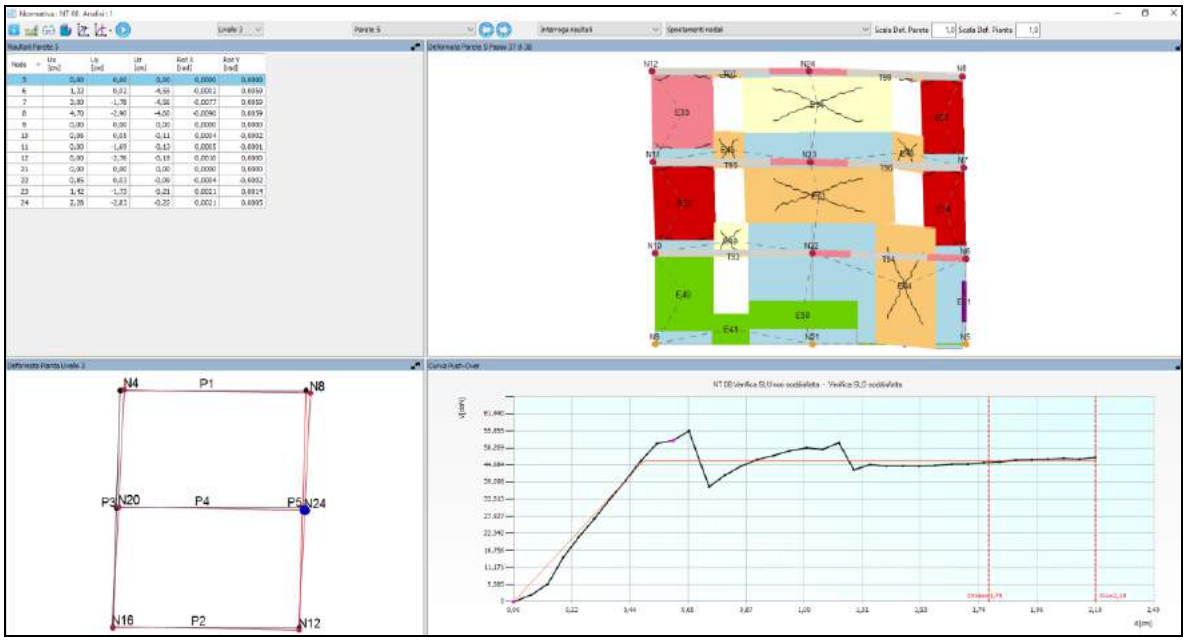

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Fig. 8a: Result of the analysis with 3 Muri - Wall P1. **Fig. 8b**: Result of the analysis with 3 Muri - Wall P5.

3. Probably causes of the collapse

The causes of instability, with a consequent manifestation of injuries till the activation of the motion through a kinematic mechanism of failure, are often linked to foundational subsidences. [14, 15]

In this case, the collapse has clearly happened because has dropped a portion of the building A in masonry that has impacted against the building B, determining in turn the collapse of a part.

But fundamental, it is that masonry buildings do not collapse for little movements because, as aforesaid, tend to take on a new configuration and to settle. This confirms the theory that we are in presence of a seabed subsidence due to the absence of the supporting ground of the foundations, in other words we are in presence of an existing cavity or a hole that has been generated. In fact, the most plausible hypothesis for a land subsidence is the formation of a cavity.

The bearing surface of the foundation, for example, due to a water infiltration or by subsidence of the mantle of a cave below, loses its load-bearing quality, that means that at equal stresses transmitted from the building, it assumes excessive deformations and in any case not those ones of project. In other words occurs localized a subsidence of volumes of soil intended to absorb the forces transmitted by the foundations. Nothing would happen if the subsidence was evenly distributed throughout the foundation plan: the building would drop slowly until find the most compact soils. No lesion, of course, would appear in the building that would be subjected to a uniform vertical translation. Instead, lesions

of posting would appear between the building and the non-structural elements not subject to the same translation (patios, sidewalks, etc).
Unfortunately, this case is extremely rare in real life because in the majority of cases the foundation is always partially concerned by the failure and transmits this state to the overlying building in which injuries occur around the contact line between the facing walls on the intact foundation and those ones resting on the part of foundation concerned by the failure.
A similar example, now an established fact, is the case of the historic building at Riviera di Chiaia (Fig. 9) whose collapse occurred because of the excavation for the construction of Line 6 the Naples Metro; by digging the tunnel, the water has filtered into the cavity, the ground was completely transported from the water and, lacking the support to the building, the collapse was triggered.

Fig. 9: Collapse of the building at Riviera di Chiaia.

4. Conclusions

The territory of the Municipality of Naples is one of the Italian urban areas characterized by the presence of a widespread network of underground cavities. The presence of these cavities is a factor that, in itself, does not involve problems related to sudden subsidence, since a large part of the Neapolitan subsoil consists of tuff rock (tufa); the real problem is the interaction of water with other materials that constitute it (layers of vegetable ground and lapilli) in presence of cavities. [16]
In every city around the world, when the water interacts with the materials in the subsurface, impregnates them, creates a constipation of the same, small depressions and, most often, comes to light on the surface; a fast action will prevent the worsening of the depressions of the soil and yieldings of artifacts.
In Naples this does not happen, precisely because in its subsoil there are also cavities and thousands of wells, whereby the water, which tendencially tends to move downwards, always finds a preferential way towards a well and, in it, washes out the loose material overlying the tuff, creating inverted cones that become evident on the surface with pits in which most of the time the buildings are involved. The problem, therefore, exists when the water that flows in the subsoil runs through spaces where the rock there is not, or there is the soil. [17]
The case study examined in this work is one of the examples of failure of a building due to the phenomena of sudden subsidence for emptying the support surface of the foundation linked to the creation of a sinkhole or the collapse of grounds constituting the turn of an existing anthropogenic cavity, probably triggered by concentrated infiltration of rainwater or by substantial losses of the system water supply.
In conclusion, affirm that "the cause of the damages are cavities in the ground" has become a commonplace, because greater attention in the maintenance of basic infrastructure, would avoid the infiltration of water and the resulting run-off of the incoherent overlying the cavities, primary cause of chasms and, therefore, of structural instability.

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Le Vie dei Mercanti XIV International Forum
WORLD HERITAGE AND DEGRADATION
Smart Design, Planning and Technologies
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The drawing of the architecture, of the vegetation and the water.

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Abstract
A complex architectural and infrastructural system which channels through the Carolingian aqueduct, the waters of the Fizzo sources; modifying natural landscapes large parts of the Terra di Lavoro campaign and through the Royal Palace, the Royal Seterie of San Leucio and the Royal Palace of Carditello characterizes monumental sense this area just north of Naples. Connecting element between the wild nature of the area and the nature of the Royal Palace is definitely designed the spectacular waterfall that comes down from Monte di Briano. The waterfall that presents in two infrastructure prospects reversed: first point of arrival Carolino Aqueduct and perpetual supply element of the long chain of tanks, used as fish ponds, which structure the main focus of the linear park along the Vanvitelli Royal Palace.

Keywords: Drawing, Survey, Luigi Vanvitelli, Carlo Vanvitelli, Caserta.

1. Introduction
On 25 February 1752 laying the foundation stone of the Albergo dei Poveri in Naples, designed by Ferdinando Fuga, and it's only been thirty-five days by a similar ceremony took place in Caserta on January 20 of that year: the laying of the foundation stone of Reggia di Caserta and designed by Luigi Vanvitelli. Two large buildings designed to accommodate, the first, the lower class of the capital of the Kingdom of Naples, and, second, to host the royal family of Carlo di Borbone, and part of his court. A sober building, although huge in size as per the original project, and a stately building with, in contrast to the Albergo of the Poor, a scenic area defined landscape from the Royal Park for about extending between and a half kilometers from the rear elevation of the Royal Palace, northward, up the slopes of Monte di Briano, relief belonging orography of Tifatini Mountains, where it is made from scratch an artificial waterfall. "I visited to Hackert granted to him in his luxurious house in the old royal palace. The new is an impressive building, like the Escurial, square-shaped with numerous courtyards: an architecture fit for a king. The location is awesome, in the most fruitful plains in the world; the slides under the mountain park. An aqueduct here conveys an entire river to meet the needs of the building and the adjacent area; This body of water forms, jumping on rocks artfully arranged, a wonderful waterfall. The grounds are beautiful, in harmony with the whole region which is itself a huge garden". So wrote Johann Wolfgang Goethe in his "Italian Journey" about Reggia di Caserta and its park vegetation consists of a strict linear system characterized by a close succession of large rectangular ponds, designed by Luigi Vanvitelli, and a romantic garden at 'English realized, between 1785 and 1805, by Carlo Vanvitelli and the John Andreas Graeffer gardener. The music of Johann Wolfgang Goethe summarizes the complex configuration and architectural landscape that, from 1752, will tend to infrastructure an extended geographical scope, the so-called Campania Felix, between Benevento area and the Caserta area or between the Monte Taburno and Tifatini Monti. A complex architectural and infrastructural system that channels through the Carolingian aqueduct, the waters of the Fizzo sources; amending also landscapes, large parts of the Earth Work campaign and, finally, through the Royal Palace, the Royal Seterie of San Leucio and the Royal Palace of Carditello characterizes

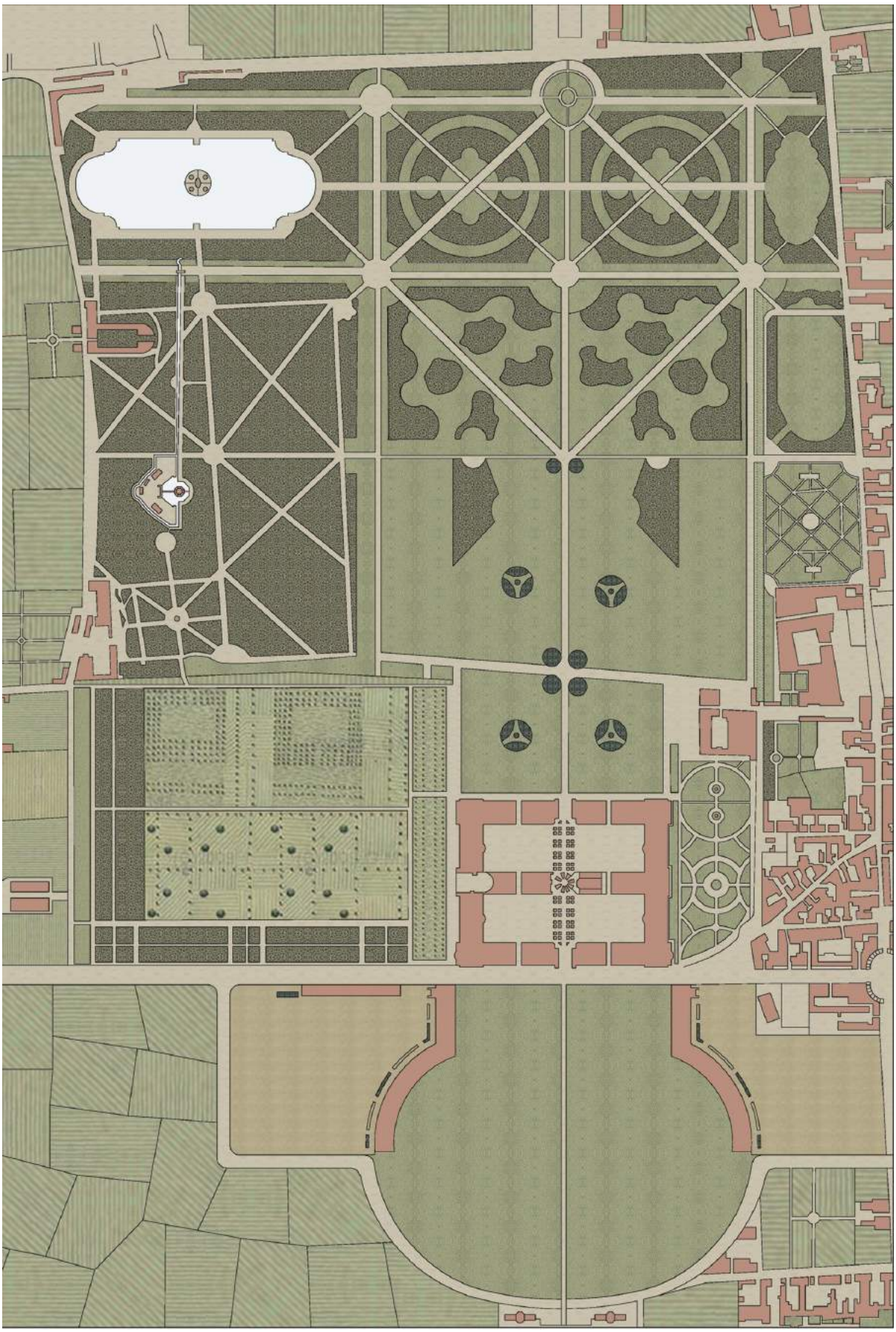

Fig. 1: The design of unrealized architecture of Royal Palace of Caserta, 1850

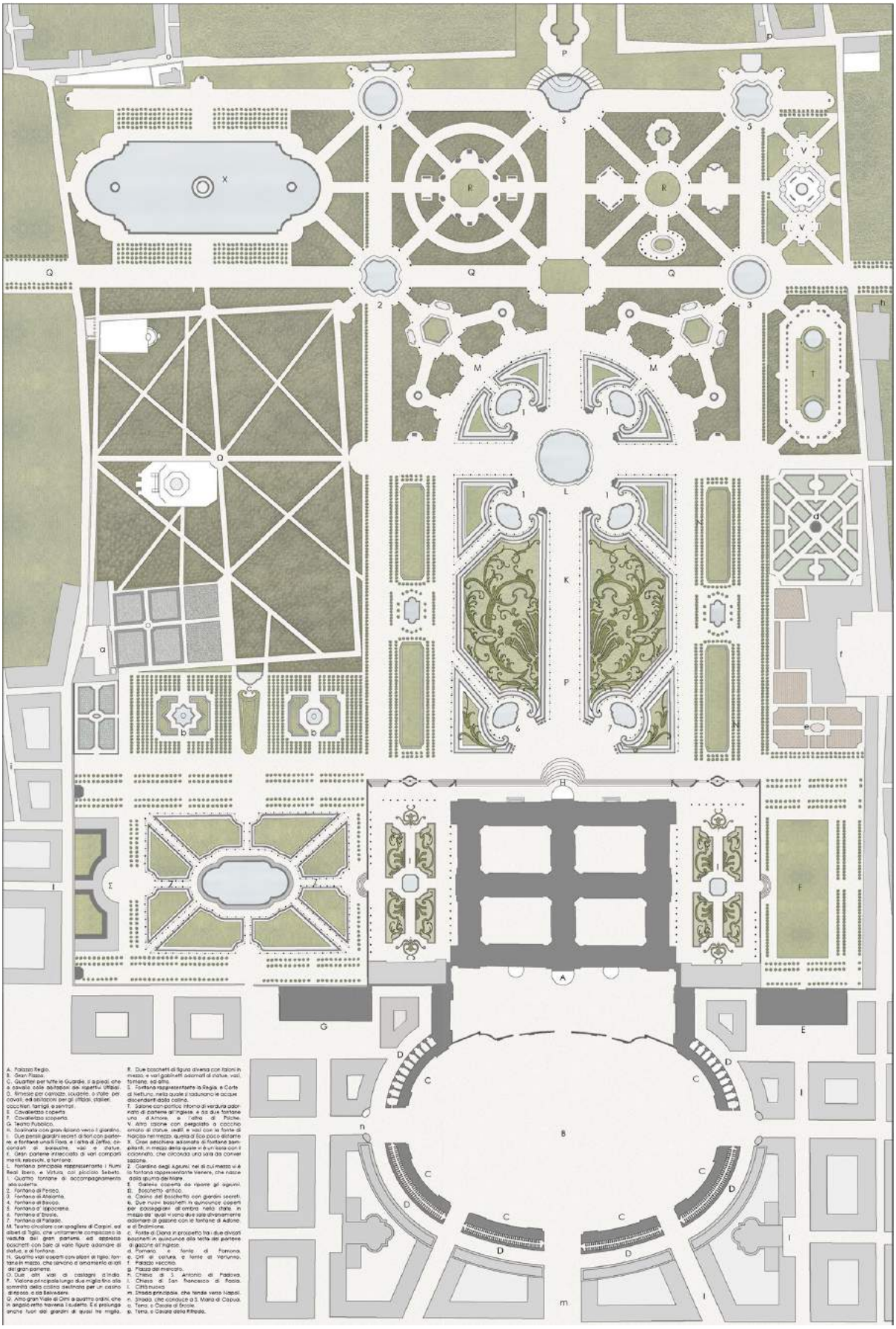

Fig. 2: The design of unrealized architecture of Royal Palace of Caserta, 1750

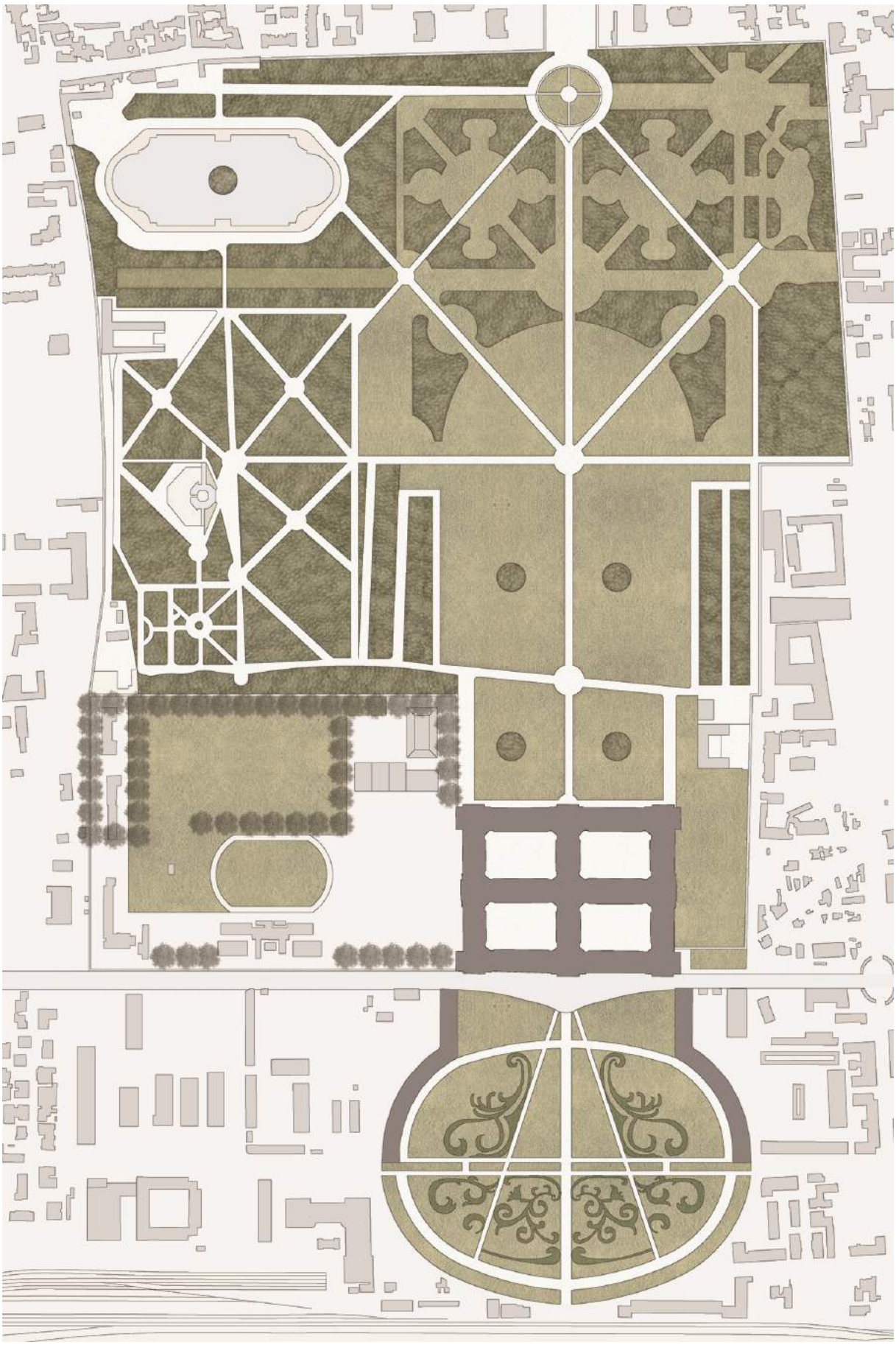

Fig. 3: The design of unrealized architecture of Royal Palace of Caserta, 2016

monumental in the sense that pre-Apennine area located north of Naples. linking element between the wild nature of the area and the nature of the Palace is definitely designed the spectacular waterfall that descends from Monte di Briano. Waterfall that occurs in two infrastructure prospects reversed: first point of arrival Aqueduct Carolino (measuring water infrastructure as a whole thirty-eight kilometers) and, on the other hand, the perpetual supply element of the long chain of tanks, used as fish ponds, which structure the main axis of the linear park along the Vanvitelli Royal Palace. An architectural and landscape complex that based precisely on the strong presence of vegetation and water its own distinctive identity principal to the point of pushing the same designer to emphasize the following words, written in the introduction of the Declaration of designs Caserta Royal Palace dedicated to the Sacred Royal Majesty, the attention to the naturalistic elements of architectural design. […] So then in Part Two, will be outlined, the variety of gardens, the building of the great work dell'Aquidotto, that much distance must conduct large volume of clear water, only for the vague formation of numerous fountains [...]. Description magnificence of vegetation and water which are also themed within the legend of Table. 1 of the Declaration engraved by Carlo Nolli letters to the following paragraph: *I□ Due giardini de'fiori colle fonti di Flora e Zefiro; K_ Gran Perterra; L_ Fontana Principale delli Fiumi Reali Ibero, Vistola e piccolo Sebeto, 1_ Quattro fontane d'accompagnamento, 2_ Fontana di Perseo, 3_ Fontana di Attalanta, □□ Fontana di Bacco, □□ Fontana di Ipocrene, 6_ Fontana d'Ercole, 7_ Fontana di Pallade; O_ Viali di Castagni d'India; R_ Due Boschetti con Saloni e varii Gabinetti adornati di Statue e Fontane□S□ Fontana rappresentante la Regia Corte di Nettuno□T□ Salone con Portico intorno di Verdura con Perterra all'Inglese e due fonti di Amore e Psiche; V_ Altro Salone con Pergolato a Cocchio, adornato di Statue, Sedili e Vasi con la Fonte di Narciso e □uella di Eco ivi vicina□□□ Gran Peschiera con Isola in mezzo adornata di Fontane ed altro□□□ Giardino degli Aranci nel di cui mezzo vi è la Fonte di Venere; W_ Galleria e coperto da custodire gl'Aranci nell'Inverno; Ω_ Boschetto Antico□a□ Casino del oschetto con Giardinetti, b□ Due nuovi Boschetti in □uinconce per passeggiare all'Ombra con due Sale e Fontane di Adone e di Endimione, c□ Fonte di Diana, d□ Pomario alla Fonte di Pomona, e□ Orti di coltura colla Fonte di Vertunno.* Well theming mythological having as support structuring the use of green and water infrastructure is the innovative architectural material with which to confront in order to enrich the institutional architectural vocabulary to be used for the realization of the great monuments of the European monarchies. The theming mythological invigorated by the discoveries of the classical sites through the excavations and the related discovery of forgotten cities and buried under the ashes of Vesuvius from Pompeii to Herculaneum blends so with new lines of research that the design of the landscape experiences in Europe beyond the Alps. […] After the discovery of Herculaneum, that is to say Resina, Pompeii, Stabiae, Oplontis, since 1783 it is determined a new point of view, extending the visual art to everyday life and the ancient architecture, turn on the interests of the European courts. Even so, the kind "pitoresco" printed, which includes images of ruins, it is stated in a few years, from the end of '600 (Misson, 1688 Berkeley, 1713-14 and 1716- 20) and the second half the '700th, in close relationship with Paestum, Sicily, southern Italy and the Mediterranean, thanks to the travelers German, English and French […]. Also the pictorial culture landscaped background assumes considerable importance to implement the environmental quality in which the monumental architecture in the early decades of the eighteenth century were immersed: the sublime visions of Claude Lorrain, Hans de Jode, Joseph Vernet, seventeenth-century painters of classical landscapes and romantic, they have certainly contributed to the research of new design experiments of landscape character. Luigi Vanvitelli, son of the Dutch painter Gaspar van Wittel, has brought in the design for the Palace of Caserta the deep content of the pictorial tradition of using it to the architectural character of the open spaces of the extensive royal park. A characterization that will, in part, sacrificed by non-realization and that, conversely, through the work of his son Carlo, will be enhanced through a design intervention model designed according to the aesthetic of the picturesque English. That is on one hand the parterre Western located opposite the side elevation of the Royal Palace and on the other, the vegetation enclosure in the English Garden located in the eastern north of the Royal Park. Two models of the garden, the first rational and picturesque the second, able to put those innovative character of the project of ground vegetation that were scattering in major European parks through the contribution of theoretical and landscapers as a M.A. Laugier and his embellishment of the gardens in Essai sur l'Architecture or by Jacques-Francos Blondel in De la distribution des maison de plaisance et de la Décoration en général des Edifices in the second book. Also neo-Palladian designers like Colin Campbell in the house Henry Hoare II to Stourhead which has a picturesque garden with rustic grotto designed by Henry Flitcroft. Well all these influences are drawn and partly realized in both the exempla in question.

2. The Western "Parterre", an vegetation island unrealized

As for the Western Parterre the reference drawing is again the Table I of the Declaration of the Royal Palace of Caserta drawings together with perspective views relating to Table XIII and Table XIV. One of the most interesting aspects, beyond the compositional setting of the Parterre, is the presence on

the western side of the same of a building curtain having the function of closing, architecturally and scenically, that invaded the space. Specifically, building block that materializes this architectural landmark, leaning against the western wall of vegetational park, is defined by two separated irregular courts by a cross arm that, in the eastern front, the anthesis views of the Parterre, is configured in a form to exedra. Well, it is known that the bottom of the proscenium of the Court Theatre has a large opening portal to the Western Parterre, it can be assumed, in all probability, that the convex semicircular should be the point of final flight of a perspective that, starting from royal box, projected outward up to include in its visual cone of architectural scene in question. It is no coincidence, in fact, that the Western semi-arm longitudinal axis of the host of the Caserta Royal Palace Court Theatre is perfectly aligned not only with the neighboring parterre but also with the building block unfulfilled adjacent to the boundary wall west of the Royal Park . Further proof of this hypothesis is to be found in the large painting cloth that currently closes the proscenium of the internal perspective of the Court Theatre: a representation of an open space defined by the presence of an architectural backdrop with the same morphological characteristics of the fifth Western building but still unfulfilled represented in the plan of Table I of the Declaration of the Royal Palace of Caserta drawings. From the point of view of composition, the western parterre is defined by a neo-classical design that is inspired by the design of the parterre proposal in La théorie et la pratique du jardinage of 1709 by Dézailler of Argenville. Specifically, from east to west, or from the west front of the Royal Palace until the building with concave semi-circular exedra, the Parterre is characterized by two open spaces located at different heights and connected together by elliptical stairs placed in the middle of longitudinal axis. The first area, or such behind the west front of the Royal Palace, is defined, as shown in the legend at the bottom of Table I to the alphabetical I, “Due giardini de’fiori colle fonti di Flora e Zefiro” resulting features four central flower beds with an octagonal pool and on the south side, from a high porch structured in five serlianas; on the northern side, in addition, by a balustrade with classic columns separated by four piers on which they are placed a marble sculptures and, finally, on the western side, by two balustrades, separated from that elliptical staircase, supporting pedestals on its large ornamental vases. The second area, located at a lower level than the first, is characterized by eight flower beds, arranged in a cross of St. Andrea, around a large water tank containing three powerful of vertical water jets. In turn, this architectural ensemble is bounded by a double row of trees that characterize the avenues to the contour. Aligned with Fonte di Flora, the exedra built inside the “Prospetto teatrale di Spagliere con Boschi, e Sale adornate di statue, e Fonti” closes the prospect of Parterre. The same term used in the legend of Luigi Vanvitelli leads to a theatrical feature scenic character, thus legitimizing the hypothesis of a relationship, at least perceptive, between the inside of the Court Theatre with the external space unfulfilled. If this open space located in the west of the Royal Palace, unfortunately not realized, represents a missed opportunity than the original building designed by Luigi Vanvitelli, in contrast, the enclosure of the next English garden, designed by the son of Louis, Carlo Vanvitelli, is a testimony to the architectural, sculptural and vegetation completely innovative with respect to the green configurations designed and published it the Declaration of drawings of the Royal Palace of Caserta. Specifically, the English Garden is built by Carlo Vanvitelli thirty two years after the start of work of the Royal Palace and only after the realization of the great ending linear park to the north with the fountain of Diana and Atteone and the scenic artificial waterfall designed by his father Luigi. The settlement area of the English Garden, chosen by John Andreas Graeffer gardener, is located on the northeastern side of the monumental Park and its main entrance is reached by tangential side clearing the fountain of Diana and Atteone. It treats of a twenty-five hectares recessed, in its northern part, in a narrow gorge behind the Monte di Briano and extending toward the south through rolling hills that announce a wide flat and clear with the neighboring village of Puccianiello. Originally an agricultural area devoted to grain production and equipped with a water tank designed and partially built by Luigi Vanvitelli in the site that, at present, is home to the Royal Aperia. Architectural complex, the latter, which announces, from the largest share of the charming enclosure vegetational, the underlying English garden embellished with other architectural objects and sculptures dotted along its winding paths. A close succession of architectures or small water infrastructure and have a walk (dams, canals and bridges) that emerge as solitary found objects, from the thick vegetation or are reflected in the waters of the canals and artificial lake that the structure of the central area garden of delights. In the large panoramic and architectural scenery of the Royal Palace of Caserta The English Garden is a small environmental tile great evidential value. Not only for its ability to express the new tendencies of the British landscape that, in the last decades of the eighteenth century, they were saying in Europe. The English Garden is realized as a pleasure garden by order of Queen Maria Carolina, wife of King Ferdinand IV and sister of Marie Antoinette the wife of Louis XVI. A new type of garden characterized not so much by large prospective telescopes monumental type but as a field of vegetational secluded intimate character than the official court life. Gardens where mirrors and watercourses, rare trees and flowering gardens, temples and architectural building pavilions, greenhouses and botanical bright dark artificial grottos follow each other in ways designed and programmed to arouse awe and wonder in the privileged beneficiaries of the time. The

English Garden of the Royal Palace was realized in two stages: from 1785 to 1789 under the leadership of Maria Carolina and since 1790 onwards under the direct supervision of Ferdinando IV. A real English garden able to enter those innovative character of the project of ground vegetational that were scattering in major European parks through the contribution of theoretical and landscapers such as M.A. Laugier with its landscaping of the gardens or by the theory treated the gardens had printed in London in 1770 by Thomas Whateley Observations on Modern Gardening, Illustrated by Descriptions or even the Dissertations on Oriental Gardening by William Chambers in 1772. Also neo-Palladian designers like Colin Campbell in the house Henry Hoare II to Stourhead which has a picturesque garden with rustic grotto designed by Henry Flitcroft. Well all these influences unfold, according to metaphysical mode and surreal, in the landscape system devised by the architect Carlo Vanvitelli and the John Andreas Graeffer gardener for the central part of the English Garden. A park vegetational inhabited also by different architectural pavilions designed by Carlo Vanvitelli or the Royal Aperia, the House of the Gardener, the School of Botany, the Criptoportico, the palladian greenhouses and that, covered with sheets of glass, nineteenth-century, and the Ruin on island of the artificial lake and the neoclassical temple in the southern sky in the English Garden. Taken together, both the Parterre Western unfulfilled and is the enclosure English are two different ways of conceiving and structuring the design of the open space in the Age of Enlightenment.

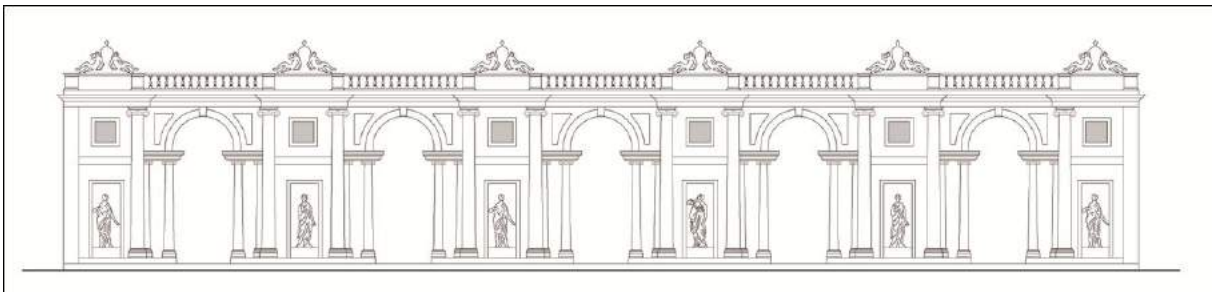

Fig. 4: The design of unrealized architecture of Royal Palace of Caserta, prospect

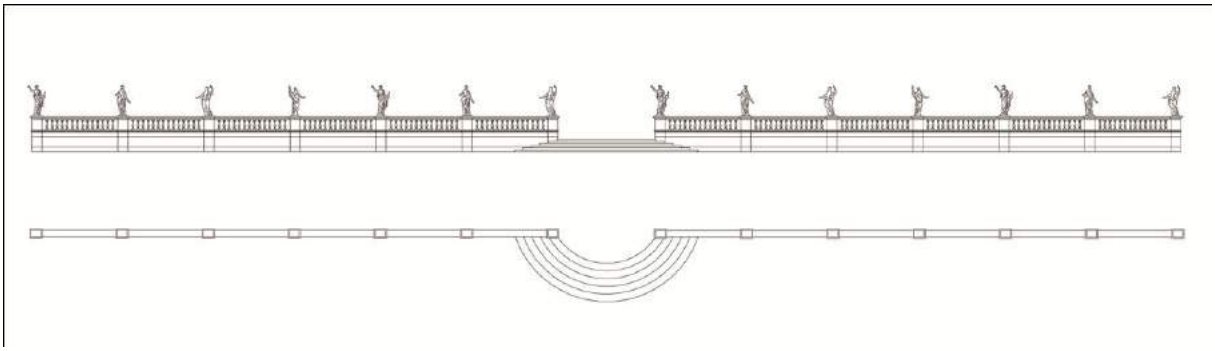

Fig. 5: The design of unrealized architecture of Royal Palace of Caserta, plan.

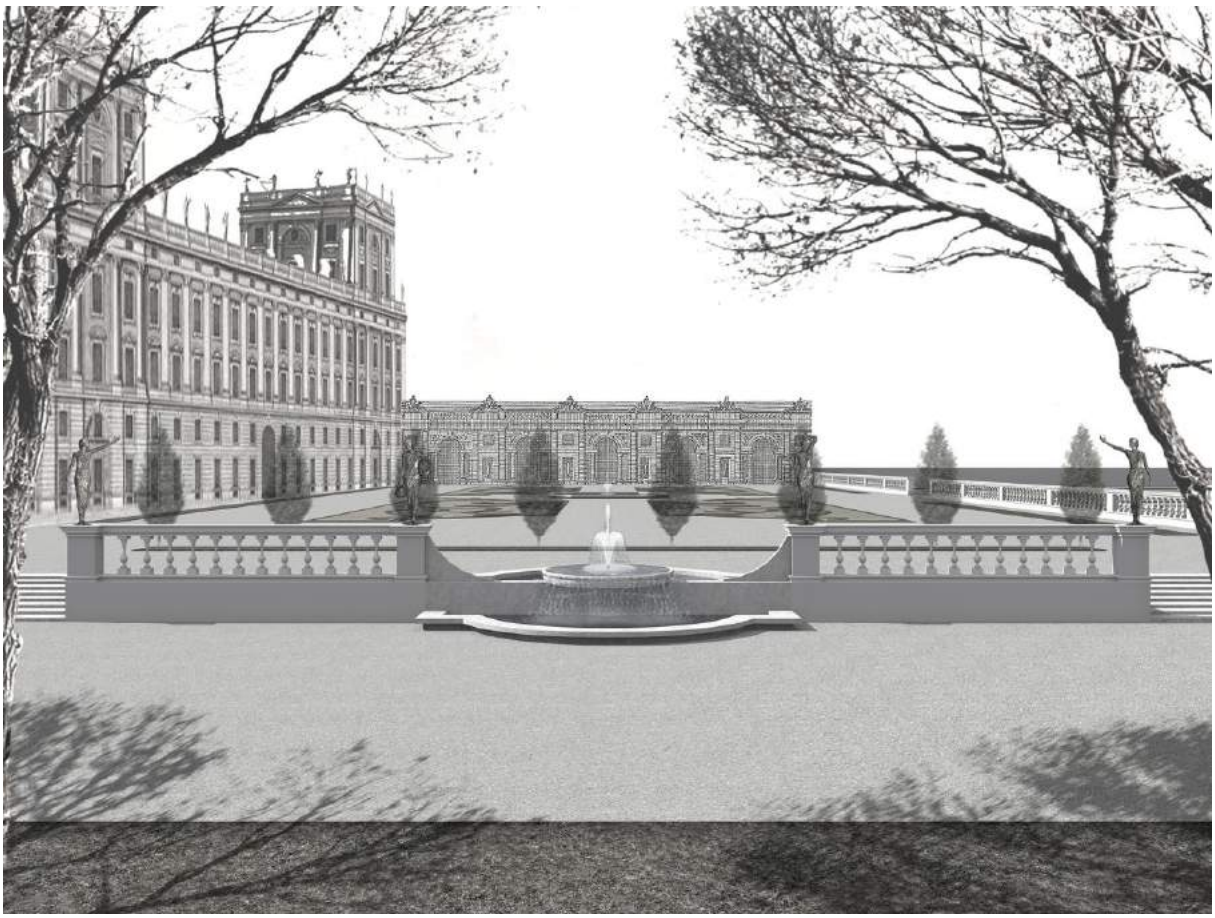

Fig. 6: The design of unrealized architecture of Royal Palace of Caserta, 3D rendering

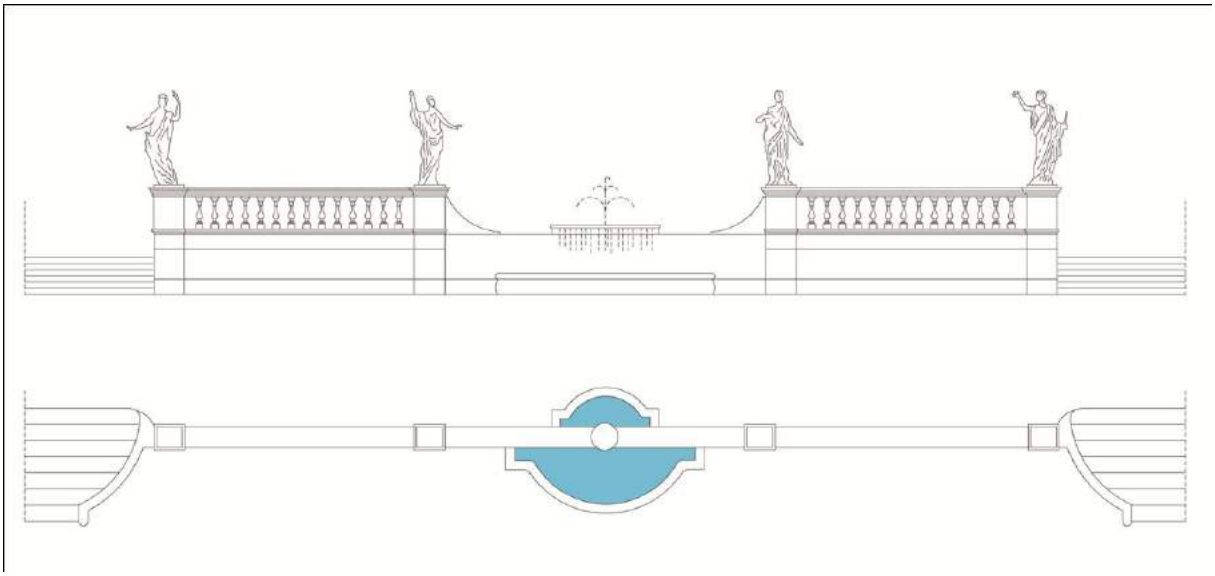

Fig. 7: The design of unrealized architecture of Royal Palace of Caserta, prospect and plan

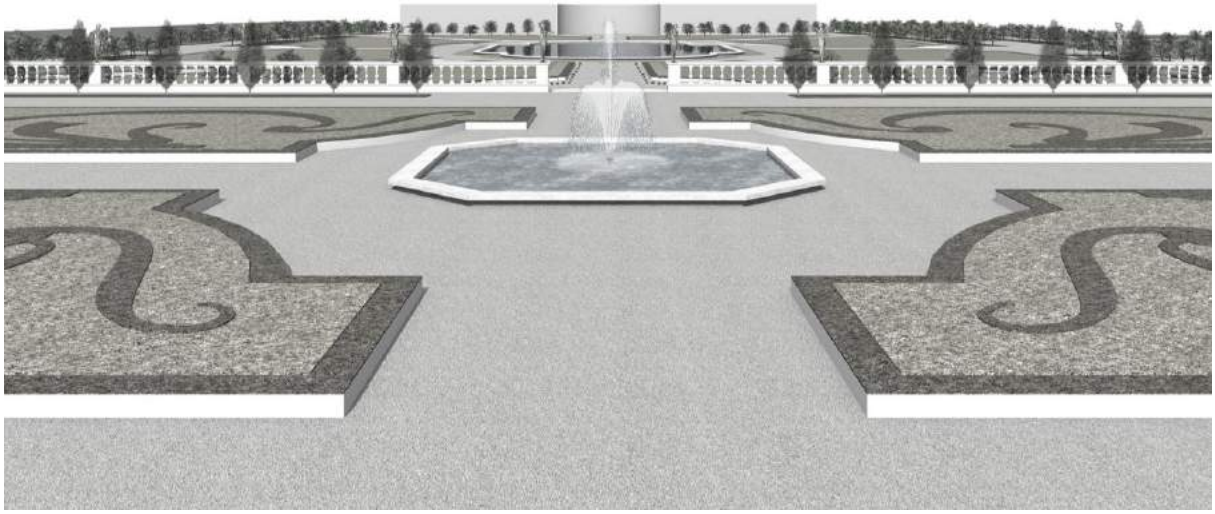

Fig. 9: The design of unrealized architecture of Royal Palace of Caserta, 3D rendering

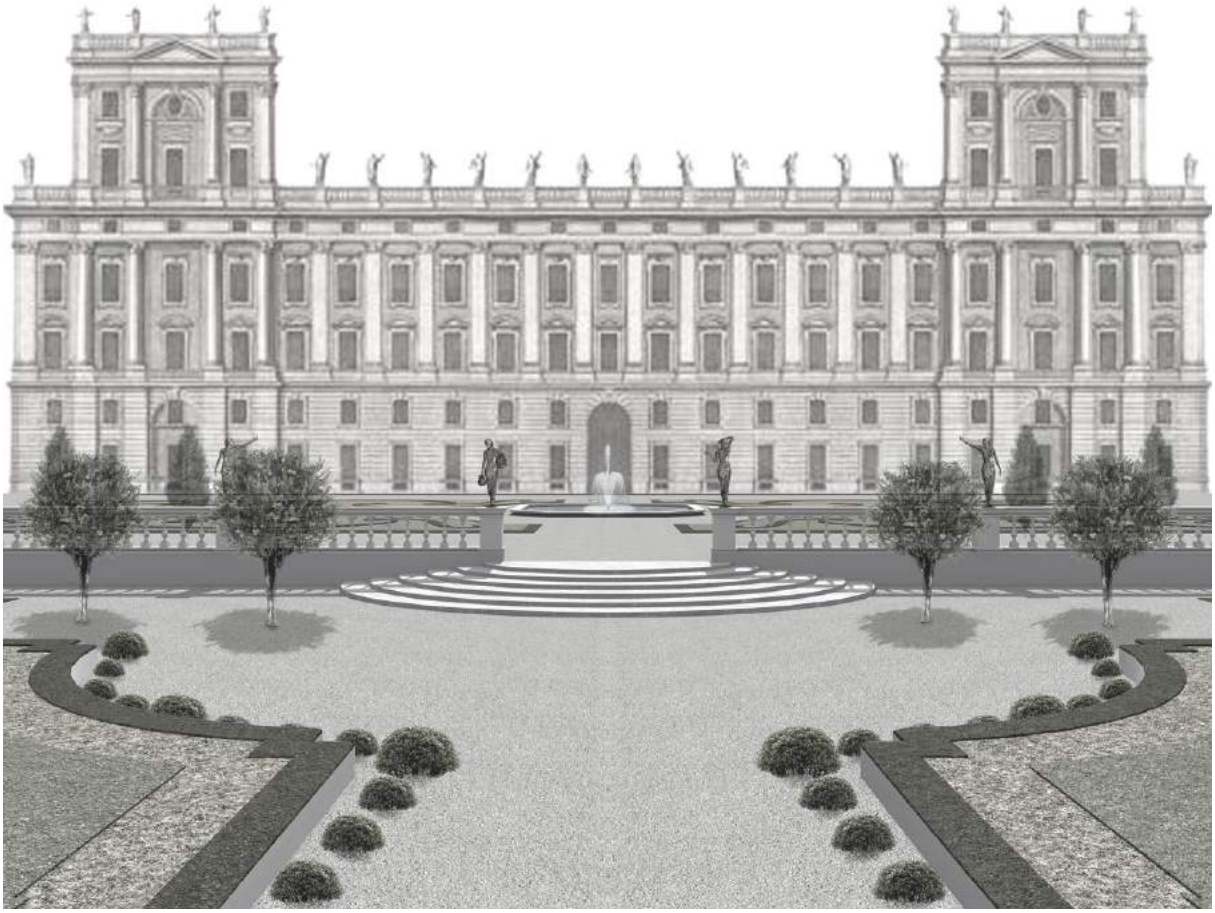

Fig. 8: The design of unrealized architecture of Royal Palace of Caserta, 3D rendering

Fig. 10: The design of unrealized architecture of Royal Palace of Caserta, 3D rendering

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The drawing of the territory. The Bay of Kotor in Montenegro.

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Abstract
The research is focused on the drawing of the territory on Montenegro, with particular attention to the series of natural bays found along the coast, it consisting of wide valleys connected together that fit deeply inland. The topography of the area is characterized by deep basins sheltered from the open sea: the Bay of Kotor, in fact, they are one of the natural ports of the Mediterranean. The territory has a surface of 87 square kilometers and consists of the real mouths, that is, the input channel that communicates with the Adriatic sea, and from four separate basins. The entrance is marked in the north by the narrow peninsula, which is also the most southern spur of Croatia, and on the south by Punta d'Arza. The territory is also cited by the poet Giuseppe Ungaretti in his poem "The Bay of Kotor" written in 1969 and dedicated to his nanny. The knowledge of the territory consisted of the reading given to the understanding of all aspects that contribute to determining the form, not only as the outward appearance, but also as a carrier of related values the history, the culture and the traditions which over the centuries have stamped their marks to the natural environment. Know an area it means to browse the history of the urban fabric, acquiring social structures, drawing the architectural presence of the present and the past, capture the value of human heritage, including the urban and monumental image of a place, its measurable identity. The measure, therefore, is the basis of knowledge and every representation of reality and documentary tracks.

Keywords: Keywords, no more than five (Arial – 10 pt – Lower case letters – Justified)

1. The drawing of the territory
The drawing of the territory is the result of the incessant work of man, "an eternal building site" where they collected the history and human culture that characterize the contemporaneity of past and present: an eternal building site, a source of creativity and modification. A multidimensional knowledge, based on discretization and measures of the heritage that extends the traditional notions of geometry and measures, and allows us a multidimensional representation, in which each component, material and immaterial, returns the territory as a dynamic entity in constant evolution. The knowledge tools allow us a multidimensional representation, in which each component, material and immaterial, returns the territory as a dynamic entity in constant evolution. The set of methods is not given by the sum of the individual single issue knowledge, but by an integral knowledge, in which data is qualitatively and quantitatively herself. Each point is described by multiple information that discusses some of the tangible and intangible characteristics triggering a ecogeometric approach that allows you to "measure the complexity", which is to recognize the basic characteristics by reading the signs. Such operating process is the most effective means not only to analyze a territory, but also to program the management of a hierarchy of actions. In the application of this method it consists of a large and varied territory, on which knowledge consisted of the reading given to the understanding of all aspects that contribute to determining the form, not only as the external appearance, but also as the bearer of intangible values, related to the history, culture and traditions that over the centuries have stamped their marks to the environment by starting a knowledge so to speak genomics of the territory. Knowing, then, is to review the history of its inhabitants and the urban fabric, acquire social structures, draw the architectural presence of the present and the past, to acquire news and discretize

the value of human assets, including the urban and monumental image of a place, its historical identity and measurable. The measure, therefore, is the basis of knowledge and representation of each of the physical and intangible values of reality and documentary traces of man in his biological evolution as a function of the environment in which he lives. To measure and capitalize the endless reasons of nature, as recommended by Leonardo, it is to recognize the genetic heritage, the identity of the places, the founding of the continuous recovery process and regeneration. A reading of places and architecture that refers to the urban landscape which is the knowledge of urban factors liable to be represented and documented, in material and immaterial dimensions, through architecture and time, that is, through the dimension in which it is conceived and measures the passage of events. It is therefore clear the relationship between nature and architecture, between the natural landscape and anthropic landscape, the comparison is the result of a long historical process repeatable parallel with the evolution of the idea of landscape in various cultural epochs. The drawing of the fields and that of writing overlapped geometrized two spaces, one of the plot and what the page, becoming a model for the great emerging projects in the natural landscape as new visual organization centers. In this context, the city emerged as spatial order, exact measurement of hierarchy, distribution of functions.

Fig. 1: The Bay of Kotor in Montenegro. The multidimensional representation of the territory.

The architecture was assigned the task of organizing the urban area according to rational criteria. The drawing, then, new landscapes: memory landscapes and arcane correspondences, such as the pyramids and tombs underground, or dense urban views, like those of the big cities, places of power who were allowed to make visible the mythical transcendence of its origins and signal of a complex and sophisticated urban structure, whose planimetric and, even more, its vertical profile, silhouetted

on the horizon in an impressive skyline, had to establish itself as a new image landscaping able to communicate on a par with those offered by the surrounding nature. A distinction between past, present and future which Plato calls “the moving image of eternity”. The Greek culture of the city was founded in large part on the laborious construction of an urban discourse structure, intended to produce a model of clarity and efficiency narrative, thanks to which the word could take the full force of the visual representation.

Fig. 2: The Bay of Kotor in Montenegro, 1648

Looked at him with indifference to the natural landscape and turned instead avidly than anthropic, the culmination of which placed the city, the community, the polis. The comparison between architecture and nature chose the meeting between the company and the architecture, which became so urban art, called to draw in the space of political figures. The city became the true human environment and its image became the mirror image of a thought constantly urged to analyze, discern, measure. The urban organization of volumes and surfaces, their functional distribution on the ground, the vertical elements and lines of flight, the transparency and opacity, empty and full, the whole architectural structure that encloses, distributes and regulates the existence collective, they became the only scenic background on which to project the membership of the places. Nature is therefore substituted by the history: the landscape flows back into the city and the city organizes the space model of the social structure. From the cities that dotted the origins of urban civilization emerged a series of signals that reaffirm the continuity of transformations. They emerge some figures that propose as constants: the first is to dominate the figure of the center in each city is presumed place of convergence and irradiation of all social, cultural and economic tensions of your domain; also it boasts mythical origins transferring its centrality from the ground to the cosmic space. The architecture interpreted this continuity shaping it in its plastic forms. The buildings were erected majestic sloping upwards, often praised as mountains; He absorbed the column, in his graceful slenderness, the figure of the monolith and its load-bearing function in the composition of “trilite”. The mountain and the column refer to the stone, becoming a fundamental element to root City in the territory, to exclude it from the transience of life in the open spaces, nomadic and changeable, to impose it as a permanent creation, to grasp at a distance, and thus as inherently given landscape. The landscape at this point declared its cultural substance in the city was represented as a link between the nature of the architecture, and imposed the second on the first, but left that both would pass freely into one another.

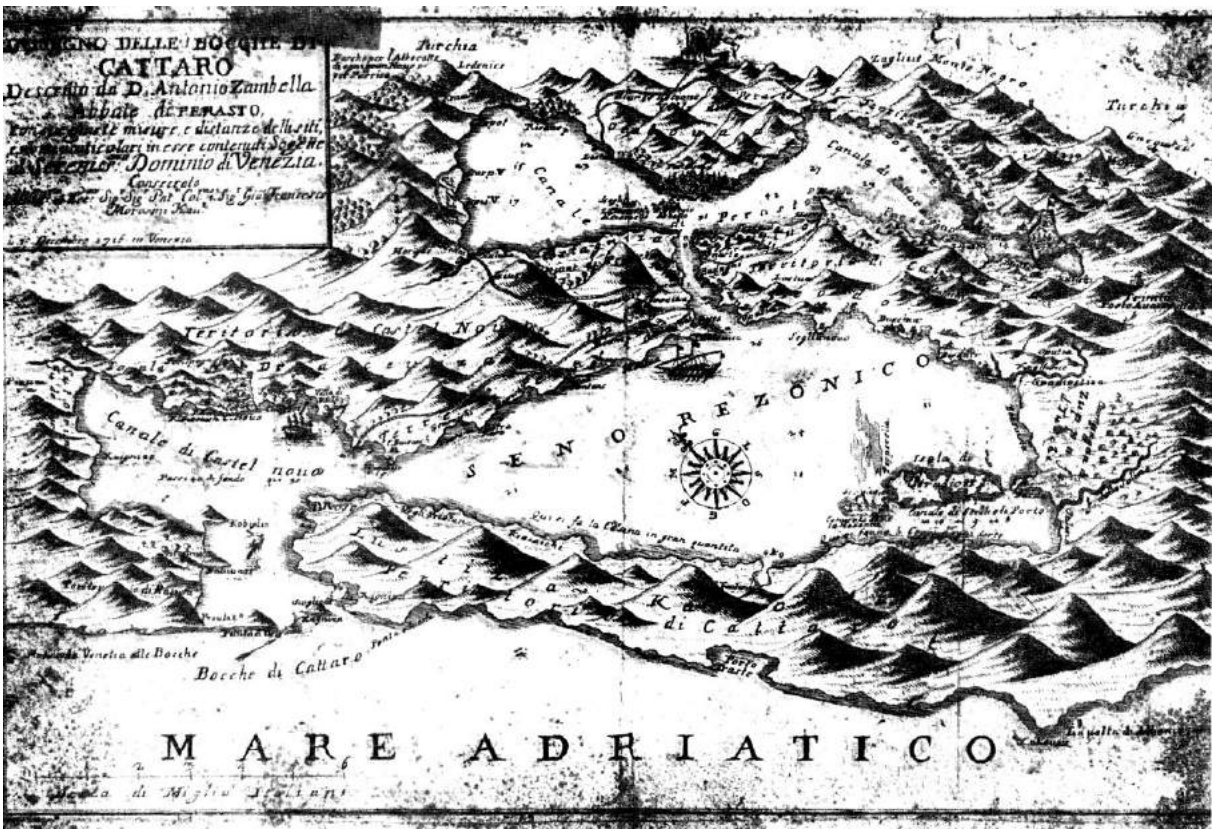

Fig. 3: The Bay of Kotor in Montenegro, 1716

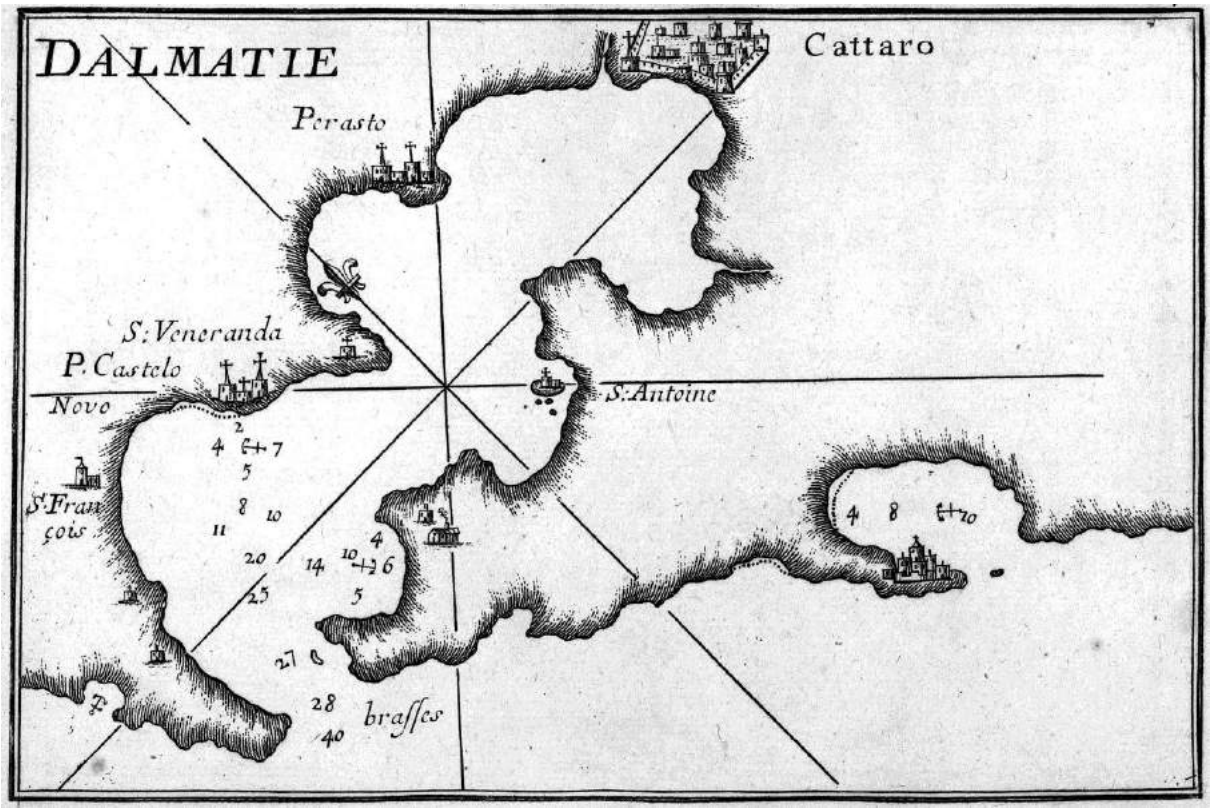

Fig. 4: The Bay of Kotor in Montenegro, 1764

The fifteenth-century city was the grounds of a “fight for power”: political and economic power, involved in the dynamics of the collective structures that, in the redefinition of urban spaces, tried in architecture design new scenarios in which to represent the strength of the his balance. The street, the square, the facade of a palace, the prospect of a road network, the construction of a bridge were not

realized as an immediate response to the daily demands, but were established as episodes of an extended project of hierarchical organization of social relations. Humanistic culture was in fact a decisive role, nurturing of motivation, philosophical a very political design. From this plot took shape an ideology that aimed to channel the energies of the hegemonic classes toward solutions which ended up create a harmonious and coherent urban landscape. The city is organized not as a representation of power, but as a stage for the effective exercise of power. They shall order their spaces according to a rhetorical structure whose eloquence has to impose itself to the population and provide coded behavior patterns. The urban structure is made in such a coordinated way and finalized language; the architecture is proposed, in its monumentality, as an interface between the artifact and nature: it opens on the landscape, making panoramic perspective around which they organize the interior space and absorbs all the visual tensions, colors, light. Permanent trace and characterize the urban and rural landscape identified by Emilio Sereni into distinct and identifiable categories: the imprint of Roman "limitation", still readily identifiable in the Italian territory; the ruins in the landscape, connotative elements in drawings and historical views of the city; the village perched, typical of Italian hills overlooking the growing metropolitan city in continuous expansion; the agricultural landscape of closed fields within the circle of the city walls, this ancient form, which is now the parks and green areas of contemporary cities; the landscape of open fields, the intensive cultivation of the extra urban areas and suburbs of large and uneven; the infrastructure network, the dominant element of the landscape and of great importance to an urban area.

Fig. 5: The Bay of Kotor in Montenegro, Kotor 1600

2. The drawing of architecture

The entrance of the ports of Kotor is marked in the north by the narrow peninsula, which is also the most southern spur of Croatia, and on the south by Punta d'Arza. The territory is also cited by the poet Giuseppe Ungaretti in his poem "The Bay of Kotor" written in 1969 and dedicated to his old nanny who lived long, with the poet, at his home in Alexandria. Very interesting is the influence of the Baroque style intrinsically linked to the current art of the time. That society, in fact, created alongside the import of Italian art and its strong influence, especially from Ragusa, a Baroque his own, modest, but adapted to their needs and tastes. The results achieved in the field of architecture, painting, sculpture, music and baroque literature, emanates the desire not only to live a materially better life and more comfortable, but also to make it more coherent and more beautiful. It is a relatively high standard of living and a culture of the society in the seventeenth and eighteenth centuries a homogeneous region, a local Baroque well developed and worthy of being taken into account in the right place into the Adriatic and Mediterranean. At the end of the century XV century, the Turks invaded from Herzegovina territory and divided the geographic and economic units. The coast between Herceg Novi and Risan was from 1482 to 1687 in Ottoman hands, while the region of Kotor, with its fairly large district, shared the fate of the Republic of Venice (1420-1797). The tragic situation is exasperated even more after the fall in Turkish hands, the fertile plain of Grbalj in 1497, and the coast of Montenegro: Bar, Ulcinj in 1571. But not only for the fact that in this way you closed the encirclement, but also because Ulcinj is installed a part of the Barbary pirates (Tunisian), after 1571. In this cultural and social context, the political and economic situation worsened. The Venetian merchants and nobles of Kotor braved the dangers of the Albanian and Greek ports by creating a favorable mercantile economy. Undertaking, therefore, the exchange of essential goods from the markets of Greece, Albania and Montenegro (corn, cheese, smoked meats, leathers), with Venice, with Dalmatia and other parts of Italy, made the Republic an invaluable service.

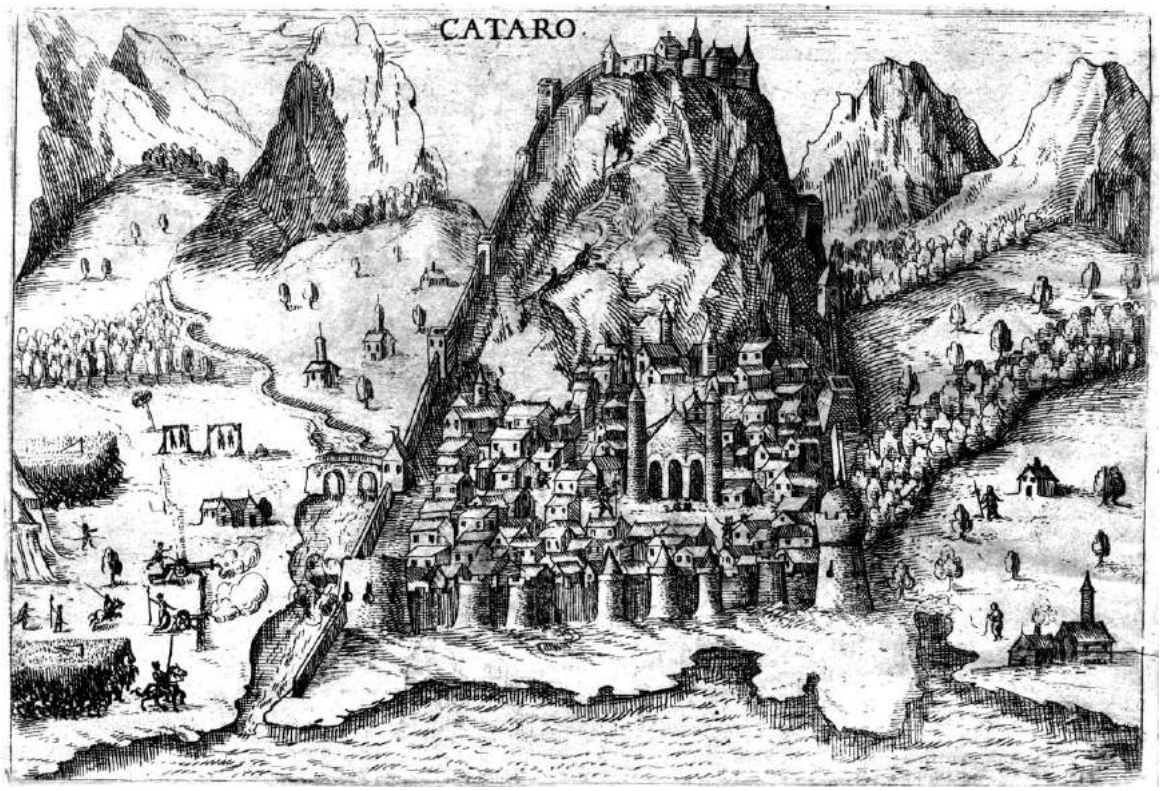

Fig. 6: The Bay of Kotor in Montenegro, Kotor 1615

Fig. 7: The Bay of Kotor in Montenegro, Kotor 2016

In this context, we must consider the obtaining of large economic and customs privileges relief from Perast, Prcanj, Dobrota, and other places, with the consequent enrichment of them. In the seventeenth and eighteenth centuries, were officially recognized by the community of sailors of Perast, Prcanj, Dobrota, Stoliva. So the maritime trade became only worry of many center and the only solution to get out of a state of misery and dangerous military involvement on the part of the inhabitants of the Venetian power. In this political context, Kotor, old Roman and Gothic town, after numerous earthquakes changed his face, becoming more Baroque. Currently, after the recent earthquake of 1979, often reappears the ancient face in numerous restoration sites. Under the plaster emerged old arches, windows, doors, she closed because it required the taste changed for a new style or the same concept of rehabilitation. The Baroque style not only conquered the profane facades and palaces but also the churches and bell towers of the Romanesque Duomo.

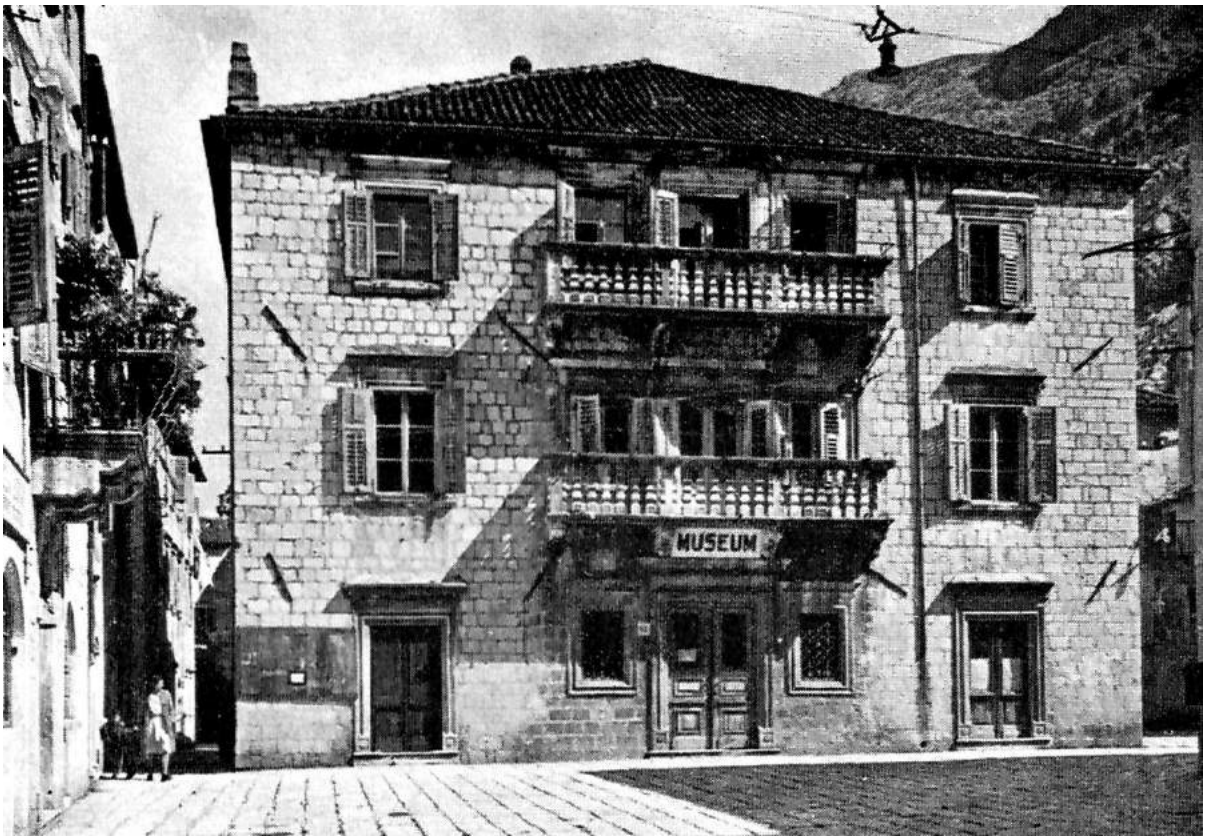

Fig. 8: Kotor, Gregorina building, 1700

Fig. 9: Kotor, Gregorina building, 2015

So the original Romanesque slender turned into a rather massive size, because the base had to be enlarged and the height was reduced by one floor. Although most of the town of Kotor has been transformed as shown in the Baroque style, this style is not at all typical of it; rather than for seafarers centers of the surrounding area as Perast, Dobrota and Stolivo, which flourished during the Baroque. Usually this style penetrates the new maritime community, from Dubrovnik and Curzola, by teachers and workers, who came to virtually perform the works. There are numerous churches and baroque architecture complex: of particular interest is the Monastery of Savina, near Castelnuovo, built between 1777 and 1799. The church had to have a high dome, according to the Byzantine tradition. The church itself is essentially Romanesque, with some Gothic and Baroque elements. We must also mention the complex of the Madonna of the Scalpello (Gospa od Skrpjela), artificial island in front of Perast.

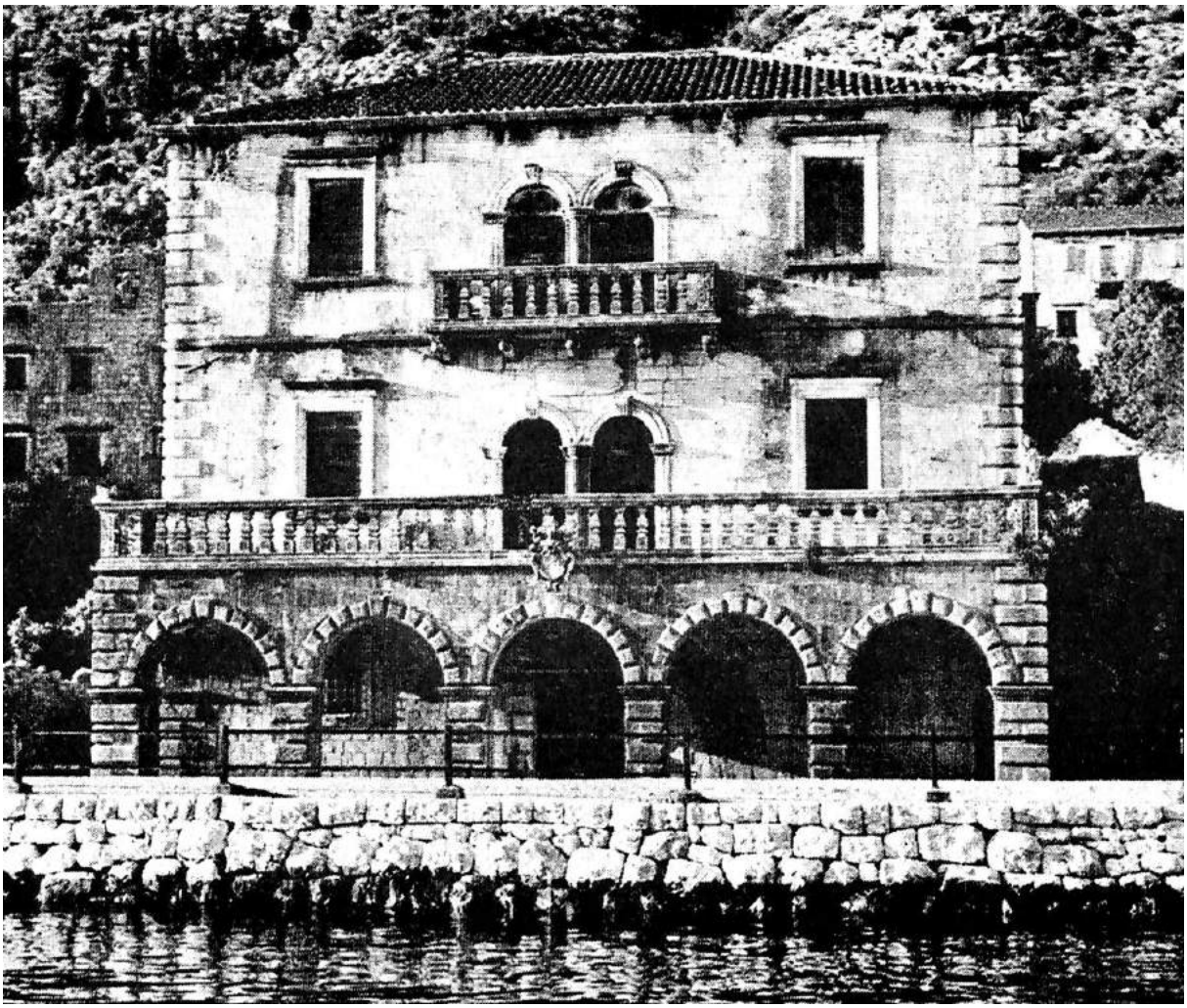

Fig. 10: Perasto, Bujovic building, 1694

Fig. 11: The Bay of Kotor in Montenegro, 2016

The church was built in 1452, then rebuilt in 1628-1630 and completed in appearance today by Pietro da Ragusa in 1725. In addition there is the Benedictine Abbey, the same name on the island of San Giorgio. Like pre-baroque phases meet in the church of San Matteo in Dobrota (1770). In Perasto seems there has been a more intense desire to give the country a center of baroque art print. The taste, refined in contacts with foreign countries, wanted to give the country, churches and houses, the nobility of the Baroque style. Of great importance the imposing bell tower, symbol of the strength of the country and at the same time, historical monument of the liberation of the northern part of the Bay of Kotor from the Ottomans, which took place in 1687. In Perasto were 14 churches of great architectural interest. In Dobrota, however, the major buildings were built mostly during the eighteenth century.

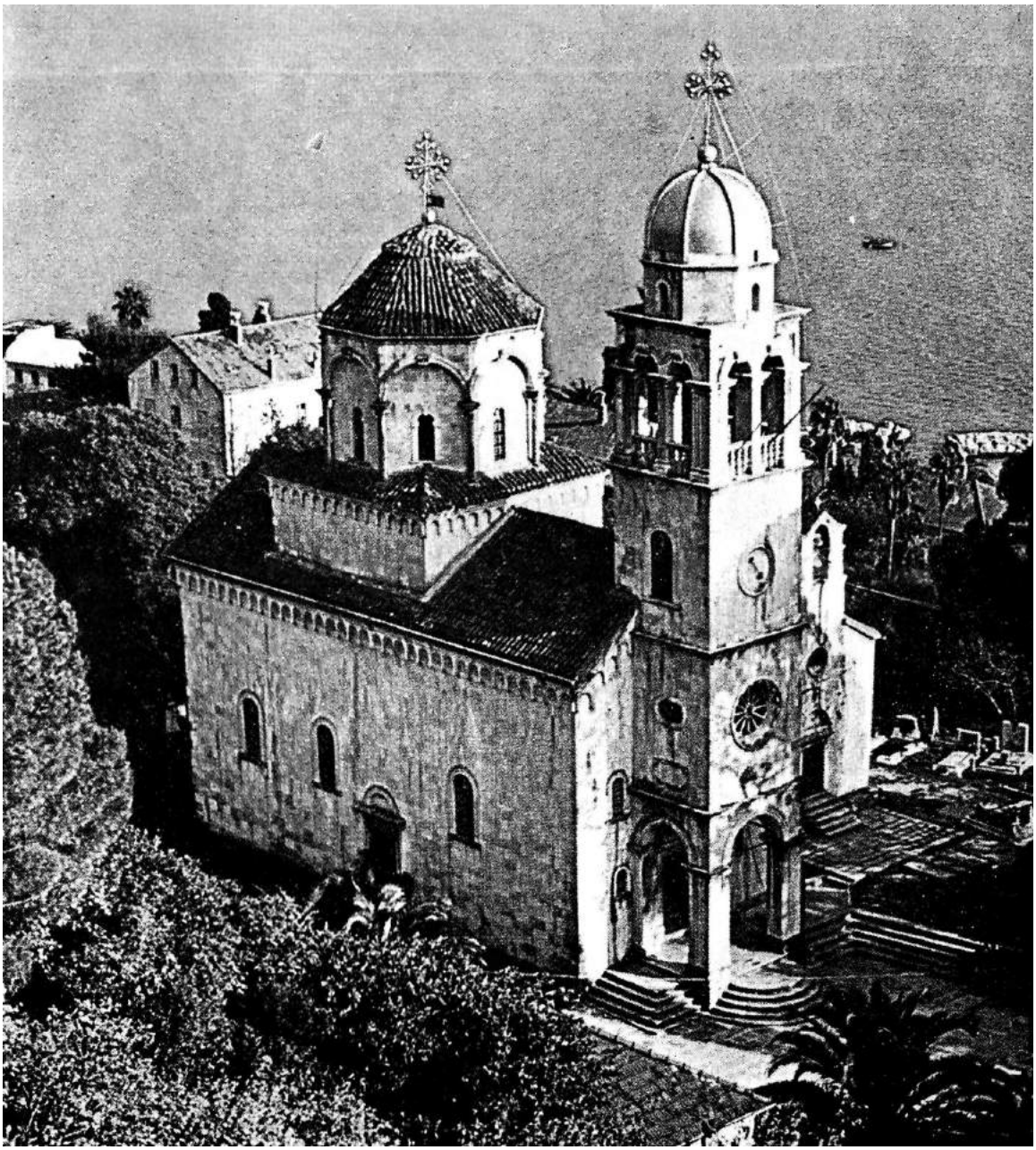

Fig. 12: Castelnuovo, Savina Monastery, 1777

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David Chipperfield: an idea of shared architecture for an ideal shared city

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Abstract
The architecture of David Chipperfield under a common generational perspective, was formed within that cultural environment of the millennium: an operational perspective that does not start with a prepared theory but from the craft, getting basis in search for quality and basic values of the building. A building, an authentic expression of contemporary life, rooted in those dimensions that represent the constants of life, of living and working. The London architect's, from his first beginnings in the early eighties, poses a central question space, aiming for a clarity of expression built on a form of correspondence and content. This “modus operandi” is based on a constant and continuous research based on the change of the use of space in relation to the materials, geometries, to light and to the structure. Starting its activities with a series of projects of “small scale” David Chipperfield has managed to give a sense of continuity to his work through a process that, after three after decades, is still becoming.

Keywords: David Chipperfield, Architecture, Project

The eighties of last century and, even more incisive the nineties century, have represented, in architecture, a kind of temporal epic characterized everything is possible: postmodernism, fragmentation, deconstruction, discontinuity and spectacular were the words order which reduced the architectural design to a consumer good to offer to the audience and the actors of the known globalized society. The deep critical revision of naive functionalism made, between the sixties and seventies, from the school of the Italian Rationalism of Milan matrix, which is the trend, has not been able to impose itself on the reality perhaps because of a powerful theoretical framework that has come to dismiss the architectural and urban design from the practical problems that European cities were beginning to present: increasing degradation of the new peripheral extensions, mummification of the ancient and historic city centers, wild construction of metropolitan areas and land use. Aldo Rossi and Carlo Aymonino, Giorgio Grassi and Franco Purini with their extensive theoretical studies have represented, in Italy, a point of such a consistent conceptual union that their own works, or simply designed laboriously created, have assumed the symbolic meaning of true and its architectural manifestos able to declaim innovative principles for a shared idea of architecture and in continuity with the disciplinary tradition. The sixties and seventies did not produce just theory. At the same time, in Germany, with the search for Oswald Mathias Ungers; England, with the work of James Stirling; in Spain through the work of Oriol Bohigas, and, in Portugal, with modernist experiments of Alvaro Siza, the new idea of architecture developed by Italian culture began to propose and implement architectural objects are capable of confronting the settlement places and can, also, to give strategic importance to the relationship between type and morphology, taking care, finally, the choice of appropriate materials thus giving up, definitely, the shortcuts offered by the global construction industry and his favorite product or the curtain wall. In this architectural landscape, situated between strong theoretical power of Italian architects and given constructive willingness of the new elderly European masters, a new generation of architects began to experiment with new approaches to the theme of urban architecture. Young architects who, thanks to the acquired ability to marry the theoretical with the practical power of their masters, have made possible a kind of critical resistance to

unbridled deregulation that produced by many protagonists of the known Star System, he has marked the last decade of XX century and the first of the third millennium. A critical resistance based on the development of regulated design experiments, not timid, are capable of proposing a “call to order” in sharp contrast to the exaggerated formalism, to ephemeral trends, and historicist quotations of Post-modern movement. Hans Kollhoff, Edoardo Souto de Moura, Alberto Campo Baeza, Roger Diener and David Chipperfield have represented, since the nineties, the reference point for the younger generation of planners who would be faced with the architectural and urban problems of the new millennium. oung people from different cultural backgrounds architects have proposed, however, a common basis of design research based on tradition and the modern as it was feasible, in the last decade of the twentieth century, in terms of harmony, normality and continuity. A cultural choice not approved by intransigent ideological positions but legitimized by connections that, beyond superficial stylistic differences, became increasingly concrete in a project to do based on a conception of the whole “realism” of the architectural discipline. The architecture of David Chipperfield under a common generational perspective, was formed within that cultural environment of the millennium: an operational perspective that does not start with a prepared theory but from the craft, getting basis in search for quality and basic values of the building. A building, an authentic expression of contemporary life, rooted in those dimensions that represent the constants of life, of living and working. The London architect, from his first beginnings in the early eighties, poses a central question space, aiming for a clarity of expression built on a form of correspondence and content. This “modus operandi” is based on a constant and continuous research founded on change of the use of space in relation to the materials, geometries, to light and to the structure. Starting its activities with a series of projects of “small scale” David Chipperfield has managed to give a sense of continuity to his work through a process that, after three decades later, is still becoming. Starting from the stimulatory capacity constraints has, from time to time, experienced potential, the tools of the trade values and limits. This wealth of experience has converged, after the first experiments to the “small scale”, in a new construction building design as well as admirable reconfigurations of monumental architectures avoiding, however, the voltage drops that often accompany these scale steps. Steps that, for the work of Chipperfield, seem entirely adequate to meet new challenges with regard to dimensional architectural and urban design not only European but global. Returning to the previously identified thematic categories, namely those of harmony, of normality and continuity, it is quite clear in David Chipperfield detect through the work since its first design made debut in Japan: the Gotoh Museum, built in Chiba Prefecture between 1987 and 1990, it contains in a nutshell all future developments of the architectural work of the London based planner placing itself in the same way a building poster able to synthesize the principles and guidelines of its project activities. First, the functional program: the Gotoh Museum is designed to accommodate a dual function or a gallery for a private collection of contemporary art and eight student accommodation.

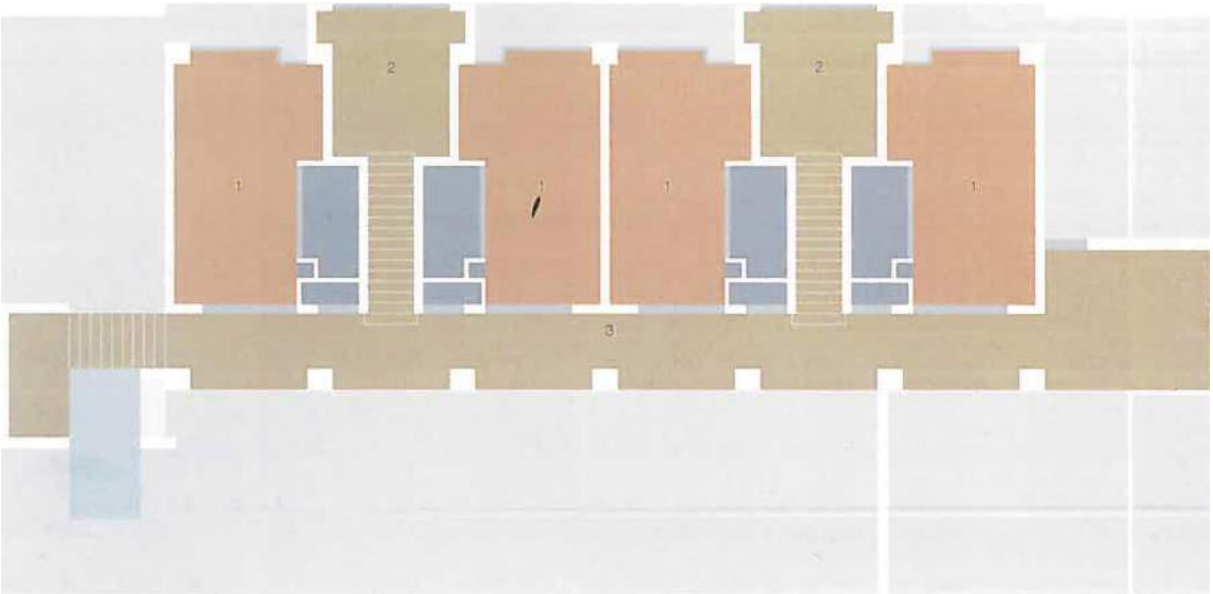

Fig. 1: David Chipperfield, Gotoh Museum, Chiba, Japan, first floor plan

The heterogeneity of the functional program and the constraints imposed by membership site (a long and narrow rectangular lot landlocked) push the architect to develop a project closed in a compound, capable of forming a small courtyard to the plan earth, where is a art gallery, which stands for the body of the small building on the first and second floor, the residences for students. Well, the introverted

nature of the public plan basement, protected from the enclosure, and the extrovert of the two upper residential floors, exposed and visually perceptible by the parallel streets to the short sides of the architectural structure, configures, as a whole, a building which, while clearly belonging the spatial tradition of modern, assumes in its built form the characters of contemporary classicism. The basement floor of the compact whole, moreover, the first floor features a loggia with metal balconies floating in the void of six bays, and finally the top floor just scored four rectangular windows and surmounted by a long protruding edge reproduce, without hesitation, a number of recurrent elements traceable in the classical language of architecture. These external linguistic occurrences are supported, however, inside the building, from a configurational choice entirely contemporary that is capable of enhancing the use of the internal space in relation to the materials used, the geometry adopted, the captured light and the structure designed. The complexity more deductible from the cross section of the project rather than the soles of the individual plans: the latter indication capable of revealing the propensity configurative and space of David Chipperfield "modus operandi" rather than the theoretical dedication typological and morphological potentially deductible by the Italian Tendency.

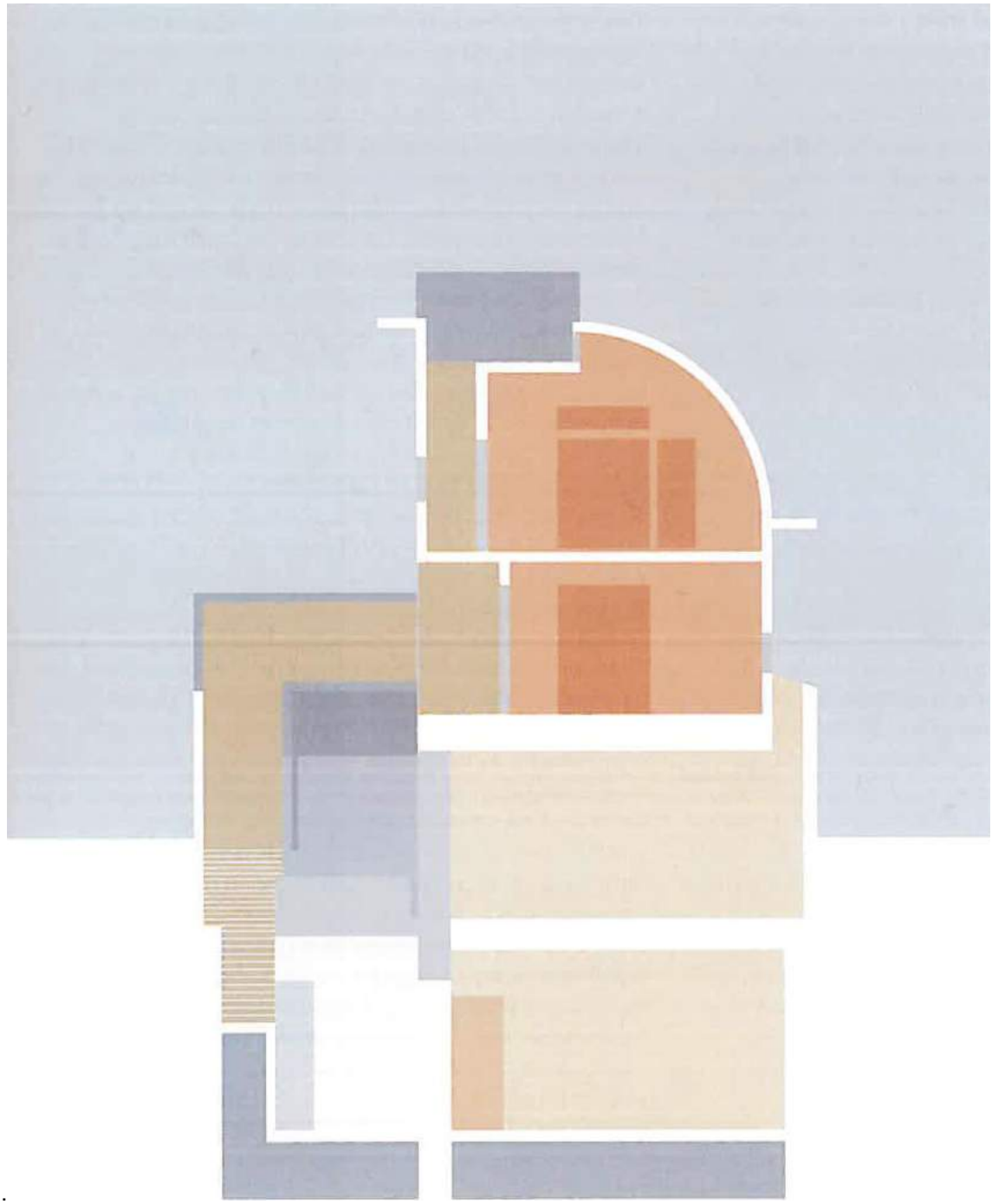

Fig. 2: David Chipperfield, Gotoh Museum, Chiba, Japan, section

Fig. 3: David Chipperfield, Gotoh Museum, Chiba, Japan, prospect

The same use of the material employed, the cement armed, is indicative of a conceptual double code used by the London planner in what can be considered, to all effects, its first work: a material that is, on the one hand, the main constructive innovation European architecture of the twentieth century and, on the other hand, a kind of vernacular material for the Japanese architecture of the second half of the twentieth century as well as reminds us of the work of Kazuo Shinohara, Tadao Ando and Toyo Ito.
Four years after the completion of the Gotoh Museum in 1994, David Chipperfield he published his Theoretical practice: a publication which, far from proposing the same way as a theoretical treatise, look through design practice, to establish principles able to transmute in guidelines for building in the consumer society, globalized and computerized. The proliferation of information that inevitably undermine and weaken the established values; innovative materials that are beyond the understanding and enjoyment of the individual; individual invention replacing subjective to objective collective reflection; the loss of shared values and the primary elements such as light, space and nature: against such architecture produced by the consumer society - of images, energies, commodities and, unfortunately, the territory - the critical resistance effort, not theoretical, of David Chipperfield is stored in the search of the primary architectural values which become more fundamental not only for the usability but also for the common understanding of the community. The search for these basic qualities appears to be the starting point of a theoretical practice emerging mainly at the dawn of the Third Millennium is in emblematic projects capable of revealing the principles and intent guidelines practical and theoretical David Chipperfield and is in cultural events of planetary resonance he cared as, for example, the Thirteenth International Architecture Exhibition of the Venice Biennale held in Venice in 2012 and entitled Common Ground. Specifically, are emblematic of this cultural attitude both projects able to immerse themselves in the open space and the natural landscape and those inserted, almost by force, in the peripheral spaces of contemporary cities namely, on the one hand, the Ernsting Service Center in Coesfeld and the Museum of Modern Literature in Marbach, and, on the other hand, the two citadels of Justice made in Salerno and Barcelona.

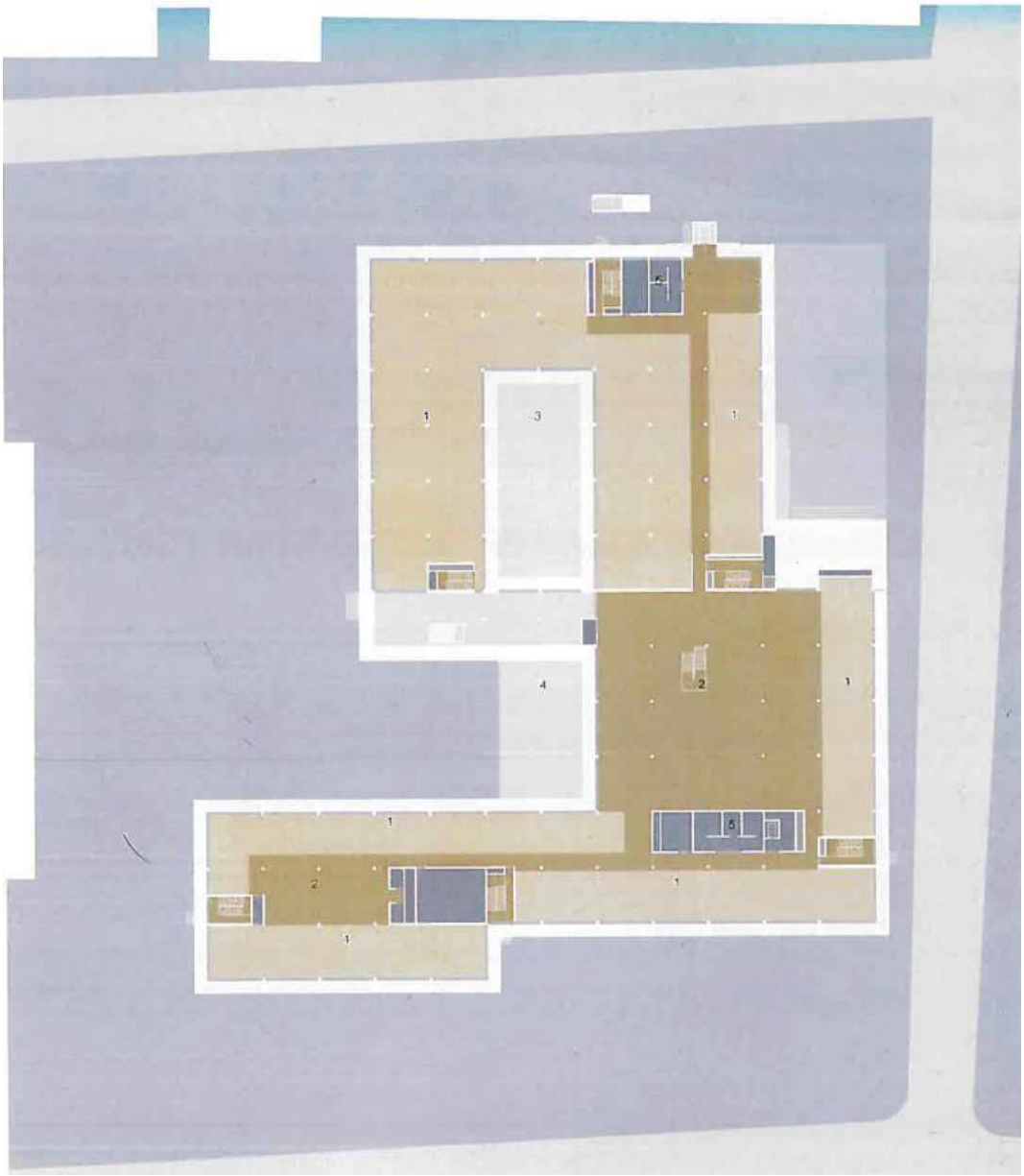

Fig. 5: David Chipperfield, Ernsting Service Centre, Coesfeld, Germany, ground floor plan

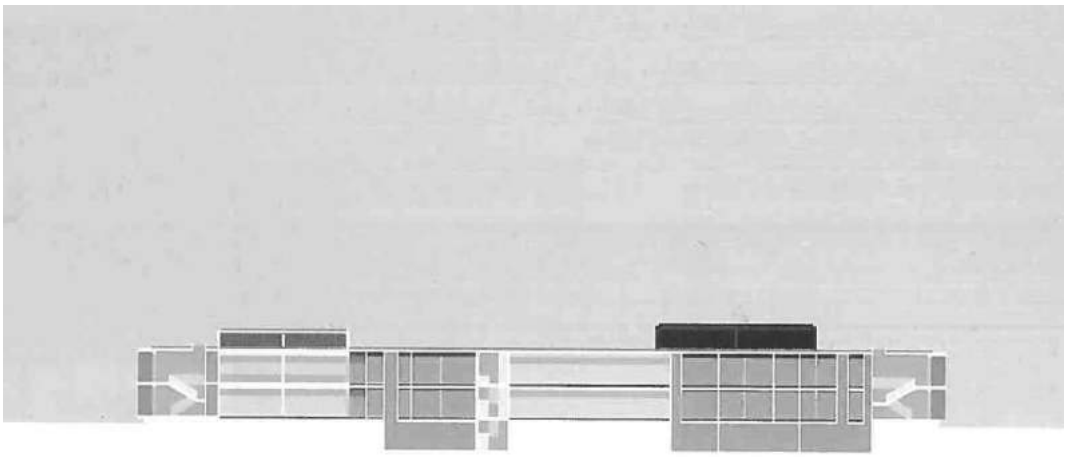

Fig. 4: David Chipperfield, Ernsting Service Centre, Coesfeld, Germany, prospect

Fig. 6: David Chipperfield, Ernsting Service Centre, Coesfeld, Germany, views

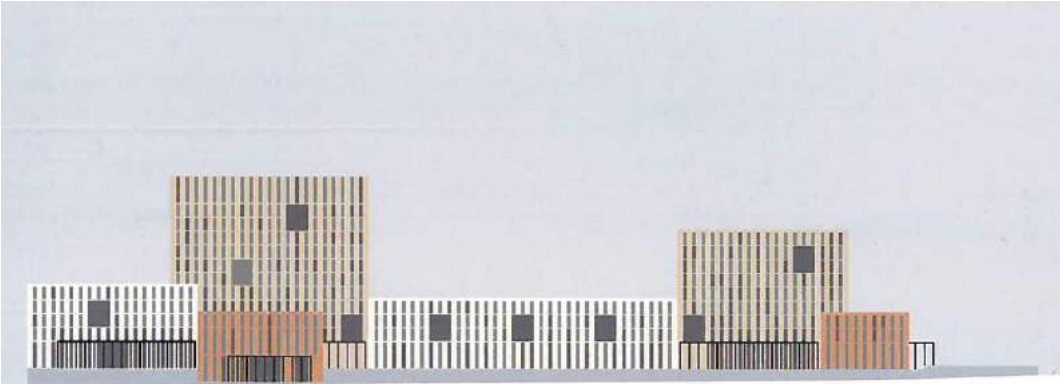

Fig. 7: David Chipperfield, Citadel of Justice, Salerno, Italy, prospect

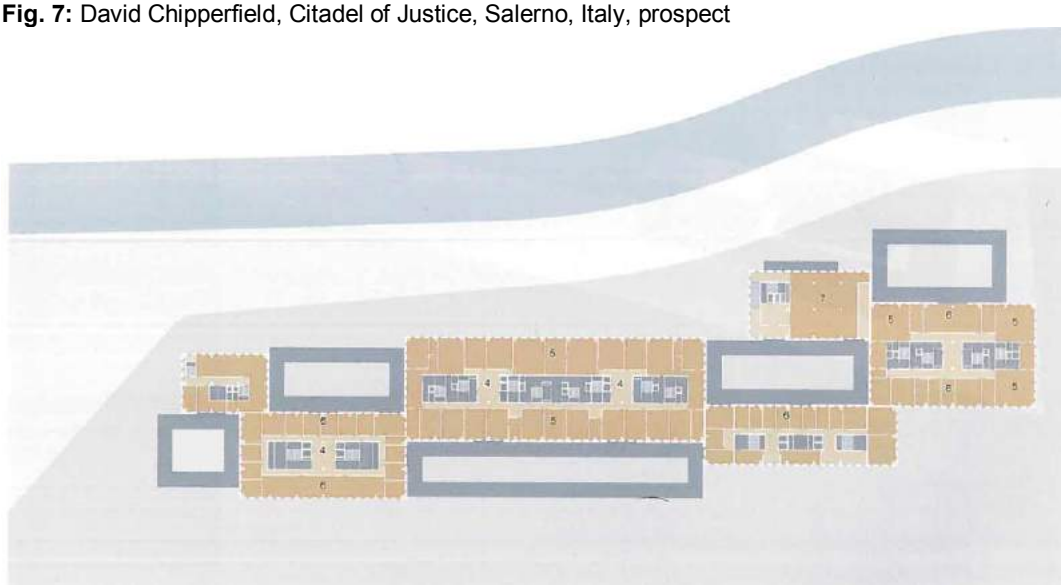

Fig. 8: David Chipperfield, Citadel of Justice, Salerno, Italy, first floor plan

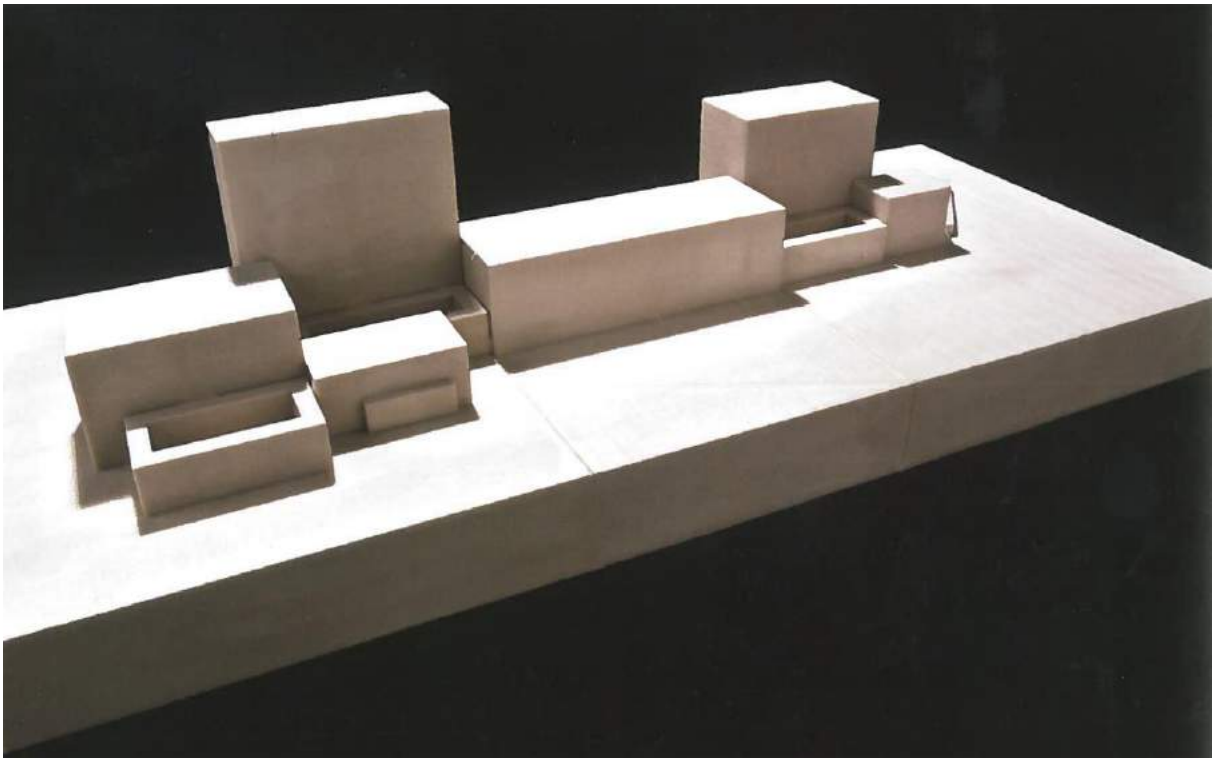

Fig. 9: David Chipperfield, Citadel of Justice, Salerno, Italy, model

In the first case architectures capable of dialoguing with the landscape and through large rectangular openings protected by white awnings and either through the frenetic rhythm to the slender and tall pillars that close the porch which encloses the rear glass volume of the German museum, a clear homage to the language architectural Giorgio Grassi and Antonio Monestiroli. In the second case, conversely, architectural complexes, real fragments of cities, characterized by pure forms, parallelepipeds of different volume and position, marked, in the tables, from a crowded sequence of pillars and narrow vertical windows, almost slots, having the same height of the planes on which they open. Buildings which, standing in the urban periphery, take a hermetically sealed architectural language, almost mute, to emphasize his defense against the peripheral boundary cities while resorting to a display of rhythm, emphasis, rhythms and architectural scores that enhance the compositional classicism. Defense of context and amending proposal of the same throug architectural representation for collective needs and for the “rites” of mass society able to a different future for the suburbs of European cities. The proactiveness of David Chipperfield does not transpire only by its architectural exempla but also some cultural events which coordinated the first three decades of the twenty-first century: the exhibition Common Ground conceived for the XII Venice Biennale summarizes thematic issues mentioned in this short paper . As pointed out previously, the work of David Chipperfield is structured in parallel to the spectacular hangover that has characterized the last two decades of architectural culture based around the so-called subjective and individual creativity of some of the Star System protagonists who drew the design source “anything is possible”. A “whole” that the global economic crisis is downsizing also strongly trying to find common solutions, not individual, the challenge that the contemporary time offers us. As written by the London architect in his introduction to the catalog “[...] This Biennale takes place in a time of great global economic concern, we have the opportunity to reconsider from a different point of view the individual, undeniable, architectural achievements that marked the identity of recent years and to stimulate a more intense evaluation of our common goals and expectations”. David Chipperfield based on his assumption tended to orient the exhibition of the Biennale 2012. “[...] towards issues concerning the continuity, context and memory, to shared influences and expectations” is not only the best call you can turn on to future generations architects but also the best remedy to redefine the relationship between artifice and nature not only in the cities but also in degraded areas of our contemporaneity.

Fig. 10: David Chipperfield, Museum of Modern Literature, Marbach am Neckar, Germany, views

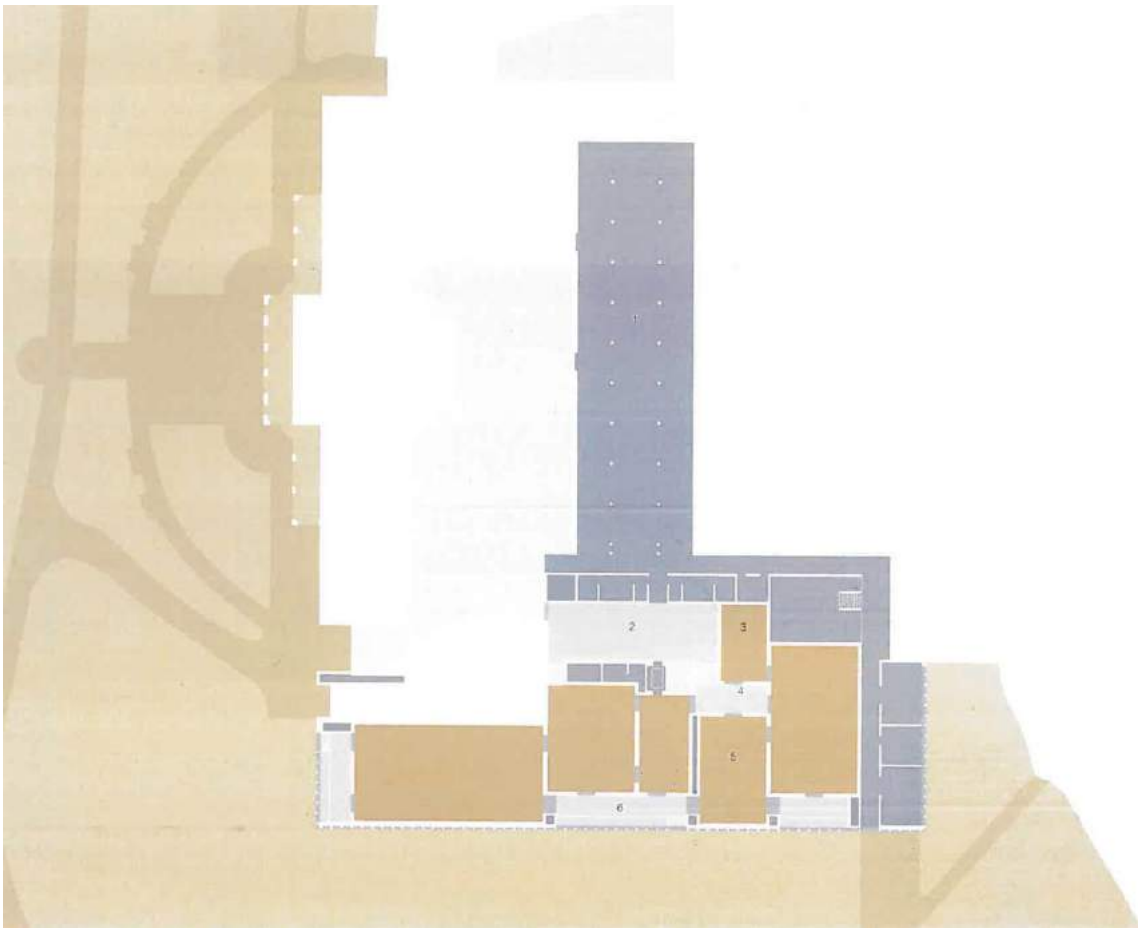

Fig. 12: David Chipperfield, Museum of Modern Literature, Marbach am Neckar, Germany, plant underground

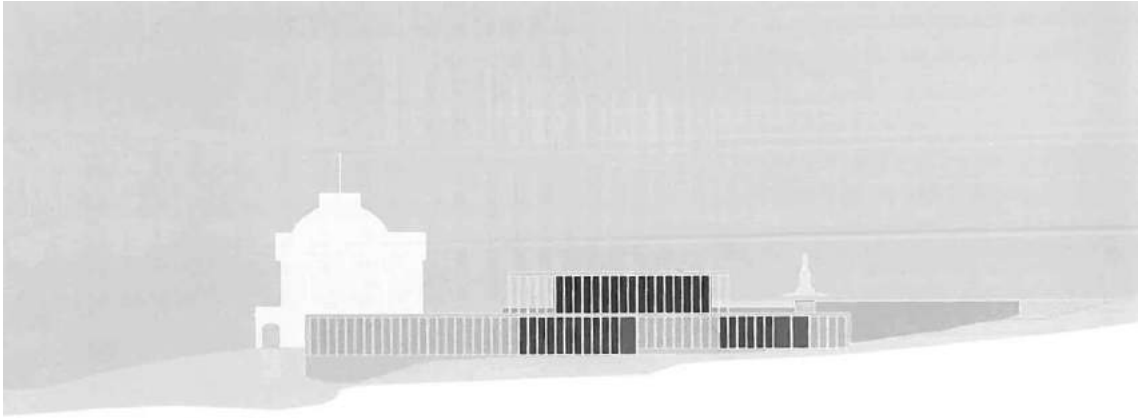

Fig. 11: David Chipperfield, Museum of Modern Literature, Marbach am Neckar, Germany, prospect

Fig. 13: David Chipperfield, Museum of Modern Literature, Marbach am Neckar, Germany, section

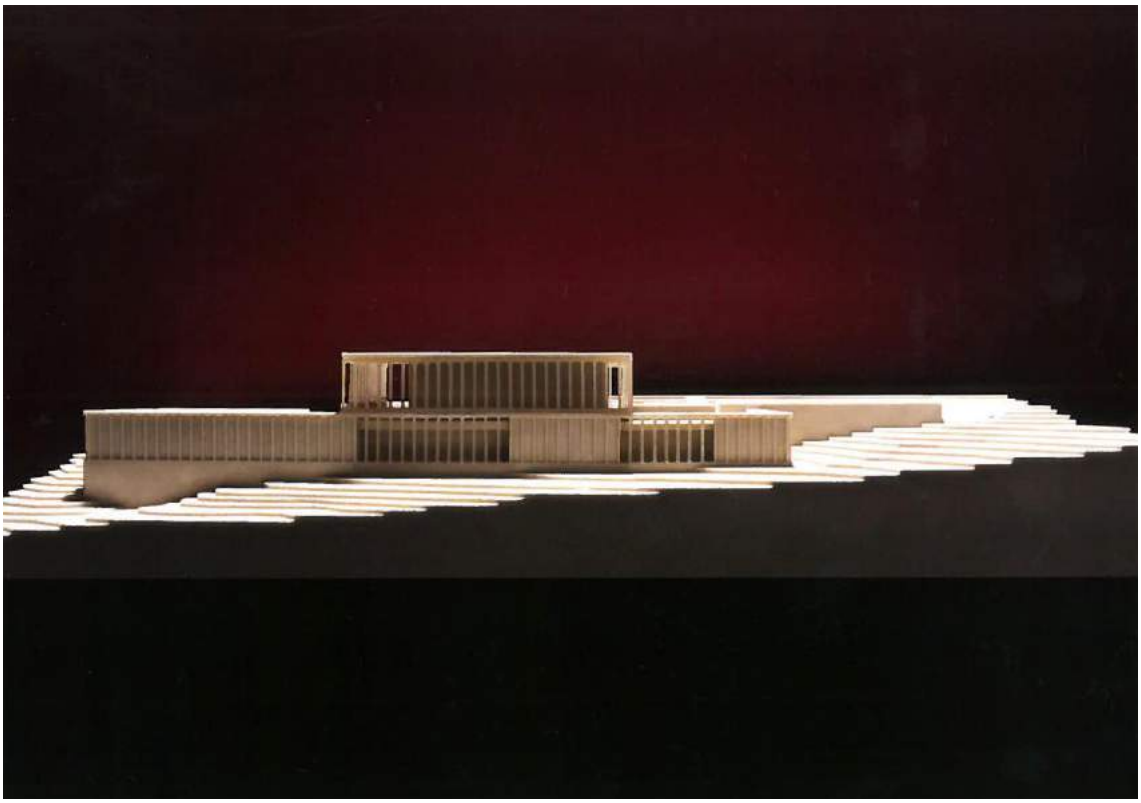

Fig. 14: David Chipperfield, Museum of Modern Literature, Marbach am Neckar, Germany, model

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Le Vie dei Mercanti XIV International Forum
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The representation of the area and the drawing of the limit.

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Abstract
In Naples, in between the seventeenth-century and eighteenth-century, the viceroy, Luis Francisco de la Cerda y Arag□n, duke of Medinaceli, he decided to give a strong signal of the reigning presence, and he hoped that the new urban works could benefit the population and make a profit civic consensus. With the construction of public works, the viceroy declares good "state of health" of the kingdom. The work planned for the Chiaia's waterfront had to have the character of the magnificence and to take a clean urban meaning. To celebrate the initiative was draft a view, entitled *"Napoli. All'eccellentissimo signor Duca Medinaceli, vicer□ e capitan generale in □uesto Regno"* in 1698, dedicated exatly to the viceroy, it then inserted into Domenico Antonio Parrino's book, *Guida dei Forestieri*. The *"Veduta della strada di Chiaia oggi detta di Medinaceli"* depicts Chiaia at the end of the seventeenth-century with the arrangement of beach a "tree-lined promenade", and this research puts it as the analysis' starting point of a series of urban plans that to attest to the transformation of the area and the development of the western urban border that has changed in the centuries, transforming the *Riviera di Chiaia* from beach to *Villa Comunale*.

Keywords: architecture, relief, drawing, transformation.

1. The Chiaia's beach in the eighteenth century
The purposes of Medinaceli viceroy, who started the transformation of the Chiaia's beach in "tree-walking", were triggered by the need to control the cultural and recreational activities of the bourgeoisie. In Naples, in between the seventeenth-century and eighteenth-century, the viceroy, Luis Francisco de la Cerda y Arag□n, duke of Medinaceli, he decided to give a strong signal of the reigning presence, and he hoped that the new urban works could benefit the population and make a profit civic consensus. With the construction of public works, the viceroy declares good "state of health" of the kingdom. The work planned for the Chiaia's waterfront had to have the character of the magnificence and to take a clean urban meaning. To celebrate the initiative was draft a view, entitled *"Napoli. All'eccellentissimo signor Duca Medinaceli, vicer□ e capitan generale in □uesto Regno"* in 1698, dedicated exatly to the viceroy, it then inserted into Domenico Antonio Parrino's book, *Guida dei Forestieri*. The *"Veduta della strada di Chiaia oggi detta di Medinaceli"* depicts Chiaia at the end of the seventeenth-century with the arrangement of beach a "tree-lined promenade". Paolo Giordano, in 2015, in the *"Detecting the e□istence to represent the firm and anticipate the resulting"* publication, defines the Chiaia's beach, in the temporal circumstance, «no more an extra moenia village in the countryside but a fragment of the garden city lowered in a landscape of rare beauty». The garden is configured in a narrow and long passage composed by the generous planting of tilias with monumental fountains, circular equipped of a stone component. The director in which lie plants and fountains don't made according to the coast line, conceptual, backward, on the mainland but in according to the line of the building curtain of the *Riviera di Chiaia*. The arboreal and sculptural row doesn't impose to the context, actually it is «inclined to breaking and to move back, interrupting its continuity and linear arrangement», as stated by Paolo Giordano, in some specific points of the walk, as it is the case in correspondence the current widening of San Pasquale. Turning our attention on all

the view, the extreme left reads the access ramp to San Antonio at the Posillipo and on the side of the entrance to the cave that leads to the Campi Flegrei. On the back of the walk, a building curtain interrupted by few roads perpendicular to the coast marks the beginning of the limited process of urbanization of the inland areas, and in the background, the hill is still all green characterized here and there by houses or isolated and scattered farmhouses while at sea the island of S. Leonardo. After about seventy years, Giovanni Carafa, duke of Noja was responsible for the "*Mappa topografica della città di Napoli e dei suoi contorni"*, published posthumously in 1775. It shows that, at the date of the reliefs around 1750, it was little remains of the intervention made by the duke of Medinaceli as it is not apparent nor the line of trees and nor fountains that interspersed it. The paper, written on 35 sheets, includes the entire urban area that extends north to the small town of Nazareth, to the extreme of Camaldoli and Capodimonte and to the south, reaches the sea, including the island of Nisida. To the west embraces large part of Phlegrean territory, up to Bagnoli and to the east, includes the Vesuvian territories to S. Giorgio a Cremano, Portici and Resina. The plan drew with the latest surveying procedures, adopting *Tavoletta Pretoriana*. In the central part of the map is included in the bay of the gulf *"Veduta scenografica a ponente della città di Napoli in campagna felice"* while below, *"Storiografia dell'antico e del moderno della città di Napoli"*, followed by a legend containing 580 numbers used to mark the most important monuments and places of the city. The plant updated by Niccolò Carletti, that «nell'anno 1775 molte correzioni vi fece per le cose urbane ed agiunte allo stato presente della città». The editing of *"Iconografia"* of capital to Giovanni Carafa is a technical instrument, made urgent, as he writes in a letter to a friend, that «di passo in passo Napoli distendendosi si sia venuta in tanta vastità, che di lei si può dire, quel che della Romana Repubblica disse Livio, che già vacilli e soffra sotto il peso della sua propria grandezza». The city «divenuta , in pochi anni, almeno di un quarto maggiore. Non vi è d'altra parte luogo al mondo che raccolga in un territorio così ristretto tanta bellezza di sito e tanti illustri memorie». The main purpose of the paper was to exert a control on the intense process of urbanization that occurred in the Vesuvian side, «perché in primo luogo l'innalzzarsi tanti nuovi edifizj a gara da' particolari sulle falde del Vesuvio ha necessità, che di quei luoghi abbia il Principe presente la pianta, perché possa regolare il sito, e l'ordine delle nuove Ville, le quali se, come purtroppo si è cominciato a fare, s'edificheranno alla rinfusa senza ordine, e senza regola nella loro situazione, invece d'abbelireque' siti, oscurandosi le case l'una l'altra, non ammettendo il dovuto spazio a i giardini ed a i viali delle Ville, lasciando le strade, quali erano prima nella campagna, strette e tortuose, non avvertendo alla dirittura, e larghezza loro, non a i comodi delle piazze, delle botteghe e degli ornamenti, renderanno quella riviera se non brutta, certamente incomoda molto, e disordinata». Careful analysis, the duke, of urban conditions in which the city experienced that the village grew up more that concent possibilities by the nature of the sites, as «Napoli nel cui sito troppo da monti, e dal mare ristretto non ha certamente la natura concorso a potervisi edificare una così ampia città». Analysis, following the usefulness of the paper to the assertions of the duke of Noja, in the same, *"Lettera ad un amico contenente alcune considerazioni sull'utilità che si trarrebbe da una esatta carta topografica"*, «utile sarebbe ancora questa carta per l'esecuzione delle nobili idee di nuove strade da aprirsi nelle nuove campagne, poiché introdotto il costume di villeggiare, si cominciano a popolare tutte di ville, sia che se ne volessero fare delle nuove, o sia che le antiche si volessero o raddrizzare o ingrandire, o pure ornare d'alberi ombrosi». The duke of Noja believed that part of the territory in the process of urbanization, was the area that ran the greatest risk, and felt the urgency a charter could bring order to the uncontrolled urbanization. In addition, he believed that only by placing an updated and accurate map, it could draw the most convenient roads and the most necessary for the expansion of the city.

2. From the beach to the Public Garden

In 1780, the first years of the reign of Ferdinando IV of Borbone, the tree-lined promenade endowed Naples with a particular type of architecture, intended to be the site of a walk worthy of respect from other scenic locations in major European cities. The choice of location is not coincidental. The front of the sun-kissed and lush vegetation surprised travelers. It is a century before, in 1692, the description of Carlo Celano in his *"Notitie del bello, dell'antico e del curioso della città di Napoli [...]"*, where recounting of Chiaia Mediterranean beauty he says «dalla parte d'oriente ha una placidissima marina, che circondata viene a destra dalla riviera di Posilipo, appresso dall'Isola de Capri, dal Capo di Massa, dal dilitioso Sorrento, dall'amene montagne di Vico, e dall'antica Stabbia detta hora Castell'a Mare. Nelle spalle have il fertile Monte di Posilipo, che principia come si disse dal Castello di Sant'Erasmo, o col volgo di Sant'Ermo, sotto del quale sta la chiesa e monasterio de' certosini. In questo monte, dalla parte d'oriente, par che la natura di continuo stia con attenta fatica studiando per mantenerlo sempre verde e sempre in fiore, essendo che in questo in ogni tempo, e sia pure nel più horrido dell'inverno, vi si lavorano mazzetti di fiori freschi, che noi colla voce spagnuola chiamamo ramiglietti, soliti a regalarsi in occasione di feste di chiese, che in Napoli ve ne sono quasi in ogni giorno. Le frutta quando in ogn'altro luogo sono agresti, qui s'hanno perfettamente mature, e con un sapore più d'ogn'altro appetibile al gusto. Le fraghe, che da noi fravole son chiamate, quando ne' luoghi di

Siconigliano, di Casoria, di Fratta e di Cardito, che ne danno in abbondanza grande, non sono né meno fiorite, qui s'hanno perfette, e d'una grossezza et odore che non si può rendere credibile se non a chi le vede. Nel cuore dell'inverno dà piselli e sparghi tenerissimi, che si sogliono inviare come regalo et in Roma et in altre parti. [...] Nel suo piede poi ha campagne per verdure che in ogni tempo danno in eccesso, e per lo sapore e per la tenerezza; non parlo poi de' giardini de cedri, d'arangi e de limoni, che quando fioriscono, che per lo più sono due volte in ogn'anno, fan coll'odore godere d'un terrestre paradiso. [...] Questa delitiosa giornata principiarà dal Palazzo Reale, detto il Vecchio, e prendendo il camino dalla strada che gli sta dirimpetto, detta di Chiaja; come si disse nell'antecedenti giornate, quest'ampio stradone vedesi ricco da un lato e l'altro di belle, commode e continuate habitationi; dalla destra fa vedere lunghi e ben dritti vichi per li quali si sale alle Mortelle». Since the end of the seventeenth century, the city grew on the western side of the gulf to extend urbanistically. Therefore, both for aesthetic and for those planning, it was realised as the *"Real Passeggio"* as named later, would exploit the extraordinary landscape collocation than the previous arrangement of the beach, commissioned by the viceroy Medinaceli a century before, also if closed long the Riviera.

Fig. 1: The Riviera di Chiaia, drawing of the *"Piano del Lido di Chiaia dalla Chiesa della Madonna della Vittoria fino a S.Leonardo con la delineazione del Nuovo Giardino Publico*", Carlo Vanvitelli, c.1780

3. The Carlo Vanvitelli's design process for the Public Garden

As it is known, the architect of the work was Carlo Vanvitelli, commissioned by Ferdinando IV of Borbone, of which the elaborate project is witnessed by the body of drawings kept in the Archivio Storico Municipale of Naples. The reinterpretation of the sheets allows a reconstruction of the ideas and documenting the likely design process, from raw processing to the final solution. The graphics kit consists of several boards, almost all undated, initialed directly from Carlo Vanvitelli and executed with great care and graphic skills with pencil, ink and watercolors. Their interest increases whereas, together with engravings and the nineteenth-century views, are the only full-graphic testimony of the Vanvitelli's promenade no longer exists, as Ornella Cirillo says, in his book *"Carlo Vanvitelli: architettura e città nella seconda metà del Settecento"*. Taking into account, the original idea of creating a "french-style" gardin, with five avenues, fountains and parterres, the different design show: the study of bodies of factory tested and closing; the extension of the garden; the gates; the vegetation; the berceaux; the trillages; fountains and statues. The problem of the extension of the villa was the cause of the continuous series of design ideas regarding the concluding volumes. The maximum extension is represented in the defined plant *"Piano del Lido di Chiaia dalla Chiesa della Madonna della Vittoria fino a S. Leonardo con la delineazione del nuovo Giardino Publico"* that ot shows, if not the first, one of the two original proposals. The villa, here, extends towards the sea demolishing the Casino dell'Invitti and background fountains; open space on the Vittoria at the entrance, two buildings and to the left of them, a staircase descends on the beach in a space enclosed by the wall of cottages and two rows of seats that surround the perimeter of the villa. The choice of seats has been defined by the advantage that they could take or, to «prendere fresco in tempo d'Estate», and prevent the water's sea flooded the promenade. The seats also lining the southern front of the garden, establish a dialogue with the Mediterranean coastline making it an integral part of the project while at the Chiaia's street, a fence with evenly spaced pillars and simple iron railing, you can make visible both the *"Passeggio"* that the *"Marina"*. Two rows of trees separating the *"Gran viale"*

by *"due viali laterali minori"*, followed by «altri due viali adornati con arcate di Spagliere per non togliersi la veduta del mare», interspersed with berceaux. Two large fountains and five other smaller dot the way along the *Villa Reale*, which curves along the coast to the suppressed monastery of San Leonardo. The two *"casini"* of the input body is opposed, in closing, a single building block that leans to the walls of San Leonardo. Everything is documented in the table entitled *"Nuova idea d'ingresso nel Passeggio Publico di Chiaia dal cavalier Vanvitelli nel 1790"* reveals that the Vanvitelli's idea to close the path does not like the opening of the garden with distant factories, but with a unique body building that echoes the triumphal arch with ionic columns and pilasters of smooth bottom. A double-body level with the upper terrace that amplifies the visual impact. A second proposal will narrow, modestly, wasteful previous project in terms of extension. They keep the seventeenth-century fountains but demolishes the Casino degl'Invitti. To eastern entrance, the two *"casini"* show the same setting but with a square shape and are accompanied orthogonally from a backward third pavilion. The side parterre are drawn with various solutions. The villa's plant is due to the repetition of a single module three times punctuated by two major and six smaller fountains. The space not included in the enclosure of the villa to S. Leonardo is marked by a pair of parallel rows of trees that lead to the mona-

Fig. 2: The Riviera di Chiaia, drawing of the "*Piano del Lido di Chiaia dalla Chiesa della Madonna della Vittoria fino a S.Leonardo con la delineazione del Nuovo Giardino Publico"*, Carlo Vanvitelli, c.1780

stery. Among all the cases studied and analyzed belonging to the corpus of tables preserved Archivio Storico Municipale of Naples, the board *"Piano del Lido di Chiaia dalla Chiesa della Madonna della Vittoria fino a S. Leonardo con la delineazione del Nuovo Giardino Publico"* embodies the solution closest to the one then realized. Than earlier, it completely differs in scope and breadth, but it consolidates the idea, once again, of making a vegetative filter permeable between the city into urban growth and the beach is not populated. The villa as a permeable filter especially on the southern slope, where, even in this hypothesis, affirming the long bench in a position to fulfill the task of transition between the beach and the green without creating physical and visual obstacles. Rectangular and symmetrical system with respect to an axis passing through the only major fountain, at the center, at right angles to the greater length of the rectangle. There are eight smaller pools that dot the villa with a specific modular subdivision four equal trouble, this time rectangular, hosting *"Botteghe di Cafè"*, *"Sorbetteria"*, *"Bottiglieria"* and *"Bigliardo*", and that two and two articulated both opening and closing sides. A short tree-lined lane is the gateway entrance to the garden, close to the left from the coast and on the right from the Satriano's garden. The design approach of the green and paths remains unchanged, while it redesigned the demolition of the Casino degl'Invitti with the integration half in the villa. At the end, a rectangular area identifies a *"Piazza per gli Esercizi Militari"* on the beach, this shows what the architect did not escape the need for major structures such as the one intended for military exercises. This last hypothesis is accompanied by the tables relating to the design of buildings and finishes, titled *"Prospetto e Piano dell'ingresso nel Giardino a Levante", "Prospetto di una parte del Giardino verso la Strada a Settentrione*", with its *"Piano*", and a detailed drawing of the wooden scaffolding to support plants and lighting. In the two input bodies, with wide coverage terraces overlooking the garden and the sea, we recognize the clear classicist matrix solutions, such as the rhythmic girder alternating arches and rectangular niches containing statues. The two "*casini"* are welded both functionally both visually by a simple gate that with the elegance

reveals the dynamic movement of the fountains. On 11th July 1781, the annual fair, which it is keep regularly since 1738 between the offshore and the *Palazzo di Castello*, it is exceptionally place for the first and last time on the open space of the Victory off to celebrate the inauguration of the *Villa Reale* in Naples. For the construction of the *Villa Reale*, despite the amount allocated on 8 June 1778, the money proved insufficient to complete the work for the inauguration date. In fact, in 1782, the architects of Caserta finished mounting the travertine fountains and only after it was provided to the installation of the gate by the blacksmith Domenico Potenza that finally allowed the planting of 22 parterre. Finally, only in 1785 they mounted the lamps for lighting.

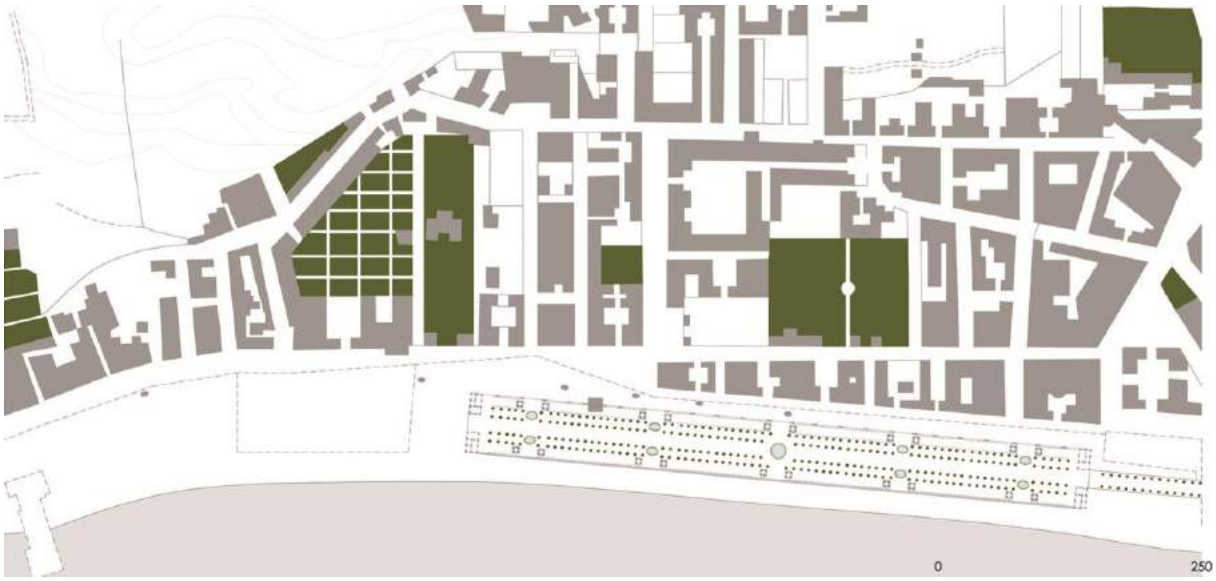

Fig. 3: The Riviera di Chiaia, drawing of the *"Piano del Lido di Chiaia dalla Chiesa della Madonna della Vittoria fino a S.Leonardo con la delineazione del Nuovo Giardino Publico"*, Carlo Vanvitelli, c.1780

4. From Vanvitelli's Public Garden to Real Passeggio

The Chaia's promenade became a place of recreation frequented by the middle class. Hosting outdoor concerts and it was lit and open at night and during the summer months, but its attendance was controlled by a very rigid class regulation that prevented access to badly dressed people and the poors. The entrance to the people was allowed only during the Piedigrotta festival. The incision of the *"Parata di Piedigrotta"*, outlined by Poulet and engraved by Francesco Giomignani, in broad outline, in plan and in accordance with an overall perspective view, is the apparatus in close conversation with the sea and highlights clearly the ideal of the boulevard extension central to the church of San Leonardo, through a wooded path. Damaged by the riots of 1799, the promenade met during the government Napoleonide a decade of profound and little-known transformations. On March 6, 1806, the architect Paolo Ambrosino was responsible for direction of the work of the first "rifazione" *Villa Reale*, which are engaged with each other, the gardener Antonio Cardone, replacing acacias with the elms, Raffaele de Rosa replaces the falling treillage eighteenth century with five sphinxes and twelve vessels of clay. Only a year later he delivered the supervision of works on Stefano Gasse, whose cooperation gave a strong development of more modern mold the *"Real Passeggiata"*. The transformative process of the villa, including the extension, it was not the result of a single project, but a gradual realization, according to the different economic needs, the changing taste of the time, along with that of the three kings who followed one another on the throne. The plan of 1790 is one of the best productions of the *Regia Officina di Napoli* conducted by G. A. Rizzi-Zannoni and the engraver G.Guerra, as De Seta wrote in his book *"Le città nella storia d'Italia, Napoli"*. It is fundamental for the possible comparison with that of the duke of Noja published fifteen years ago as there are read moments of the development of the city from piazza Mercato's placement to increase construction recorded in the half eighteenth century. In this plant, the Chaia's beach appears already placed to the royal villa in the tract near Pizzofalcone. Chiaia had become one of the twelve districts of the city, full of new buildings. In 1803, drawn by N. Carletti and engraved by Filippo Morghen, It is finally born, as Pane writes in his book *"La città di Napoli. Tra vedutismo e cartografia, Napoli"* also «a proper Neapolitan edition, revised and enriched with 92 references, over four perimeters of the urban walls, marked with letters (A-D) and three symbolic notations», all determined by the interest tourism. It is interesting, not to prove a fundamental condition urban development, since it documents a transitional stage, but it allows us to acknowlegde of the state going through the villa, a villa almost no vanvitellian.

5. From the first expansion of Stefano Gasse to the trasformations half of century

Dethroned the Borbone, in Naples, it is established with the government of Giuseppe Bonaparte who in 1807 appointed Stefano Gasse director of the *Villa Reale*, who asked him for the renewal of the system, in years degraded, and the extension of its scope because the Vanvitelli's project was interrupted abruptly in his opinion, and in addition asked him to break the symmetry that characterized the eighteenth-century, giving to all more movement so that «la smisurata lunghezza non riuscisse nojosa per l'uniformità delle disposizioni, e delle decorazioni» as it was read from notes of Gasse. The

Fig. 4: The Riviera di Chiaia, Villa Reale's image reconstruction, 1810

dynamism was to be a visible sign of the beginning of the new era. From 1807 to 1809, Gasse was concerned of renovation and only in 1810 with Gioacchino Murat, who he began working for the extension. The extension proposed for the first extension of the villa interested in the area to the west, by the end of Vanvitelli's public garden to the area on which showed up the *chiesa di San Leonardo in insula maris*. For the difficult economic situation, the architect ordered a plan of works divided into two phases: the first, included work on the perimeter of the plant expansion; the second, to be reduced in the form of park of the additional surface. In 1812, after approval to the project economics, Murat ordered the execution of the "English-style's grove" which included winding paths and flower beds to "bean". The project underwent a radical change during construction two years later, when the work on a pond and a small temple resulted too expensive. Gasse showed up then, a replacement planting to not break the walk grafting, on the continuation of the main road, a bumpy driveway lined with slightly

raised beds for cover behind houses, with several groups of trees, chosen in collaboration with Federico Dehnhardt, inspector of plantations. It will be the large number of plants to denote an english character; in fact, in an inventory of 1814, there are 3,900 shrubs, woody plants in 2984, 619 live oaks, 428 cypress trees, 388 olive trees, 206 of weeping willows and ailanti next to the iron railing, 81 Carditello's plane trees, oaks and acacias. The villa was composed of three parts: the first, included the eighteenth area, completing the renovation already started; the second a wood similar to the previous arrangement of 1806, with a circular open space of intersection; while the last was articulated with four "groves", in the middle of which it would have been a race track lined by an avenue for pedestrian safety, with two steps for the seats and a row of large trees behind. The four groves locate the poem area dotted with busts of Italian poets alternated with fountains and seats. In addition, at the center of the woods «uno spiazzo grande, atto a' giochi, e danze, praticato sopra la porzione anteriore de' casamenti di S. Leonardo» with parterres and fountains at the entrance. Symmetrically closed the walk, an iron gate between two bodies watch with an open dock of the bay. The project still retained reminiscences eighteenth using topiary art away from naturalism but tended towards a romantic characterization using the groves. The Consiglio degli Edifici Civili approved part of the draft and walked the perimeter of the factory work until 1811. In the following years, the architect Gasse with the help of Ambrosino, present two other projects for the beautification grove. Continuing, you arrive in a large space with an obelisk, a focal point on which the axis of the wheel drive towards further widening ornate circular seating. Here too, all around the road, there are winding paths, shaded and interrupted by several small spaces, that «porterebbero il Viandante, o verso il Mare, o pure nel Viale praticato verso la Strada». On the demolished monastery of San Leonardo, a circular plaza with a central fountain and a monument serves as a hinge for the whole of the villa. The second project of the previous correction setting, with two smaller paths that lead the central one. The first runs along the iron railing with willows, the second leads to a terrace at San Leonardo, always «ornato di parterri, con una Colonna nel mezzo, da dove si goderebbe il magnifico aspetto del Mare, e dell'amena costa di Posillipo». The *"Pianta della città di Napoli"* designed by Giosu□ Russo and engraved by Domenico Guerra in 1815 is the first plan of the city taken and published in the nineteenth century: they precede its only the designs of De Fazio-Malesci and Marchese. On their return in 1815, the Borbone found a converted villa and a building site in progress. Architects are encouraged by the same Ferdinando I to complete the former San Leonardo area, where, instead of regularizing the front of the sea, they decide on a budget and décor to create a dock. In 1819, the king ordered the closure of the shipyard. Gasse edited a plan of work in which the shape of the Villa «gli ha impegnati a cavar partito al possibile de' luoghi circostanti seguendo in ciò le orme di tutti gli architetti di giardini irregolari». The project resumes the original plan to "English", but above all, directs the placement of architecture in harmony with the gulf. The vegetation screen off the homes of Chiaia, contrasting with the delicious Posillipo's hill that now attaches its picturesque forms, its vegetables, and its Casini and becomes part of the prospective extension of the villa. Ancient literature assumed a strong evocative role when in 1819 Gasse, winning the competition organized by the archaeologist Francesco Maria Avellino, he built the circular temple dedicated to Torquato Tasso. In 1826 in the same way, Gasse made the Ionic temple dedicated to Virgilio. For both temples, Gasse employed the sculptural quality plastic Angelo Solari for the bust of Tasso entered the center of the temple dedicated to him and Tito Angelini for Virgilio's head, housed in the Ionic temple. The temples are for series, now in mid-ancient walking, a point of view toward the grove that awakens sweet sensations, being his eyes turned toward the temple but also to the tomb attributed to Virgil and with the same logic, the other side, among the laurel trees, see the small temple of Tasso, in the background of the Sorrento coast, where he was born. The continuous mix of artificial and natural elements has always been given to the villa a great architectural and environmental value and the presence of fountains and sculptures of great artistic interest, has done nothing but confirm it even more. The *"Pianta della città di Napoli e de' suoi contorni"* delineated and recorded in the Real Officio Topografico di Guerra in 1828, shows us not only the appearance of the city during the reign of Francesco I, but also the exceptional technical level, the rizzi-zannoniana tradition, with which were delimited the slopes of the Vomero with Floridiana, the *Riviera di Chiaia*, Mergellina and Piedigrotta. In 1830, Giuliano De Fazio and Orazio Dentice, municipal technicians, design and make a new entrance to the villa from the side of the tower. The new stretch that took shape as a result was called *"Villa Nova"* and pushed up to the height of the piazza della Repubblica. In 1831, after complaints of Dehnhardt for the state besetting the vegetation on the sea side, they start the dismantling works of the pavement and parterre. The botanical moved so that the green was reinvigorated as to have such fame in the guides. Subsequently it was deemed necessary to re-assign the work to ensure that the Gasse *"Villa Nova"* was built at the existing garden. In 1834, Gasse had to provide for the design of about 1500 palms to the west, the space created by the end of the first expansion to the new entrance on the present piazza della Repubblica. Four years later, in 1838, the model used by Andrea De Jorio for the preparation of its plant-guide of the city was

Fig. 5: The Riviera di Chiaia, drawing of the *"Pianta della città di Napoli"*, C.Ossani, 1843

not the relief published in 1828 by the Real Officio Topografico restating the sole of the Rizzi-Zannoni of 1790. Rather than reduces the plant of the Real Officio Topografico, with all the problems related to filing and reduction, the canon chose to use a pattern that was only polish and to which it was necessary to make slight modifications to upgrade. The author certainly reuses his previous studies, for example a plant followed in 1826, ie two years before it was published in Naples plant of the Real Officio Topografico. Among the updates would include the expansion of the *Villa Reale* at Mergellina, the square of the Real Palazzo with the church of St. Francesco and the new Foresteria, the Orto Botanico, the new road of the Campo Marte and that of Capodichino, the Osservatorio Astronomico, new situations roads off the Pigne cones and via Foria. The fortune of the *"Piante dei dodici □uartieri della città di Napoli"* is the fact that for several times was necessary the representation of the city with a larger scale. The first performance of this kind was carried out in 1798 by engineer Luigi Marchese and the tables are to be related to a customary 10 November 1798, which established the general directorate of police. The division of the city into twelve districts had a previous twenty years and was established with a pragmatic of January 6, 1779. The purpose of controlling the city are deduced from both the high level and is the largest number of reported information. Of this survey there were the originals of 1798, a processor 1804 and a further copy of 1813. Originally, the relief was made up of 20 panels, of which it holds an interesting union framework recently rediscovered and studied by G.Alisio, after twelve quarters was represented the surrounding area, in eight designated tables: *"Posillipo", "Chia□a", "Canciani", "Arenella", "Salute", "Capodimonte", "SM degli Angeli alle Croci"* and

"Monte Lautrecco". Only in the twenties of the nineteenth century it was decided to propose to print these helpful cartographic documents. The design and updating of the tables was performed in the Officio Topografico di Napoli on the basis of detailed surveys that already possessed the city, brought to completion between 1814 and 1822. The design of the lithographic plates occurred between 1825 and 1830. It is likely that these cards were to accompany the great plan of the city, whose etching was ended in 1828. In addition, in the *"Pianta della città di Napoli"* of F.lli Migliorato dating back always to the same period, the last part of the villa that goes from the end of the first extension of Gasse until the *Torretta* is marked with masts scattered and no solution for flooring. This space was probably used for walking and resting horses. In the *"Pianta della città di Napoli"* of Ossani on 1843, the last section presents the wall to the north that marks the villa's border with the Chiaia's street while on the seafront there is free solution without borders. Here, compared to the previous we see a first attempt of the green, with a pair of rows of trees. On 1853, the *"Pianta della città di Napoli"* produced by the Real Of-

Fig. 6: The Riviera di Chiaia, drawing of the *"Pianta della Città di Napoli"*, Reale Officio Topografico, 1865

ficio Topografico not much differs from the previously analyzed plant, but it shows how in those years have been subject to the transformation of the waterfront from the wide *Torretta* to *Sermoneta*. On the opposite side, at the entrance of the villa you notice the primitive shape of Piazza Vittoria. A few years later, on 1857, the *"Pianta della città di Napoli"* by F. Ceva Grimaldi, Richter C. documenting the attempt to close also definitely the last villa tract through a dock on the waterfront, creating a completely closed system. It is also transformed the Santa Lucia's quay to the east of the villa. About

8 years later, the *"Pianta della città di Napoli"* of the Real Officio Topografico documents the first bridged operation in the sea to St. Lucia while in front to the villa's entrance, Piazza Vittoria appears completed in its looks.

6. Conclusions

At the end of this planimetry excursus, from 1698 to 1865, I consider necessary to report what it was written by Paolo Giordano, in 2014, in his book, *"L' Albergo dei Poveri a Napoli"*, the importance of the survey and the action related to it, «detecting means reassess: ie measured, discretize and understand in order to reconstruct a unified framework of knowledge, it means capitalize good, the architecture, which, in most cases, is not used properly to its true potential». Acquiring this concept, and placing it at the base of any relief, it is understood that the relief well to give the information purely metrics, it allows you to read the architecture with a critical eye than the layers that have altered and transformed. The planimetry survey allows tracking of the past and consequently to know the path that led the architecture, or in general the land, to have the look with which wont appear in contemporary eyes. The *Riviera di Chiaia* in Naples as Paolo Giordano writes, in 2015, in the *"Proceedings of the thirtieth International Conference of the representation teachers of Turin"*, «it represented an ideal urban setting for testing the potential of architecture design, in its dual sense of relief pattern [...], caught in the act as instrument able to reconstruct stages of growth, layers, transformations [...]» and to «identify, categorize and select urban elements is the gender of both architectural and sculptural [...]» and finally «to prepare, as the final goal of this journey of discovery, a foreshadowing of the perfect *Riviera di Chiaia* based on a "design modification" capable of bringing out from the general chaos of the current situation, the real monumental textures, architectural and vegetation, from which to take the moves to support actions consistent with the identity of the site specific characteristics analyzed».

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New Monuments in Renovated Urban Areas. Roma: Science City, Varese: New Theatre

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Abstract
Over the past 20 years, the contemporary city aims to reorder a new monumentality through which to redeem pieces of incomplete and degraded urban areas.

Museums, theaters, stations and new settlements claiming the role of new polarities able to reorganize the physical relations system with pieces of ancient formation cities.

The re-establishment of new monuments rests on old symbolic assumptions replacing the church and town hall as a place of collective recognition.

The architectural codes derived from it are configured through a system of signs in which the linear outline of the building loses the reference to volumetric conciseness and is welded to the game of scalar sudden jumps. In this respect, the architectural expression suggests continuous shifting of meanings and participates in the reversal of the traditional meaning of the Monument.

The system of "complexities and contradictions", anticipated by Robert Venturi 50 years ago, is confirmed, though renovated in the physical / psychological relationship between various elements, in the kit of signs, combinations and visionary impulses that impress themselves in the most recent results of the contemporary architectural scene.

Keywords: Monument, Urban, Theatre, Conciseness, Scalar jump.

1. Section
Over the past 20 years, the contemporary city aims to reorder a new monumentality through which to redeem pieces of incomplete and degraded urban areas.
Reactivation in a modern way of museums, theaters, stations and new settlements, produces the drawing of urban elements who claim the role of new polarities in close relationship with the parts of the city's most ancient formation. In the relationships between different parts of the city, the re-establishment of new monuments is based on ancient symbolic assumptions replacing the church and town hall as a place of collective recognition. The resulting architectural codes are configured through a system of signs in which the linear outline of the building loses the reference to volumetric conciseness and is welded to the game of scalar sudden jumps. In this respect, the architectural expression suggests continuous shifting of meanings and participates in the reversal of the traditional meaning of the Monument. In this sense, the system of "complexities and contradictions", anticipated by Robert Venturi 50 years ago, is confirmed, though renovated in the physical/psychological relationship between various elements, in the kit of signs, combinations and visionary impulses that impress themselves in the most recent results of the contemporary architectural scene. On the background of these functional, figurative and morphological interrelationships, two proposals, for example, return the reciprocal relationship between historically distant parts of the city.

1.2 First Proposal: City of Science

The first proposal, drawn up for an International Design Competition sponsored by the City of Rome, is the project for the district of the "City of Science".

Contextualized in the north quadrant of Rome, near the Maxxi Museum by Zaha Hadid, the project occupies the area of a military barracks system, closed on Via Guido Reni. As a whole, the project consists of a set of buildings that recall some figures of the Roman iconography , from the sacred monument (Mouseion) to the “Palazzina”.

The museum called "City of Science" stands on Via Guido Reni, and is set up as a walled archaeological remains. Inside, in correspondence of the circular cavities, the building houses a structural system with cup shape in continuity with the outdoor area treated to green.

Two massive buildings reconstruct the corner of Via Guido Reni and Via Tartaglia and give rise to a perimeter of semicircular pattern that integrates with the parterre. This latter is a puzzle emerging from the ground in the form of light relief to rebuild, suggestively, a great marble plan: Memory of the Forma Urbis Romae.

These buildings with an extensive thickness of walls are spread over three floors and overlook on the central space made by large semicircular niches. The central core is a hollow space, with the roof supported by seven pillars, which is used for the exposure of large pieces. In continuity with the museum, the residential buildings are arranged in a line transverse to the axis of Via Guido Reni. The general shape of the buildings is linked to the modernist legacy of the Roman house, filtered through the examples of Libera, Moretti, De Renzi, Monaco and Luccichenti. It is an open planimetric system, with slanting lines, designed to optimize the average more advantageous exposure. Each residential building is constituted by a basement plus six residential floors. Depending on the most advantageous location, the basement contains the commercial and business accommodation. All the integrated system is designed to favor a phased implementation and ensure a smooth completion of the entire building. From the typological point of view the residences are designed with a staircase that serves two or three accommodations. The front of the building has a mixed-line perimeter suitable to favor neighborhood circumscribed areas, like small internal squares that contain the commercial and business accommodation. The overall system ensures a complete permeability of the area where the open spaces, treated to green, act as channeling of flows inward. Typical trees of the site they settle in the interstitial sites to contribute to climate mitigation. The building fronts are designed as a function of sunshine. The faces south-east and west are characterized by three frames that combine the planes in pairs and give a giant order to the back of the window system. The north fronts are predominantly of smooth masonry with the individual windows in high relief. The frames on the sunnier sides have a thick vertical tubular webbing useful to shade and to channeling rainwater from the crowning slab. This appropriate system of water reuse can break down the fine dust and thus contribute to climate mitigation. The outer frames, clearly rationalist, are wooden material (type "baubuche"): a micro laminated wood, very durable, environmentally friendly, which allows the use of very thin layers. The roofs are planted with perennial species by constant development over time, without the use of careful maintenance. The materials used, with high environmental quality, together with essences and natural cooling devices enable the reduction of harmful emissions and reduction of energy consumption.

Fig. 1: **General View**

Fig. 2: **Masterplan**

Fig. 3: **Aereal View**

Fig. 4: **Housing View**

Fig. 5: **Inside View Museum**

Fig. 6: **Inside View Museum**

Fig. 7: **Night View**

1.3 Second Proposal: New Theatre

The second proposal, which is also the result of an International Design Competition, concerns the reconstruction of the Teatro di Varese, the redesign of the square outside and configuration of a new residential building with neighborhood services. The masterplan is in a degraded area with an urban context defined and a hilly landscape area. With these assumptions, the general system aims to build the spatial and visual unity between the urban environment and the Bosto hill. The new Theatre, designed as a stage machine, is constituted by an agglomerate of simple massing, graceful by slight curvatures. The foyer is thought of as a large portal, height of 16 meters, which contains the "rooms" of rectangular plant, with a height/width of 4 meters and a depth of 8 meters. This set of rooms is the schedule by which the theater's activities are projected towards the square in front with a game of visual cross looks. It is a genuine screen built in an alternating montage of scenes whose preparation is thought by many artists able to grasp, in the various stations of an evocative path, the hallmark of the History of Theatre in all its different expressions. The foyer is a didactic exhibition space from which, via a ramp, you can access at the art room and at the roof of the theatre. In this way it becomes the link between the outside and the inside which filter area that can welcome visitors and direct it to different activities. The parterre hosts 900 seats in a rectangular room with a slight slope to optimize the visibility curve. Two galleries overhanging the parterre contain 300 seats each and complete the total number of 1500 seats. The scenic tower reaches a height of 24 m. and have the stage floor at 1.50 m. to facilitate the loading/unloading from the means coming laterally from Via Bizzozero. The outer surfaces of the entire theatrical system, with slight curvature, are coated with reflective material to capture and resend the glare of the lights and of the external landscape. The Theatre Square has the flooring in bi-chrome stone with alternating drawings and is engraved by regular and limited areas for the planting of the valuable trees. The integrated residential system develops along Via dei Giardini via a modular structure consisting of elementary bodies with rectangular base of 5x10 meters. The articulation of the elementary bodies is designed to promote the optimal lighting. The orientation includes the living area that faces sout-west/west, in the direction of the hill Bosto, the services in the north-east/east and the sleeping area in both directions. The combination of individual modular cells has gradually slipped into the urban context in order to derive the terraces towards the Bosto hill. All focused on the hanging gardens system , the concatenation of the cell produces a variety of spatial situations that eliminate introspection. The different rotations and the calibrated slippage planimetric prevent, in fact, the direct look in the adjacent residences. At the same time, due to the change in serial combinations, it combines the desire of subjective individuality to the principle of shared participation to exploit the advantages of the collective residence. The ground floor of the residences is constituted by a continuous front permeable adjacent the stairs , and is configured as a basement height of 4.50 meters. This basement is the support for the first level of residences with terraces, divided by each single dwelling, obtained by the gradual retreat of the elementary cells. The other four floors are arranged in a pattern cluster designed to capture the most beneficial view and optimal illumination. From the typological point of view, the residential system develops with a staircase that serves two apartments per floor. From the constructive point of view, due to the modular repeatability, it is provided the use of a mixed system of prefabrication and assembly in work. The facade on Via Bizzozero is rebuilt in continuity with the existing building perimeter. The parallelepiped building with a rectangular base contains the features required for business, for local health agencies and offices. For a three floors height, the building is dug by three rectangular courtyards open on one side, and is available from several existing elevations. The multipurpose hall reclines on the corner of the base towards Via Ravasi. A side element with steps, with planted areas, allows the usability of activities placed at different elevations.

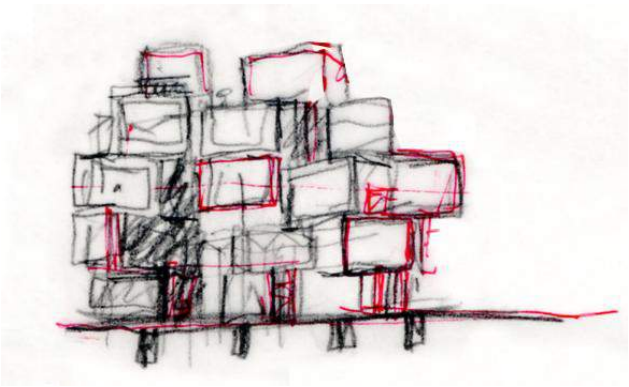

Fig. 8: **Concept**

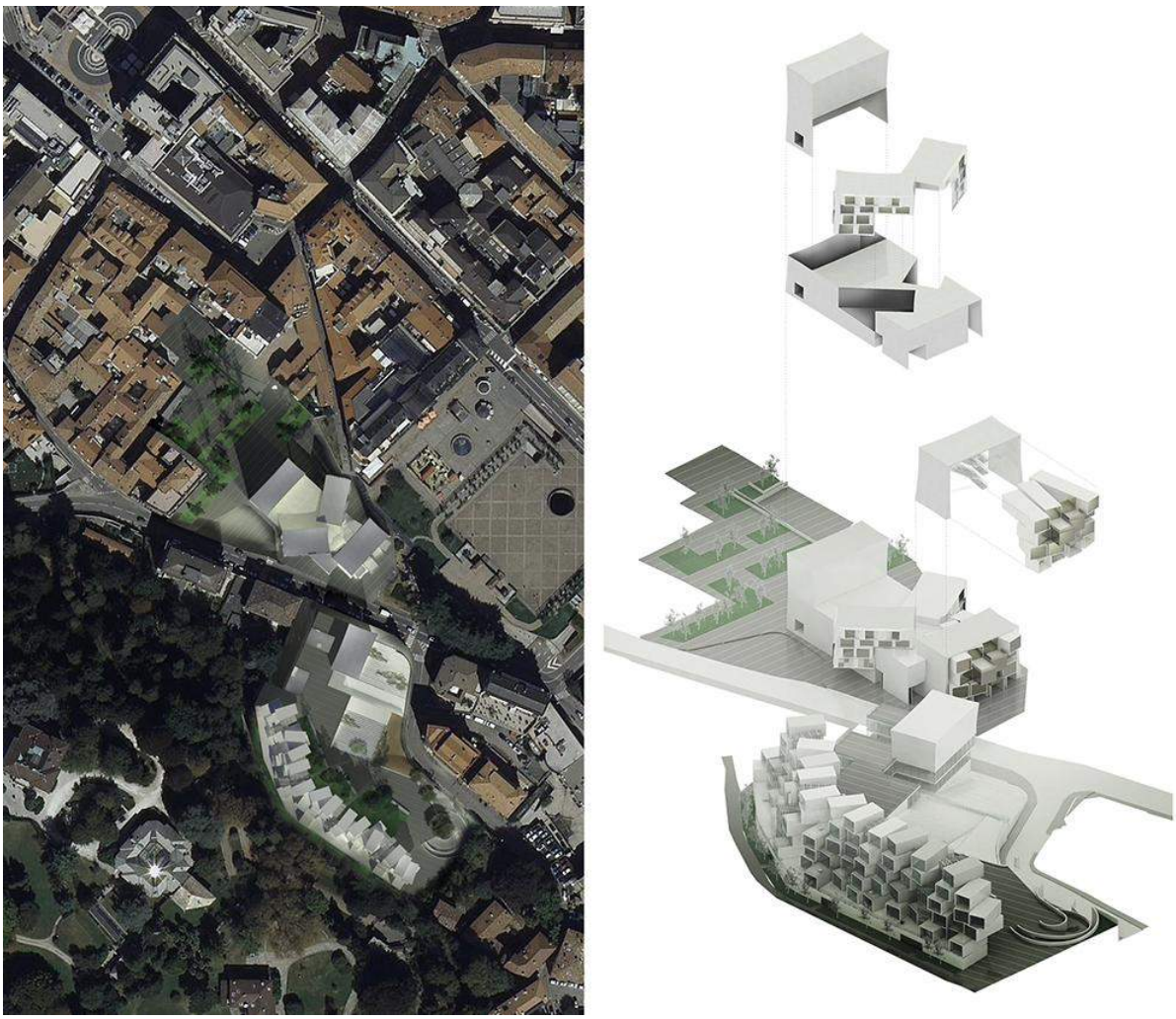

Fig. 9: **Masterplan**

Fig. 10: **View of the Theatre**

Fig. 11: **View of the Theatre**

Fig. 12: **Foyer of the Theatre**

Fig. 13: **Housing View**

Fig. 14: **Housing View**

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The rebirth of man through the regeneration of spaces

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Abstract
One of the main purposes of Architecture should be to improve the quality of human life through the design of space. Ability and sensibility of architects are always very influential to act in particular contexts of our cultural heritage: one of the most complex areas of intervention regards prison facilities. Professionals have to design projects of recovery to guarantee proper areas with all security needs, although the prison buildings are often old structures. In this case, the importance of the way of designing is essential to help the process of detainees' reeducation: in fact, the biggest problem is that spaces are alienating and this implicates that the detained will be always a social outcast. If the purpose of the jail is rehabilitation, the ambient where the imprisoned live, should encourage their positive reply. Unfortunately, the conditions of the most of this kind of structures are often inadequate. The prison of Naples, in *Poggioreale* neighborhood, is one of the creepiest examples.
The Neapolitan Onlus 'Made in Earth' is engaged in this type of intervention: they designed a project of recovery of one courtyard of the prison. The conditions of the spaces and the restrictions imposed by security reasons have pushed the Made in Earth team to search alternative solutions to support a better quality of life in prisons. The aim of this article is to suggest good examples to offer some guidelines of intervention in designing jail's spaces.

Keywords: Jail, quality of life, rehabilitation

1. The role of architecture in projecting the jail
In collective imagination, detention facilities are associated with different living conditions from those that we normally live each day. In fact, we tend to believe that the living conditions of the jail must necessarily be of lower quality than we expect for ourselves every day, although detainees are people with the same needs of air, light and space.
These considerations stem from the fact that actually, the majority of prisons provide extremely poor living and degraded conditions, due both to the management and to the architectural project. In fact, one of the principles that led to the architectural design is definitely the consideration on what it means and represents. Therefore, a related question is whether the architecture of the prison's space should be considered as part of the punishment or rather, the design should aim for "good living", providing the same attention and care that every structure aimed to accommodate people deserves.
The issue is that often the concept of freedom is in some way associated with that of jail space: freedom is reduced through the reduction of space. Even the space itself becomes a punishment creating inconvenience for the detained who has to live in undersized cells, with little light and without possibility of having a personal space. But it's easy to understand that the conditions of people living in jail must be protected to allow their re-education.
On the contrary many Italian prisons result to be inadequate because detention is conceived almost exclusively within the cells, without enough communal areas for socializing among detainees. As we will see below, in the case of the penitentiary institute of *Poggioreale* in Naples, the courtyards are

almost the only area where detainees can spend some hours of the day in company of others and the only place where they can receive different incentives.
The architect is the one who has the task of reasoning on how the space will be lived and "inhabited" (regardless of its function) and he also must be able to identify with the users of the environments. It is not difficult to imagine the consequences of a different setting on an individual. Think for example on light projecting, an indispensable element in architecture. Yet, in our minds, darkness and artificial light (as well as the reduction of space) are the connotative items of a cell.
Our opinion is that architects are responsible for choosing: they can propose a strategy based on punishment or operate in the direction of recovery and social reintegration. Obviously the relationship between architecture and detention is complex and detailed. It would be appropriate that the architectural debate supports the political debate, but this rarely happens.
Penitentiary policy has affected prison construction, but building construction is something different from architecture, which instead involves a series of considerations relating to the meaning of living and the quality concept. But probably quality is considered superfluous in detention facilities because factors (certainly fundamental) such as security and control have increased relevance.

2. The relationship with the city

Originally the prison and the courthouse were housed in a unique structure, usually in the city centre. When the two functions were divided into different buildings, jails were placed in the most marginal areas of the city. The reasons were health and hygiene and the will to define a building typology segregated and alienated from the urban civil context. Because of these new peripheral locations, the relationship between the city and the jail is even more complicated due to the distance from the network of services that strongly separate the penitentiary institutions from the associative sector that favour the processes of social and cultural mending.
In this condition, the jail accentuates its role as an excluding place.
The relationship with the local community becomes increasingly weak due to the absence of contextualization of prison facilities in the city. This presence is clearly recognizable from gratings, gates, high walls... but it’s a silent presence, which has no dialogue or exchange with the surrounding context. Yet the old prison placed in urban centres represent a piece of the city's history. These constitute an element of urban memory and of cultural heritage. Their physical removal would facilitate the removal of memory.
This is particularly evident in the case of Naples, where the jail is located in the central area and is deeply rooted in the urban texture of the neighbourhood also constituting a clear "discontinuity", or rather an extraneous place in the collective life. The urban condition of *Poggioreale* has changed profoundly: from peripheral it has become central. Today the presence of the jail is strong, almost a main part in that fragment of the city. In the same way, the relationship with the outside world influences the living conditions of the Neapolitan detainees through noises, voices and parts of the skyscrapers in the business centre that are visible over the high walls of the courtyard.

3. A new approach: the jail of Milan

The second House of Imprisonment of Milan-Bollate has been inaugurated in December 2000 and since its opening has been characterized as an institute with the aim to realize a project for the gradual social inclusion of detainees. First premise of the program is their empowerment through a type of penality which allows the freedom to organize their day. As an exchange for this autonomy, they have to learn how to responsibly manage the spaces and be active participants of detention life. Then, the Direction assumes the responsibility to ensure an opportunity for reintegration, while detainees are required to experience individual paths to start a process that will gradually bring them back to external social environment. Practically prisoners decide freely which cultural activities and sports can be organized. In addition, the delegates of the various departments have to accommodate the newcomers, working together to improve the organization and to discuss problems of coexistence.
And yet another key point of the project is the integration with the life of their territory. In fact, thanks to the interaction with the local community, the jail of Bollate has succeeded to create a strong opening to the district whose contribution is indispensable for planning effective social interventions of reintegration. So the City and the Region finance projects for the establishment of networks dealing in finding outside job opportunities. In this way, the Institute aims to become a resource for the community, as the numerous projects that involve detainees engaged in works of public utility. Architecture supports this program, defining the different spaces for the several activities carried out within the institution. Indeed, there is an education area and facilities dedicated to cultural and recreational activities as well as sports. These include the theatre that regularly hosts theatrical performances, concerts and literary meetings. These opportunities are addressed both to the prison population and to outside visitors. Or, in the centre of the prison, there is a library, which has more

than sixteen thousand volumes and which also makes use of an on line catalogue. These services are managed directly by detainees.
Obviously also sport activities are constantly practiced, for example football tournaments, tennis, gymnastics or yoga.
Finally, since a year, a restaurant called *"InGalera"* was opened inside the prison. It offers fifty seats and it is open for lunch and dinner, six days a week. Nine people work here: five in the kitchen and four as waiters. They are all detainees, with the exception of the chef and the maître, external professionals called to give prestige to the project. The restaurant is the result of a synergy between the public administration and private initiative, which has a twofold objective: the first is to provide detainees of training and work skills, useful to their social reintegration; the second is to give everyone an opportunity to interface with life in jail, through a constant opening to the public. In this way the restaurant can be the bearer of a cultural message, which aims to increase awareness about the meaning of the penalties and to strengthen the basis for an effective social inclusion of detainees.

4. A project for Naples

Future interventions must be focused on the idea to improve the quality of detainees' life. It means to design better spaces than the existing ones, where there must be the possibility to do different stimulating activities. In order to do this, architects need to be able to listen and interpret the needs of the detainees. First of all, they have to deliver quality in designing the spaces, which means quality of life. They also have to respect all security rules of the prison in terms of materials, structures, shapes, grade of visibility. In this way, architects can operate with not so many elements but, at the same time, the designing process becomes more challenging.
In this paper, we want to show an example of a sensitive approach to this issue: it is the design of a courtyard for the penitentiary institute of Napoli *Poggioreale*. This work is the result of an elaborate analysis and research by architects and engineers of a Neapolitan no profit organization named "Made in Earth Onlus", of which we are part. The organization is usually engaged in the design of foster houses, training centres or buildings for local communities in India. It answers to specific requests by the Indian NGO "Terre des Hommes Core" that takes care of about two thousand children in Tamil Nadu (a southern Indian region). After two years of activities there, Made in Earth Onlus has tried to operate on the Italian territory with the opportunity to rethink one of the most important space for detainees in *Poggioreale* jail. So they accepted the assignment to try to give more dignity and decency to the spaces of a structure that are in very bad conditions.

Fig.1: A view of the penitentiary institute of Napoli *Poggioreale*

The project of one of the jail's courtyards is thought to also be suitable for other courtyards of the building at a later stage: the area is distributed on a modular mesh where the functions could be collocated in different ways. The intent of architects is to absorb a small piece of city into the courtyard: this solution gives the chance to the inhabitants of the building to live in a small square, where they can stay with others or by themselves. The challenge is to give vivacity to this space and to encourage the right use of it.
In a first moment we were focused on the analysis of the actual situation in the courtyard and on the research of positive examples of designing in jails. In a second phase we defined the objectives to be achieved. First of all, we were confronted with the director of the prison and the security team: we asked them what kind of needs they had and we also observed part of the typical day of a detainee. In this way we could annotate the dynamics in which they live during their open-air hours and how they live the open spaces. So we analysed two points of view: first the needs of security that concern visibility and prevention, in fact the prisoners' activities must be controlled and the structures must be thought to prevent hiding or construction of weapons; then, the needs of detainees concerning sport and social activities, indeed many of them spend their open-air hours doing sports in courtyard, while others just make conversation walking around or sitting down.

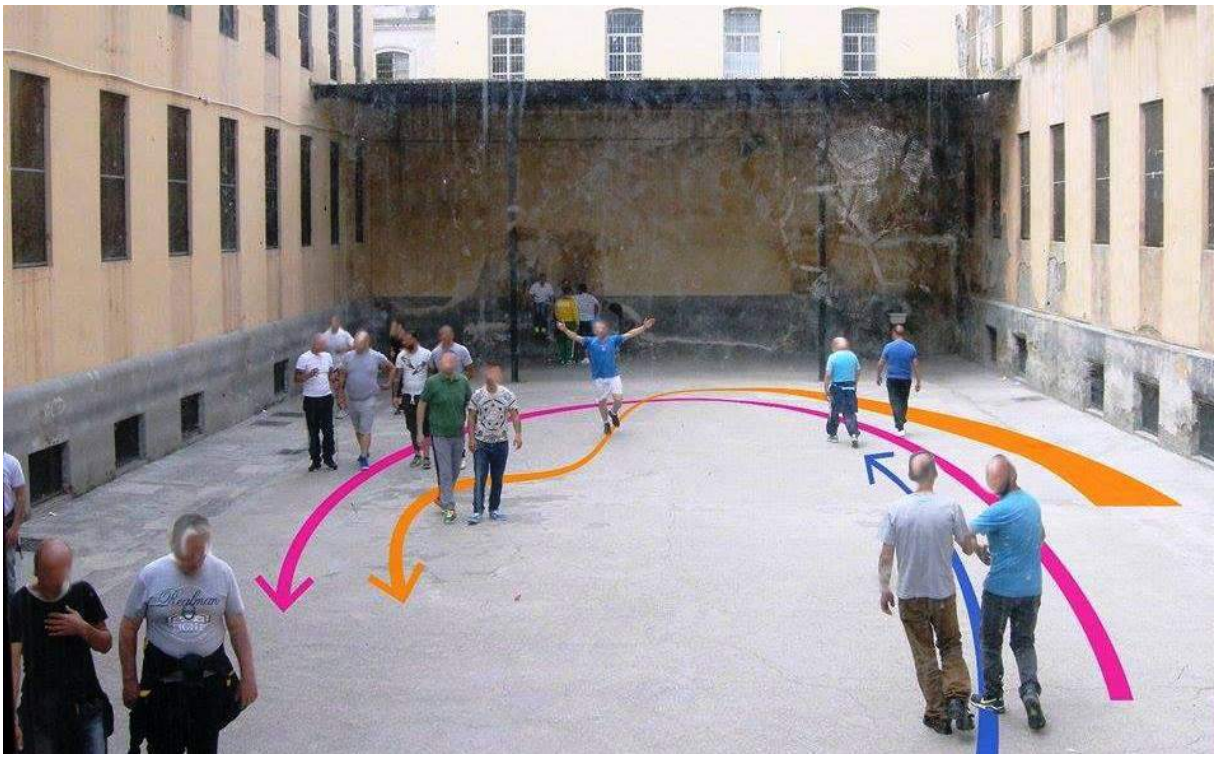

Fig. 2: The actual situation in the courtyard

After this first analysis stage, we needed to confront *Poggioreale's* condition with other structures, so we studied positive examples of interventions on detention facilities in the world. In some cases (completely different from the one we're working on) there is another idea of prison life: the architecture is essential to guide detainees and it's thought to give them the opportunity to improve their way of living and their relationship with others, allowing them to practice different activities. In this way the detainee feels useful and feels he's playing a role. The structure of *Poggioreale* is very strict and it is not compatible with a flexible organization of spaces and functions. Specifically, the courtyard where we would like to operate is an aseptic space, a big expanse of asphalt, without sitting space or anything else. The request by the Director was based on the will to increase the hours of open air, but in order to do that it is necessary to improve the quality of the spaces and thus of every single courtyard. At the same time, renovating the spaces of the jail is an opportunity to give a task to detainees and this means giving them dignity and making them feel useful.

4.1 The requalification of a courtyard

Now we wanted to propose an innovative vision of prison life. We thought that a new idea of the spaces could help detainees to have a better behaviour and we wanted to propose a stimulating place where there is the opportunity to do more activities; also different colours and materials could help giving various perceptions of the same space. The design proposes a flexible organization: like in a city, where there are squares and streets and where functions mix up between them, in the same way,

detainees can participate to different dynamics. The project was thought to offer the possibility to do sports, to relax in company or alone and to protect themselves from the sun or the rain. These choices were motivated by the belief that, more freedom favours willingness to improve. We also had to choose what kind of activities detainees could do. This choice is a way to involve the detainees and to give them the opportunity to build their own space, so they can take care of it. This intervention also requires a lower production cost, being made by prisoners.

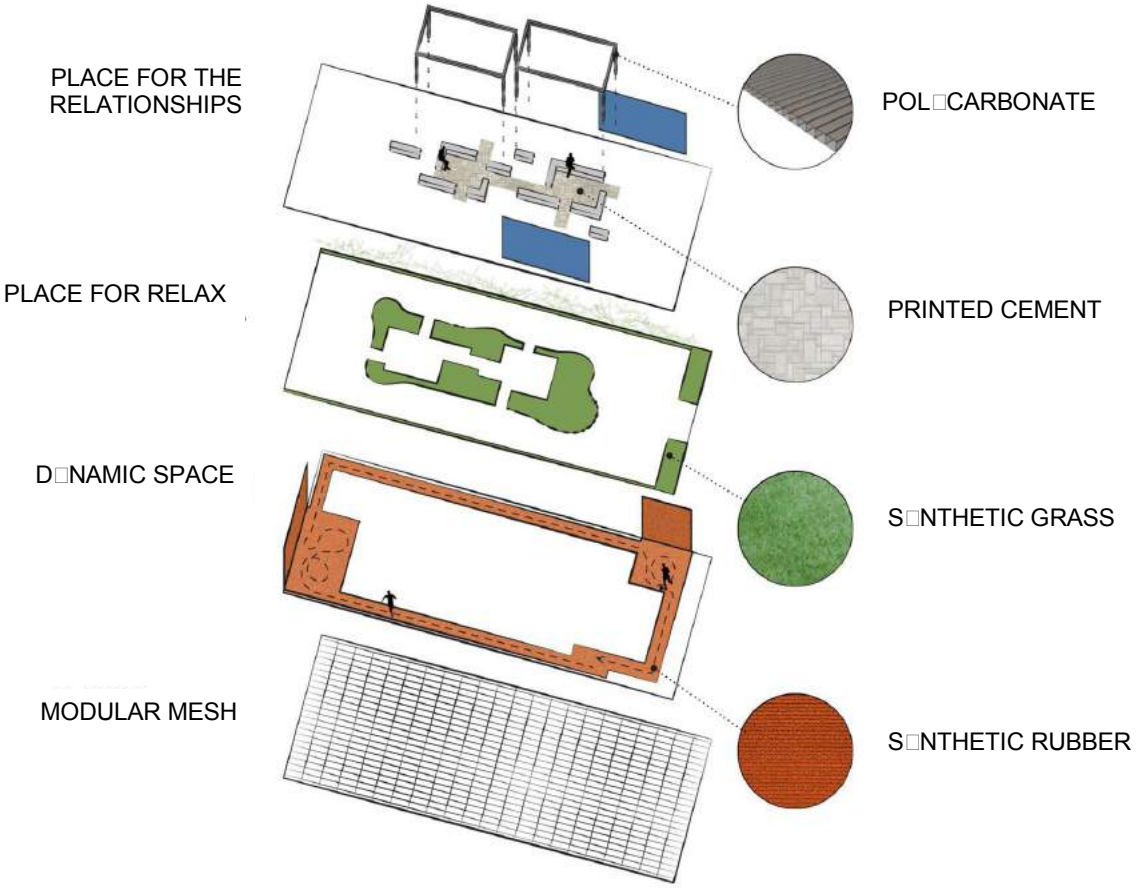

Fig. 3: The design made through layers

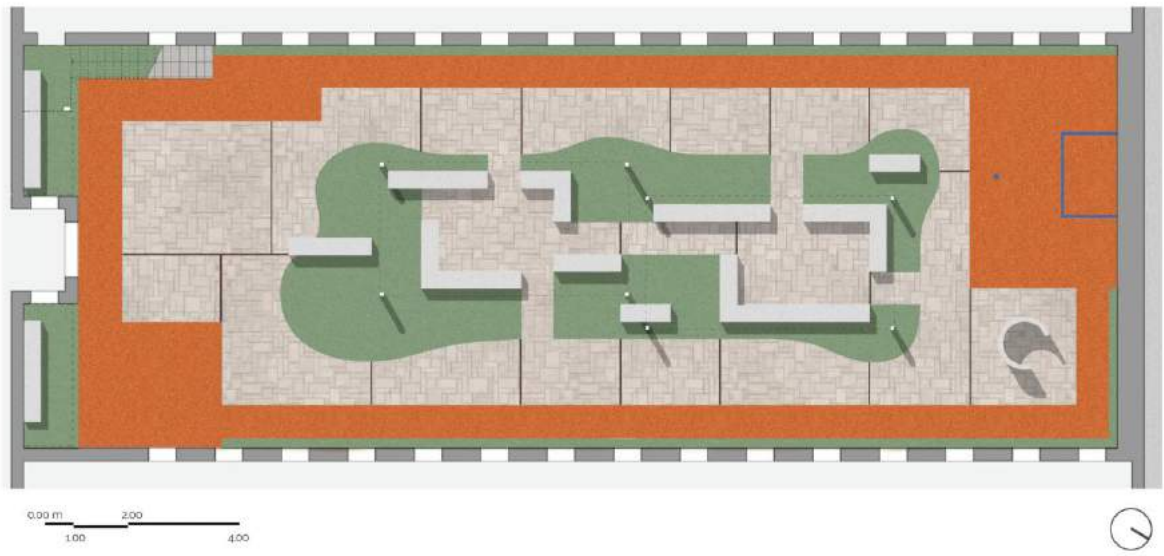

Fig. 4: Plan

The design is thought like an overlapping of four layers that are different in colours, materials and function. The first one (that is the starting point) is a modular mesh since one of the principal objectives is to adapt the project to the other jail courtyards. This is the way to propose a flexible solution in terms of organization of the different areas and this method allows to change the position of activities in the plan: in fact, each space is designed in function of a grid of 0,60 x 1,20 meters. The second layer is defined by the “dynamic space” that is the area dedicated to the physical wellness and to the comfort of detainees. Around the perimeter of the courtyard, we designed a track for jogging, which includes two little areas for playing football or basketball. The material planned for this space is an innovative pavement: a synthetic orange rubber suitable for sport activities and it doesn't require nails to mount it, but simply a resistant glue. So it is a safe setting method, but it requires a bed of levelled screed. This is one a labour activity that needs professional workers. The third layer is represented by a “relax space” and it’s conceived with synthetic grass where detainees can rest and relax like in a park. This type of material is ballasted and is mounted with the use of a resistant glue applied directly on the pavement. The shape of this layer is more organic, to give more vivacity to the courtyard. The fourth and last layer is the place for the relationships where detainees can socialize, talk with others while sitting on structures designed for this scope. There are some other areas where detainees can paint the walls to encourage their creativity and freedom of expression. The material used for this space is printed cement: this kind of material can propose a texture similar to a rock or wood pavement, or any other possible material. It allows a good and uniform surface, in this way there are no spaces between different tiles, like in a common pavement, and so it results being safer.
The problem of a plan with different elements is that detainees can hide something and it isn’t safe. A few concrete benches are also placed that can’t be disassembled as they result heavy. In addition, there are two platform roofs (welded on the ground) painted with intense colours and with an alveolar polycarbonate cover filtering light and heat.

Fig. 5: Section

Fig. 6-7: View of the courtyard

5. Conclusion

This project has been an opportunity to reflect on the theme of living inside a jail. We believe that beyond the problem of spaces dimension, the space concept is very important: it is not just the place for the execution of activities, but a tool to guarantee the person's identity. Jail is defined as a real institution of re-education and of reintegration when it can put in contact the "inside" and the "outside", leaving to the detainee the possibility to satisfy his needs and necessities to be stimulated.
Then the question is to plan the use of space trough diversified areas, which offer several alternatives (like playing sports, relaxing or simply chatting) facilitating socialization among detainees and remembering that it's relationship that makes a place alive.

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The Restoration of the Notre Dame du Rosaire Chapel in Istanbul

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Abstract
Notre Dame du Rosaire Chapel is a part of Saint Euphemie School Complex and was built as a school for nuns. The site is comprised of a school, a monastery and a chapel building and is currently in use as Kemal Ataturk High School. Present structure is assumed to be built in 1912 after a fire ruined the original wood structure in 1911. Chapel never had a comprehensive repair until 2010 and hence maintained its original characteristics. Kadikoy Municipality bought the building in 2010. Restoration project of the chapel was held within Yeldegirmeni Revitalization Project and has been prepared as a response to adaptation and reuse problems of numerous buildings in Ottoman territory built for missionary activities in 19th century. Here, we will discuss the methods and the decisions taken during preparation of restoration project of Notre Dame du Rosaire Chapel.

Keywords: Restoration, Re-use, Istanbul, Yeldegirmeni, Kadikoy.

1. LOCATION
Notre Dame Du Rosaire Chapel is located in Yeldegirmeni neighborhood in Kadıkoy, Istanbul (Fig. 1). On the Asian side of Istanbul, Kadikoy is surrounded by Uskudar in north, Atasehir on east and Marmara coast on south and west. It is the 6th most populous in 39 provinces of Istanbul with 532.835 inhabitants [1]. Yeldegirmeni is located across Haydarpasa bay and surrounded by Recaizade Street in south, Anatolian Railway line in east and north, Rihtim Avenue in west. It is a neighborhood of Rasimpasa district along with Haydarpasa, Ibrahimaga, Talimhane and Sogutlucesme neighborhoods [2].
On June 5th, 1998, Yeldegirmeni is declared as 'Urban Conservation Area' by the 2nd Preservation Board [3]. Yeldegirmeni (Windmill) neighborhood was called after four windmills producing flour for Ottoman Palace between 1774 and 1789. Population resided in the neighborhood mainly consisted of Turks and Roums until 19th century when Jews began to settle down after a major fire in Kuzguncuk which caused a much complex ethnic structure. Yeldegirmeni Urban Conservation Area is composed of steep narrow roads and small squares. Architecture in this area varies depending on different ethnicities in the neighborhood existing for decades. Architecture dominant in the region is similar to that of Tarlabasi, Kuzguncuk where non-Muslim population is concentrated in late 19th century. 3-4 story wood frame or brick masonry houses were built in rows which mostly don't have front or side courtyards. Houses were mostly constructed in Art Nouveau style with empire or baroque details and usually have projections [4].
Yeldegirmeni Revitalization Project was commenced in August 2010 by Kadikoy Municipality and the Foundation for the Protection and Promotion of the Environment and Cultural Heritage (CEKUL) as primary actors. It aims sustainable and holistic interventions to physically, socially and economically deteriorated urban texture and preserve local values of an urban center in Asian side of Istanbul which has a unique historical identity. Unlike numerous ongoing profit oriented projects in Istanbul, Yeldegirmeni Revitalization Project was designed taking local and social consequences into consideration.

Fig. 1: Istanbul City Map, [5]

Private parties as well as various non-governmental organizations like "Our Streets Foundation", "Yeldegirmeni Volunteers" and “Earth Foundation" contributed to the project. But the most crucial role is played by local residents whose participation was essential since local network and public participation plays a very important role in socially sustainable recovery.
Project can be considered as reformist in the way it sets local residents to intervene their own neighborhood instead of government or private parties which may cause a destructive social gentrification that has recent examples in city history. Project is managed by a community center which is located in the neighborhood and a group of voluntary residents directly participate in administration and thus transforming neighborhood with local people in a harmonious and sustainable way [6].
Scope of the project involves physical projects such as renewal of infrastructure, preservation and reuse of historic buildings, creation of public spaces, facade arrangements as well as social projects like local residents and tradesman's associations, establishment of community organizations and workshops. It also aims to get integrated with city scaled projects like Marmaray Project, Anatolian Rail Project, Haydarpasa Project in long term [7].

2. HISTORY

"Notre Dame du Rosaire Chapel" was constructed as part of a nun's school called "La Nouvelle Eglise et La Pensionnat Sainte-Euphemia" (Fig. 2).

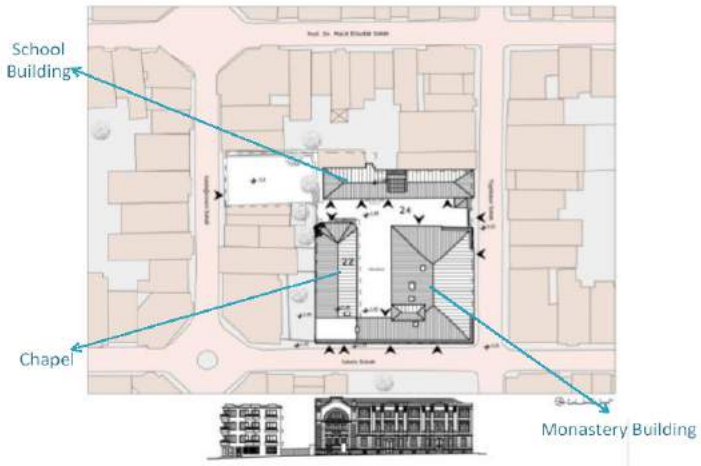

Fig. 2: Site Plan-Survey (Karbeyaz, Eyupgiller, 2009)

It was established in 1895 as an unlicensed school for girls and has been certified in 1913. A document found in the Prime Ministry Ottoman Archives dated September 17, 1912 states that the complex was built in three units as school, monastery and chapel and was entirely destructed after a

major fire that took place in 1911 [8]. In 1935 school administration was handed over to the Ministry of Education and the name of the school was changed as Kemal Ataturk High School. Chapel has been abandoned and rarely used until it started to serve Kemal Ataturk High School as a gym. It was completely isolated after the 1999 Marmara Earthquake which caused structural damages to the building [9].

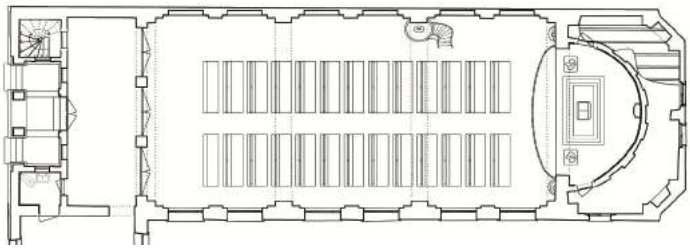

Fig. 3: First Floor Plan-Restitution (Karbeyaz, Eyupgiller, 2009)

Fig. 4: Long Section-Restitution (Karbeyaz, Eyupgiller, 2009)

Fig. 5: Cross Sections-Restitution (Karbeyaz, Eyupgiller, 2009)

Today, monastery building hosts Kemal Ataturk High School while school building is vacant. Chapel building was partially vacant while basement floor was serving as meeting hall and 3rd floor was in use as a part of school library. Monastery and School buildings were registered as 2. Degree Architectural Landmarks on June 16, 1981 by the High Council of Immovable Monuments and Antiquities while chapel building was registered as 1st Degree Architectural Landmark on April 13, 2011 by the Istanbul Cultural and Natural Heritage Preservation Board- No.5 Regional Board. Within files of complex in registration board, it is stated that the school building was damaged due to excavation work in adjacent lot and needs to be evacuated and chapel building can be rented as gym to school management since it lost its characteristics as a religious building (Fig. 3-5), [10].

A signature, which could be read as "E. Girije" and is presumed to be of the architect's, was observed on construction drawings in the school archive. "Annuaire Orientale Trade Annuals" includes an architect named "Emile Griet" who was active in Istanbul between 1892 and 1895 but no further information could be obtained [11]. Design of chapel is very similar to chapel in St. Joseph High School in Kadikoy, thus is presumed to be designed by the same architect which could be either Perpignani, Michelini or Augier (Fig. 6), [12].

Fig. 6: Photo Demonstrating Chapel Interior (Kadikoy Municipality Archives, 2011)

3. ARCHITECTURAL DESCRIPTION

Located at the intersection of Taslibayir and Iskele Streets, chapel building occupies lot 22 of block 205. Monastery and chapel buildings unite in a U-shaped single building surrounding a courtyard in south. Chapel is approximately 30.0mx10.0m in size reaching 16.0m of height in the courtyard (Fig. 7).

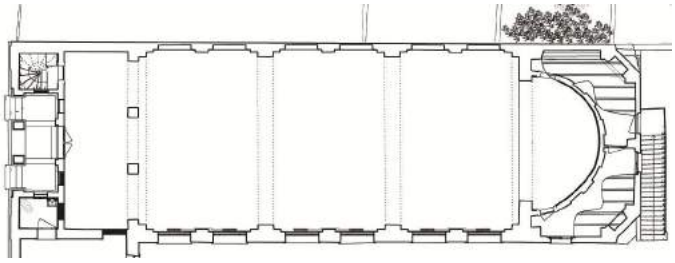

Fig. 7: First Floor Plan-Survey (Karbeyaz, Eyupgiller, 2009)

3.1 Planimetry and Spatial Features

Fig. 8: Cross Section-Survey (Karbeyaz, Eyupgiller, 2009)

Chapel building has 4 stories. Access to basement floor is only available through inner courtyard. There is a meeting hall with a stage and 4 rooms in basement floor. First floor has 2 accesses from south and north. Main access is from south on Iskele Street. There are two priest rooms, nave, apse,

narthex, toilet and staircase on first floor. Partial 2nd-gallery floor is open to nave in north and was used as depot, while partial third floor can only be accessed through monastery building and was used as library (Fig. 8).

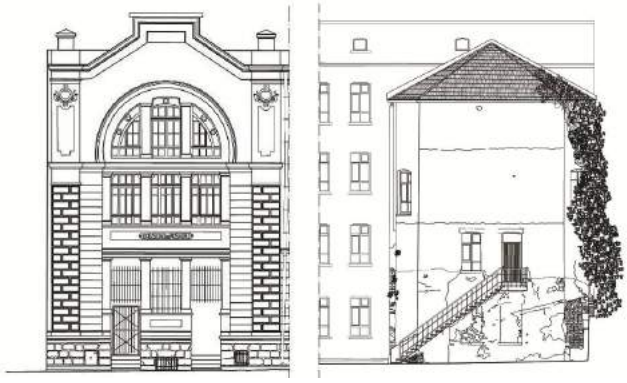

Fig. 9: South and North Facades-Survey (Karbeyaz, Eyupgiller, 2009)

South facade of chapel which overlooks Iskele Street is the most remarkable one (Fig. 9). Chapel and monastery buildings are perceived as a whole on this facade whose total width is 39.0m while chapel occupies 10.0m of it on west. Chapel is 15.0m of height on this facade. The presence of chapel was distinguished by some significant variations like “Eglise N. D. Du Rosaire" inscription and a remarkable entrance. South facade of chapel is coated with artificial stone which was a common application in late 19th century in Istanbul [13]. Based on south facade characteristics of chapel, it can be classified as Neo-Renaissance in architectural style.

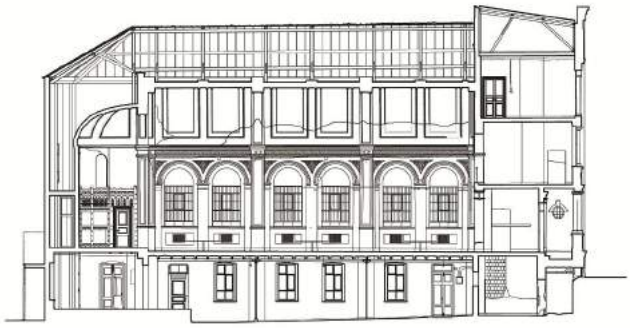

Fig. 10: Long Section-Survey (Karbeyaz, Eyupgiller, 2009)

Chapel can be perceived as an individual building from west, north and east facades which are plainly painted on stucco and have no significant characteristics (Fig. 11).

3.2 Construction Techniques and Materials

The foundation could not be inspected on site, however 0.50m thick stone foundation walls and a drainage system could be observed on historical construction drawings obtained from Kemal Ataturk school archives.

Walls of chapel were mainly in brick masonry while stone and brick were mixed used on basement level. Brick arches integrated into basement walls were used to reduce load. Thickness of load bearing brick walls along the building changes between 0.45m to 0.90m while the thickness of the non-bearing partition walls are between 0.15m to 0.30m.

French Vault (Volta) floor system was used all along the building. Width of vault arches varies between 0.45m-0.60m while width of steel beam is 0.10m. Vaults are supported by lally columns in basement floor.

Nave in first floor is topped by a 20.0mx10.0m tunnel vault at the height of 9.20m and is roofed by hipped wood roof structure tiled with Marseilles tiles on top (Fig. 10).

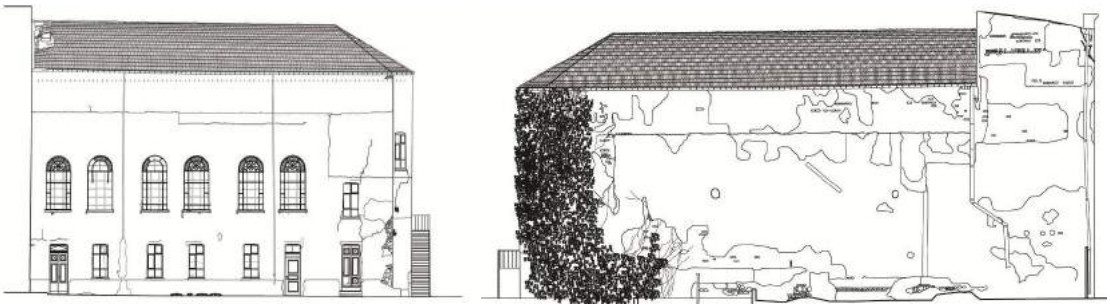

Fig. 11: East and West Facades-Survey (Karbeyaz, Eyupgiller, 2009)

3.3 Deterioration

1999 Marmara Earthquake and settlements in adjacent lots caused structural damages on the building. Vertical structural cracks noted in the north part of the chapel along basement and first floor walls pointing out an elevation change due to the settlement in the grade. Vegetation on north part of the building also widened structural cracks.

South part of roofing was severely damaged and horizontal structural cracks could be noted along east, north and west facades.

Humidity was one of the major problems along chapel and caused plaster deteriorations especially in basement floor and on the vault of the nave.

Although chapel was not intervened elaborately, it is possible to track an annex constructed adjacent to north wall of chapel. Annex was demolished leaving stucco decay on north wall. Original stained-glass windows were also intervened unskilfully through time.

4. RESTORATION PROJECT OF NOTRE DAME DU ROSAIRE CHAPEL

Restoration project was officially approved on 30 November 2012 by Istanbul Cultural and Natural Heritage Preservation Board- No.5 Regional Board and construction was completed in 2013 [10].

During restoration studies, structural and material deteriorations were identified and interventions were investigated to eliminate causes. Decisions were taken to allow building use as a 'Cultural Center' in accordance with the historic nature of building.

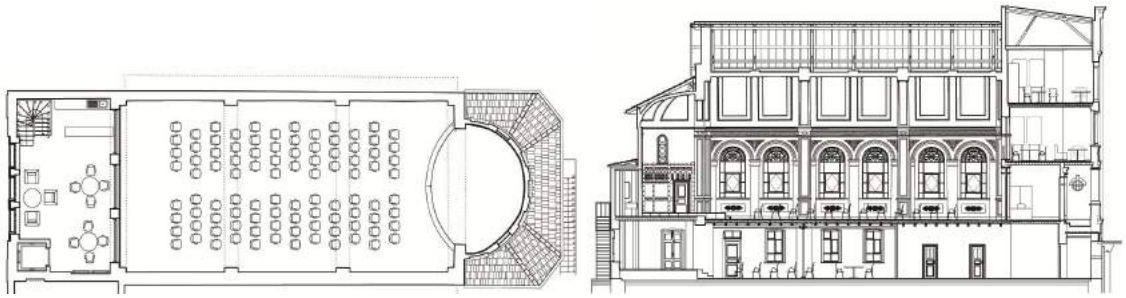

Fig. 12: Gallery Floor Plan and Section-Restoration (Karbeyaz, Eyupgiller, 2011)

All gates and interior connections between monastery building and chapel building were sealed except emergency exit on third floor. Vertical circulation established in the building. Original wood stairs on southwest corner is extended to basement and third floor using identical materials and construction techniques. Additional wood stairs is added on north-west corner using original techniques. Rooms which originally functioned as toilet on southeast corner of basement and first floor are replaced with an elevator shaft in whole building considering handicapped accessibility and decor transfer along the building (Fig. 12-14).

Basement floor is designed as a multi-purpose hall for 64 people to host amateur theater, music and dance exhibitions. Inauthentic additions were eliminated, original windows were opened and technical rooms were added. Floor level is lowered to courtyard level. Floor heating is installed while natural ventilation is recommended (Fig. 15).

On the first floor, nave and narthex are divided by three wood panels. Narthex is allocated for security and cloak-room using demountable wood panels. Nave is designed as a multipurpose hall for panels, exhibitions or chamber music activities for 96 people (Fig. 16, 17).

Fig. 13: Section-Restoration (Karbeyaz, Eyupgiller, 2011)

Fig. 14: East and North Façades - Restoration (Karbeyaz, Eyupgiller, 2011)

Wood floor of apse was lifted and stained-glass windows were designed in the nave based on information obtained from historical photos. Windows in the nave and apse were considered to be sufficient for natural ventilation of entire space. Former priest's rooms are transformed into backstage by small interventions and a wood stairs is added to connect room to basement floor. All ornaments and decorations on tunnel vault and apse on first floor is preserved and completed according to photos obtained during restitution studies.
Addition on the north to cover original apse semi-dome is removed (Fig. 19). Semi-dome is exposed and covered with a hipped tiled roof as shown on historical maps [14].

Fig. 15: Basement Floor Interior (Right: Karbeyaz, 2009; Left: Umar, 2013)

Gallery floor is designed to serve as a cafe for the entire building (Fig. 18). Third floor is allocated for administration of Cultural Center. Elevator shaft was added on southeast corner and wood stairs is

extended along the building on the southwest corner of the room. The access to the monastery building is preserved as emergency exit. The window on north wall is opened to provide access to roof which was inaccessible.

Fig. 16: First Floor Interior (Right: Karbeyaz, 2009; Left: Umar, 2013)

Fig. 17: First Floor Interior (Umar, 2013)

Removal of inauthentic additions was one of the main interventions recommended during restoration project. Unskilled additions in basement and ground floors were removed, original closed windows were opened and lighting and heating elements were renewed. Stained-glass windows were designed based on old photos and postcards of the chapel. Entrance was retained on south facade, through the main gate on Iskele Street. Gutters were also renewed and replaced.
Humidity was one of the main problems. Thus, existing drainage system was renewed and drainage pipes were enlarged where necessary.
Surface cleaning was recommended regarding the pollution, plaster erosion and dense vegetation on walls of chapel. Facades were completely scraped off old plaster and replastered. Dense vegetation on northwest corner of chapel was also removed and wall facades were disinfected by ‘Herbicide’ in order to prevent reemergence (Fig. 20).

Fig. 18: Gallery Floor Interior (Umar, 2013)

Cracks observed in chapel were classified into two categories: structural and superficial. Structural cracks emerged due to grade settlement around foundation walls. Cracks between nave and apse and on top of apse windows were significant results of the settlement. Horizontal structural cracks were noted on northern, eastern and western facades due to later interventions on facades. Superficial cracks were however, generally seen on plaster, due to removal of inauthentic annexes.

Fig. 19: North Facade (Right: Karbeyaz, 2009; Left: Umar, 2013)

Wood roof structure, wood finishes and wooden doors and windows inside the chapel were completed or replaced. Gypsum ornaments and stone window sills were also replaced and exposed.

5. CONCLUSION

Notre Dame du Rosaire Chapel is restored as a "Cultural Center" considering its role within Yeldegirmeni Revitalization Project and minority of current Catholic population in the neighborhood. During meetings held with Kadikoy Municipality, it has been especially stated that building should be restored preserving its original religious identity so that it can serve as a church for Syriac people from surrounding neighborhoods in the future.

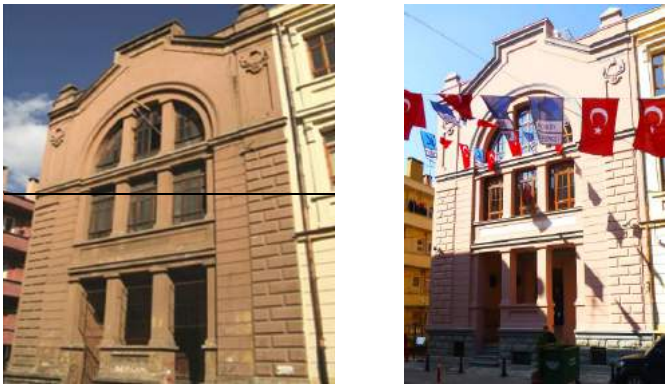

Fig. 20: South Facade (Right: Karbeyaz, 2009; Left: Umar, 2013)

Fig. 21: Opening Ceremony (Kadıkoy Municipality, 2014)

Restoration and re-use decisions were taken in harmony with cultural heritage values and historical structure of building. Nonhazardous interventions were proposed while importance of active use of such historical buildings is emphasized for preservation and transfer of cultural heritage to future generations. Project brought Kadikoy Municipality 'Union of Historical Towns Award' in 2012. The restoration work is completed in 2013 and the Notre Dame du Rosaire Chapel is currently in use (Fig. 21).

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Eco-smart technologies for the new relationship's spaces

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Abstract
Where agricultural production has built the identity of places and the quality of the landscape, in a particular condition that sees a whole series of "environmental crimes" added to the damage caused by a growing out of control, experience new possible uses of the land to give back to the places their own original beauty means, in this research, the application of innovative technological systems for the recovery of the territory. The work involves the use of eco-smart technologies for urban farming and is directed to the rehabilitation of degraded urban areas in order to improve their environmental characteristics. In particular, we present a case study involving an area located in the town of Casal di Principe, district of Caserta, which is currently in a degradation and abandonment state.
The proposed project consists in a semi-open structure characterized by the use of eco-smart systems for the indoor and outdoor vertical cultivation, for the improvement of the soil permeability and for the recovery and reuse of rainwater.
This structure has several volumes including one, on two levels, used as a market that runs along the north-south axis of the area. The structure of the market is particularly innovative cause it provides, in its interior, also agricultural production carried out through systems for vertically growing. The exposure of these products, in addition, is characterized by interactive multimedia systems which allow to obtain ecological and environmental information.

Keywords: environmental design, innovative technologies, urban farming, urban open spaces

1. A new alliance Lorenzo Capobianco

The modern history of growth and urban transformation of the metropolitan area of Naples (the city and the surrounding areas) seems to be double: social, economic and environmental excellence that build and spread the image of the city in the world correspond with a series of accidental conditions that draw a city in an incomplete modernity in an everlasting state.
From a cultural and economic solidity that elected Naples (and its territory) as one of the most important European metropolis to a long and unresolved deep social-economic crisis.
As a result, the high density of population in that area corresponds with one of the highest monumental heritage of the world: religious centres, churches, royal palaces, noble buildings, monuments, castles, military buildings, archaeological sites, ancient villages, historical centres, parks and landscapes. An indisputable condition of unicum, a sort of alive and inhabited monument. But there, ruthless and cruel processes of growth and building development built the city joining estates' lands and building development in the property speculation, first, and a deep economic depression coming from the oil crisis in the 70's that took the inhabitants to decay and cholera.
The distance between the place where you live and where you work is the subjective space that consults about the nature of its identity. Hamlets, villages and neighbourhood meet, confusing with each other in a mix of tuff and cement with similar but different, common but particular characteristics.
Also the territory of Casal di Principe (Figure 1), that includes the innovative technological system that is the main topic of this research, and probably it is the main example in comparison with other neighbouring areas and it found in the agricultural industry its identity and quality. Nowadays, the non-control of the planning is considered with an endemic economic and cultural poverty and a long series

of “environmental crimes” that gave a great contribution to underline the situation of these lands, testing new possible uses of the soil to return the original beauty of those places that is now an undeferrable need.

Fig. 1: The territory of Casal di Principe

It doesn’t deal with the application of eco-smart technologies principles to recreate that pact with the nature broken by the human beings from the modernity period and either with the limitation of the research of a due compensation with regard to a land wounded committing a crime.
This research represents the occasion to meditate and examine about different themes and kinds of architecture, that nowadays seem to need more than one update: in a time when the cultural paradigm of the unlimited growth, typical of the 20th century, was inverted going towards the unsolved problems of the contemporary city that are added to a new emergencies, creating a new crisis to the urban design and starting a discussion about the role of the architect and the new chances of architectural design. It is necessary starting new models to transform and operate to entrust their centrality to the human gaze. Through closed and measurable shapes, the sense inversion of the perception of strengthened elements in the urban landscape, an updated relationship between public and private space, we can examine the theme of a new housing to give back the identity to the places of our everyday life. In everyday life, this “housing feeling” seems to be free from the “prison” of the walls to project to the spaces of the city, building a belonging feeling among inhabitants, city and a new possible sense of identity of the places. So, a possible city that offers itself as light and colour of a new urban landscape, possible answer to the diffusion without quality and rediscovering the space related to the city as a real alternative to the models of growth and change that gaze elsewhere: a new and a more perceived care that opens to the research of a language and of expressive understood and shared shapes, able to reduce the wide gap between common sense and architectural research, to shape those common unaware needs that, if unheard, can release a destroying charge in the transformation process of the image of the city and how it is composed.
In fact, between need and occasion, the tumultuous process of growth of the city led in the triple name of rebuilding, speculation and emergency. About them, Casal di Principe is a witness and gives to present multiple and opposing faces of cement where the plural identities of the land dilute, almost disappearing, distinguishing the rural and agricultural landscape and the urban inhabited area.
The decay and abandon images in our everyday life there and in the surrounding areas aren’t ascribable to the obsolescence of a building technology or to the maintenance lack, but they have to be measured with complex conditions that interlace the economic aspect to the political and sociological one. If on the one hand, the economic crisis sometimes has an enormous difficulty considering the Public Administration to grant the minimum conditions of “decorum” of its open spaces, on the other hand, also the users seem to show a low propensity to the identification of the total space as a common good with all the deplorable results.
So, inflecting the Vertical Farm and the Aeroponic plantation means to investigate with a new gaze the themes of the squares and the aggregation places and to imagine a new selling formula, so to speak participated, correspond to the building attempt of a new identity aiming to sensitise users to promote

awareness and knowledge of the places and of history in order that “taking care” becomes a spontaneous and shared attitude.

2. The environmental rebalancing of urban open spaces Rossella Franchino

The forecasted growth of urbanization that will take place in the coming years should also consider the quality of urban areas in relation to the use of natural resources. To take action on urban land development in order to find an alternative to the model which prevailed throughout the last century, the consolidation efforts should be addressed focussing on, among other things, improving ecological and environmental quality. The conversion of urban open spaces is particularly significant, with them taking on a strategic role in the transformation of anthropic contexts as well as constituting nodal elements able to perform the delicate function of connection between the urban and surrounding natural systems. This transformation process assumes a particular role when the open spaces have strongly compromised ecological-environmental conditions since their transformation corresponds to a tangible renewal of the urban context.

The study of the conditions of the air, water and soil subsystems is one of the preliminary activities in the regeneration of natural open spaces in urban areas with poor conditions as a result of past anthropic activities. The way of being reused, the natural and landscape reconfiguration as well as the usability in general are all closely related aspects to the achievement of a renewed quality of the environmental conditions of the area as a whole.

In order to appropriately structure the environmental re-balancing interventions of urban open spaces in an eco-oriented perspective, this work focuses on the contribution of natural water and green resources, in order to use the principles of nature as a model of sustainable management by stimulating their inherent natural potential.

In this context, the control of rainwater flows to the ground is particularly important in order to correctly and sustainably structure assumptions of urban transformation and rebalancing since the natural hydrological cycle of water at a local level is strongly affected by urbanization. In an urban context, the continuing increase in impervious surfaces often causes considerable problems of erosion and flooding, thus disrupting the balance between the precipitation, evaporation and supply of groundwater and surface runoff. A change in the management of water resources in urbanized areas is therefore necessary, with it having to follow the natural cycle. The actions to establish a sustainable management include re-waterproofing the ground, as well as to allow for the infiltration of rainwater so as to recover and reuse it.

The traditional water cycle in rural areas, with extensive permeable surfaces and the presence of vegetation and surface water courses is characterized by high evaporation and penetration as well as low runoff.

However, the water cycle in urban environments is characterized by lower evaporation and reduced infiltration which leads to the reduction of groundwater, as well as a considerable increase in the surface runoff due to the waterproofing of surfaces. This means that the water must be quickly collected and channelled into the sewage system and does not supply the underground aquifers.

Natural systems can be used to check the water collection process, thus allowing for a management at a territorial level through a waste collection effected through the implementation of a self-regulating urban micro-basin that is managed according to the principles of “design for water conservation”. These natural systems are even more effective if, in addition to controlling the problems related to water management in anthropized areas, they also control the green aspect. This interconnection makes it possible to realize *blue green* corridors that pass through the urban environment and help to connect the existing natural systems as well as contribute to the improvement of the ecological-environmental characteristics of the area as a whole. The infrastructure systems that make it possible to reach these objectives can guarantee a sustainable future for urban areas and generate multiple ecological-environmental, social, cultural and even economic benefits.

The use of technologies that employ green blue resources is proposed for the environmental re-balancing of urban open spaces, with the goal of using the principles of nature as a model of sustainable management by stimulating the inherent natural potential of these resources, that have remained undeveloped due to mass anthropisation.

Systems with principles that recreate the natural characteristics of the territory can be used to control the water use cycle, so that rainwater can be considered a resource rather than as waste. To control flooding and the infiltration of rainwater into the soil, permeable paving, properly prepared green strips (green streets), drainage systems and rain gardens can be adopted. The collection of rainwater as a function of reuse can be either through simple collection systems that exploit the land slopes and permeable surfaces (passive systems), or with more complex systems of collecting water from impervious surfaces such as roofs, paved surfaces, etc. (active systems).

Where possible, filter strips could be used to control water quality, forming a natural system realized through particularly effective vegetation zones for the purification of water by reducing surface runoff,

while not only favouring infiltration but also intercepting and reducing pollutants. In addition, for the remediation of soil, it is possible to resort to phytoremediation which consists of a natural system that uses the ability of certain plants to extract heavy metals from the soil and regenerate its organic compounds.
In this context, urban farming can make a valuable contribution, with it being an effective instrument for the renewal of urban open spaces. Through the agricultural development of the spaces urban farming can represent an opportunity both to recover and rehabilitate degraded urban open spaces so as to improve them from an ecological point of view. Once suitably redeveloped, these areas can be networked with the green spaces in the city so as to create an ecological connection with the rural and natural areas of the surrounding territory.

3. Case study: a hypothesis of a new relationship space Francesco Corvino

In light of the aforementioned considerations and in order to obtain an applicative definition of the previously discussed concepts, a case study is described that deals with the application of eco-smart technologies for the redevelopment of a degraded urban area located in the town of Casal di Principe in Campania (Italy)[1].
The study area (Figure 2) is located along two particularly important roads, Corso Umberto I and Via Circonvallazione, thus making it easily accessible from the neighbouring towns.
The proposed intervention (Figure 3) consists of a semi-open structure ((Figure 4 and 5) which creates a square equipped with outdoor cultivation systems (Figure 6). This structure has several areas including one to be used as a market that runs along the north-south axis on two levels (Figure 7). Inside the market, there is the production of agricultural products through vertical farming systems, the display and sale of these products with innovative interactive multimedia systems with environmental information on the products on sale.

Fig. 2: Territorial framework

Fig. 3: Territorial framework

Fig. 4: Semi-open structure

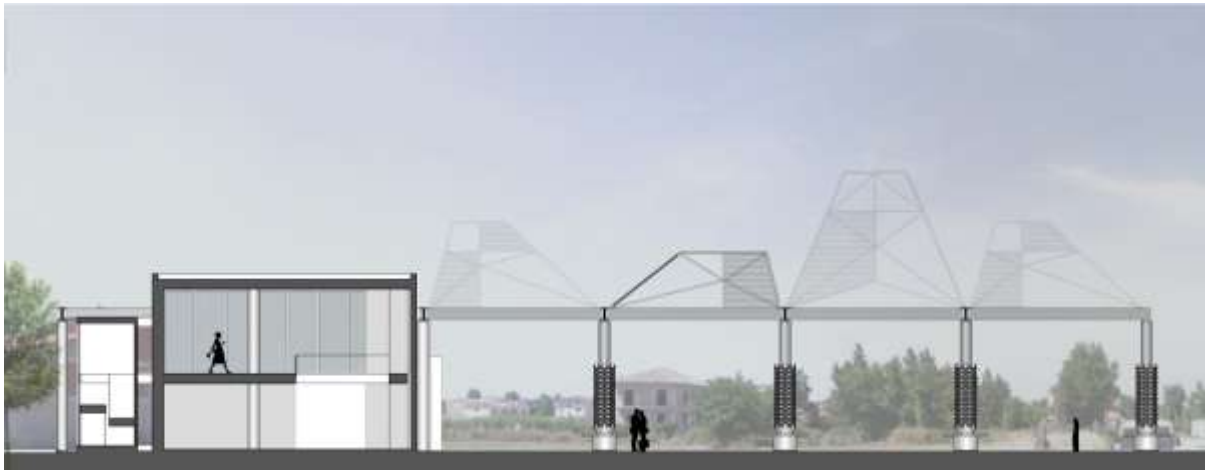

Fig. 5: Semi-open structure - section

Fig. 6: Square with outdoor cultivation systems

Fig. 7: Market structure

The system also has two other areas, one for the storage of tools, on one level, and the other for bars/restaurants, again on one level. The structure is equipped with walkways on each side, which overlook the road, a dense treed area to the west to isolate the square from neighbouring buildings, along with rainwater recovery and reuse systems. The car parks are located along the long side of the area and have a draining floor. The structure has several spaces for socializing.
In order to redevelop the area within a sustainable perspective, the intervention is characterized by the use of innovative environmental technology systems. These systems relate in particular to technologies for the vertical indoor and outdoor cultivation, the improvement of the permeability of the soil and the recovery and reuse of rainwater. The work also proposes the use of technologies for auto-production of energy as well as multimedia for defining the environmental characteristics of the products. The following describes some of the technological systems used.
Regarding the vertical indoor cultivation (Figures 8 and 9), it consists of vertical green structures, either mounted directly onto a wall or on horizontal supports, from which customers can buy the products directly from the plant, with the certainty of a fresh, just harvested, product.
This system, applied to both the horizontal and vertical indoor cultivation does not use soil, the plants are fed with a misting system operated by a pump, which is powered by renewable energy and requires minimum maintenance.
The indoor cultivation of vegetables creates particular shapes and colours in the interior, giving an added value not only aesthetically and functionally, but also to the physical and mental well-being transmitted by the sight and smell of the crops.
The outdoor cultivation system (Figures 10 and 11) has vertical elements distributed among the external spaces and consists of a tank with a base containing a solution of water and organic nutrients, an upper adjustable structure with a series of openings in which the seedlings are placed, an inner pipe that dispenses the nutritive solution and a pumping system that is activated at regular intervals and sprays the nutrients where the roots grow. The energy is obtained from photovoltaic panels.
The system has a water footprint that saves 90□ of water compared to a traditional cultivation.

Fig. 8: Indoor cultivation system

Fig. 9: Indoor cultivation system

Fig. 10: Outdoor cultivation system

Fig. 11: Outdoor cultivation system

Notes

1 This case study is a part of the graduation thesis in Architecture of Francesco Corvino, coordinated by professors Rossella Franchino and Lorenzo Capobianco in the academic year 2014/2015 (Department of Architecture and Industrial Design "Luigi Vanvitelli", Seconda Università degli Studi di Napoli).

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Smart cultural regeneration of degradation

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Abstract
The courtyards surrounding school areas, or rather the areas we have designated for the formation of future generations, are usually in a state of abandon or un kept and are underutilized for didactic purposes.
We need to fill these empty urban spaces that surround our schools, these outside spaces are like zippers that connect the school area and areas for general population. Between the classrooms and the streets and the squares. The external areas of school buildings are usually delegated as entrance ways and passageways towards the school rooms which are seen as the primary didactical spaces. To modify, change and valorize these spaces is a unique opportunity to re appropriate our land, to project and create educational gardens in spaces that are currently detractors and empty urban spaces is not only an educational but also ethical choice. An action that betters life styles and improves the landscape and gives more quality to the environment. Making a single urban and semi urban web that combine ethical rules that bring together different types, uses, places and territories to strengthen knowledge and identity as to enhance the development an ethic that favors the young users. A determinant action that can be considered a real re qualification of the territory. An architect is honor bound in that the aspect and the function of a space has an influence on the social, economic and moral behavior and strengthens the interaction between man and the environment.
Keywords: LANDesign, interstitial spaces, regeneration, life styles, requalification.

1. The culture of the interstitial spaces

The contemporary city with its processes too frenzied to be historicized composes a complex phenomenological framework that requires a new capacity for critical analysis of territoriality, no longer legible in its continuity.
In contemporary urban landscapes, territorial governance strategies, planning practices and design approaches, must be increasingly directed to urban regeneration projects involving the upgrading of residual and interstitial spaces.
Actual emergency is the savage and immoderate consumption of ground for new cement, despite the demographic decrement, as the founder of Slow Food Charles Petrini informs, "from 1990 to 2005 the two millions of hectares of dead agricultural ground are overcome or covered with cement."
The urban landscape is a physical expression of the culture of a society formed by signs engraved by man, the landscape is given by the succession of the single fragments that all together give birth to a history of the ground. Nowadays it is required to find the way to get back again to a heterogeneity that doesn't have to use the analysis on a grand scale but it can find its answer through an analysis that turns to the micro, by focusing on all those interstitial areas bridled among infrastructural nets that constitute the negative part of a city. As Rem Kollhaas defines them "they are real urban beads drawn by discontinuous and hidden limits."
The genesis of these spaces is definitely tied up to the non- planned, the paradox is when, rather than to find ourselves in front of urban voids situated into the peri-urban areas, places that already set out from the lack of a precise identity and a defined role in the territorial order, we are in presence of areas of high degree of usability and functionality as the external area of the scholastic buildings, in other words the places assigned to the education of the new generations, left in a state of decline and abandonment, forgotten by the pedagogy and taken away from education.

These areas are the connection between spaces inside education and the ones outside the collectivity, between the classroom and the street, the square.
The peri-urban or urban voids places if planned as elements of connection between built and green spaces can become the mean of transition between the public and private sphere, answering to both new social and space management questions. Scholastic environments are the spaces where little boys spend the greatest part of their days, often grey, sad, engraving in the perceptive and emotional sphere of the single child, that becomes adult in amorphous spaces, with the risk to get used to unsightliness. Today it emerges the necessity to see the school as an integrated unique environment in which the micro- spaces finalized to diversified activity have the same dignity and introduce characters of habitability and flexibility able to welcome people and school activities every moment, offering characteristics of functionality, comfort and wellness.
Many are the didactic strategies that provide for a team working organization (according to vertical and horizontal aggregations), all characterized by the active involvement of the student in his own learning process. Teachers, in this space, don't develop frontal interventions but they play the role of facilitator and organizer of the activities, structuring " learning environments " aimed to advantage a positive environment, involvement and the contribution of every student in all the phases of the job from the planning to the evaluation.
One of these spaces, that is not taken into account for its potential daily and multifunctional use, is the external area of the school itself. An area not identified as a place devoted to education but left to the carelessness and the uselessness.
The external spaces of the scholastic building left in state of abandonment or not exploited are pure wealth for the implantation and the development of a project that can be applied on a territorial scale.
Such project is aimed to spread the culture of nature starting from the youngest, to make a solid and compelling territorial retraining, an ecological regeneration of the area, the re-use of disposed and /or abandoned grounds by the planning of educational vegetable gardens.
A project this, that involves a wide range of competences and it is developed by the students that belong to the school where they are supposed to spend the most important years for both their educational and psychic growth.

1.2 Territorial redevelopment through educational vegetable gardens

Every single project will be different from the others because it will be made by the children themselves, the five senses must be used and the body becomes important as much as the mind.
The crop of the interstitial spaces therefore as cultural and environmental value, manifold are the positive factors that justify this type of choice:
- Rediscovery of the biological times (to know how to await, culture of slowness)
- Tool to develop the perception of the space and the time in the environment of life
- Possibility of involvement in almost all the sensory perceptions: visual (forms and colours), tactile (consistence, damp, softness), auditory (dry leaves, birds), gustatory (tasting products of the garden), olfactory (smell of the vegetables and the flowers, of the compost etc.)
- Occasion to stimulate the creative spirit and the observation tanks to the construction of the vegetable gardens: approach, forms in relationship also to the different vital cycle of the plants and the necessities of alternation corp.
- Observation and study of the possible incompatibilities among a wide range of plants.
- Comparison of the really "to know how to do", rediscovering manual work and the implementation of the theoretical knowledge.
- Rediscovery local specialities preferring the use of agricultural products that belong to local landscape as a way to find out again one’s own cultural identity.
- Place for exchanging knowledge, cultivation practices and botanical knowledge too.
- Teaching how to establish a relationship with nature and how to take care of it rather than exploit it.
- A chance to use residual and public spaces.
- Environmental education (culture of recycle: the organic discards became again a resource, the use of different materials to build the vegetable garden).
- A chance to carry out a quality control of the agricultural product through personal consumption or for instance served in the school canteen.

A prompt action that departs from the observation of the place and the knowledge of the environment, that if proposed it can be considered, as a whole, a real territorial retraining in the macro territorial framework. So far by this type of action we hit the hot issues already faced, as well known, by MADE expo in Milan 2015, matters that represent the future of the sustainability.
Choosing the vegetable garden, however, can be considered as symbol of the Mediterranean Diet, wealth and patrimony founded upon the biodiversity of our territory and the nutritional knowledge, recognized, as well underlined from the note MIUR n. 7853 on October 14th 2011 "Guidelines for food

education in the Italian school", virtuous model of health and patrimony of the humanity by the UNESCO from 2010.
To transform, to change and to give wealth to this space through a project that recalls our roots and our Know how, a didactic garden it is a' unique occasion to get back our earth and those that are currently detractors and urban voids.
The Applied Research Project LANDesign, scientific directors Sabina Martusciello and Maria Dolores Morelli, Department of Architecture and Industrial Design Second University of Naples with BENECON Scarl Regional Competence Centre for Cultural Ecology Economy SUN, publishes each year an International Competition urges the participants of the schools of all levels and universities, in heterogeneous project groups, the pursuit of sustainable and integral development with one or more of the concrete actions. Concrete actions as a short vegetable gardens, redevelopment of an abandoned space of the School or University, for example: a green area to be converted into a vegetable garden or orchard, an unused enclosed space prepared for new use, a road, a garden, a square close to the school or university and a long vegetable gardens, monitoring and maintenance of an area that has already be redeveloped by the school or university; for example: the area converted into a vegetable garden or orchard, an enclosed space prepared for a new use, the street, the garden, the square near the school or university (following some examples of monitoring sheets). The Applied Research Project LANDesign from June 2010 to March 2016 has promoted 11 editions of the competition LANDesign with the following results: 400 schools of Campania of all levels involved in the Project; 1,380 university students of the Department of Architecture and Industrial Design SUN Project tutors in schools; 47,500 schools; 45,000 families; 307 vegetable gardens set up in schools; 550 design prototypes on the theme of LANDesign by students of Design, SUN and school pupils as co-designers.

Allegato B - SCHEDA ORTI LUNGHI

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SOPRALLUOGO EFFETTUATO DA Anna Orefice, Yana Babychuk, Anna Liguori

Federica Guarino IN DATA 25/01/2016

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benessere	0 1 2 3 4 ~~5~~	consistenza	0 1 2 ~~3~~ 4 5
creatività	0 1 2 ~~3~~ 4 5	lavorazioni	0 1 2 3 ~~4~~ 5
		concimazioni	0 1 2 3 ~~4~~ 5
		limitazioni capacità d'uso	0 1 2 3 ~~4~~ 5
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attacchi	0 1 2 3 ~~4~~ 5	attacchi	0 1 2 ~~3~~ 4 5
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partecipazione	0 1 2 3 **4** 5	drenaggio	0 1 2 **3** 4 5
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rivalutazione	0 1 2 3 **4** 5	produttività	0 1 2 3 **4** 5

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Allegato B - SCHEDA ORTI LUNGHI

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SITA IN Aversa

ORTO CORTO

INAUGURATO IL 30 Maggio 2015

SOPRALLUOGO EFFETTUATO DA Rosa Fabozzo e Ilaria Pellecchia

IN DATA 09/12/2015

allievi		suolo mq 22,5	
partecipazione	0 1 2 3 4 (5)	drenaggio	0 1 2 (3) 4 5
apprendimento	0 1 2 3 (4) 5	pietrosità	0 (1) 2 3 4 5
rispetto	0 1 2 3 4 (5)	struttura	0 (1) 2 3 4 5
benessere	0 1 2 3 (4) 5	consistenza	0 1 2 (3) 4 5
creatività	0 1 2 3 (4) 5	lavorazioni	0 1 2 3 (4) 5
		concimazioni	0 (1) 2 3 4 5
		limitazioni capacità d'uso	0 1 2 (3) 4 5
colture arboree		**colture ortive**	
attacchi	0 1 2 3 4 5	attacchi	0 1 2 3 4 (5)
condizioni delle gemme	0 1 2 3 4 5	condizioni delle foglie	0 (1) 2 3 4 5
condizioni delle foglie	0 1 2 3 4 5	uniformità della colorazione	0 1 2 (3) 4 5
uniformità della colorazione	0 1 2 3 4 5	coerenza periodo-dimensioni	0 1 2 3 (4) 5
coerenza periodo-dimensioni	0 1 2 3 4 5	condizione degli ortaggi	0 (1) 2 3 4 5
condizione dei frutti	0 1 2 3 4 5		
effetti sulla vita nella scuola		**stato di salute dell'orto**	
attività connesse	0 (1) 2 3 4 5	cura	(0) 1 2 3 4 5
sostenibilità	0 1 (2) 3 4 5	partecipazione	(0) 1 2 3 4 5
rivalutazione	0 1 (2) 3 4 5	produttività	(0) 1 2 3 4 5

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Knowledge and preservation of the *Chiostro Piccolo* in Certosa di Pavia, an example of integration between construction and decoration in Sforzas artistic culture.

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Abstract
Inside of the monumental complex of the Certosa di Pavia, the *Chiostro Piccolo* (Small Cloister) seems to play a secondary role in comparison with the sumptuous marble façade of the adjacent church and the large architectural measure that characterizes the innovative typological articulation of the *Chiostro Grande* (Grand Cloister).
But, after a careful analysis, this little courtyard, built around the middle of the XV century, is an amazing example of integration between the constructive knowledge bequeathed by the Lombard gothic bulding site and the spatial sense in the earlier Renaissance plastic research.
The typical Lombard clay brick had been used by Guiniforte Solari both for the elegant sequence of the arches of the portico and for the high-relief decoration of the medals –and their polished iconographic program - that articulate the fronts. Later, Giovanni Antonio Amadeo chose the same material when he was called to realize the monumental fountain in the northern wing of the portico.
This kind of brick doesn't have superficial glaze and for this reason it is extremely fragile and vulnerable to the degrade caused by the time and the atmospheric agents.
Using methods of survey by digital photo-modeling allows precise investigations on the state of preservation or degradation of this extraordinary example of "sculptu-architecture" that shouldn't have been possible with the traditional way of survey and two-dimensional representation.

Keywords: Certosa di Pavia - Survey – Preservation – Lombard architecture – digital modeling

1. Introduction
The extraordinary monumental complex of the Certosa di Pavia amazes the visitor who arrives there, following the rural way which started from the historical territorial link between Milano and Pavia through the valley, the *Barcho*, Francesco Sforza and Lodovico il Moro's favourite hunting area [1].
The complex of the Certosa di Pavia was born at the end of the XIV century when Gian Galeazzo Visconti wanted to give to the settlement of the monastic community the task to strengthen his dynastical power on the northwest of Italy. The Certosa di Pavia appears today as the result of a long building process including not only the construction part as the church, the monastery with its cloisters, the Palazzo Ducale and the outbuildings but also a never ending reshaping process of its soil characterized by the presence of karst springs, irrigation ditch and canals.
The extraordinary characteristic of the location combined not only with the geographical, hydrographical characteristics but also with the building and material ones are the fragilities of the Carthusian complex itself. In particular referring to the Chiostro Piccolo the most important phases of its realization prematurely intertwine with the events linked to the problematic research of its delicate preservative equilibrium.

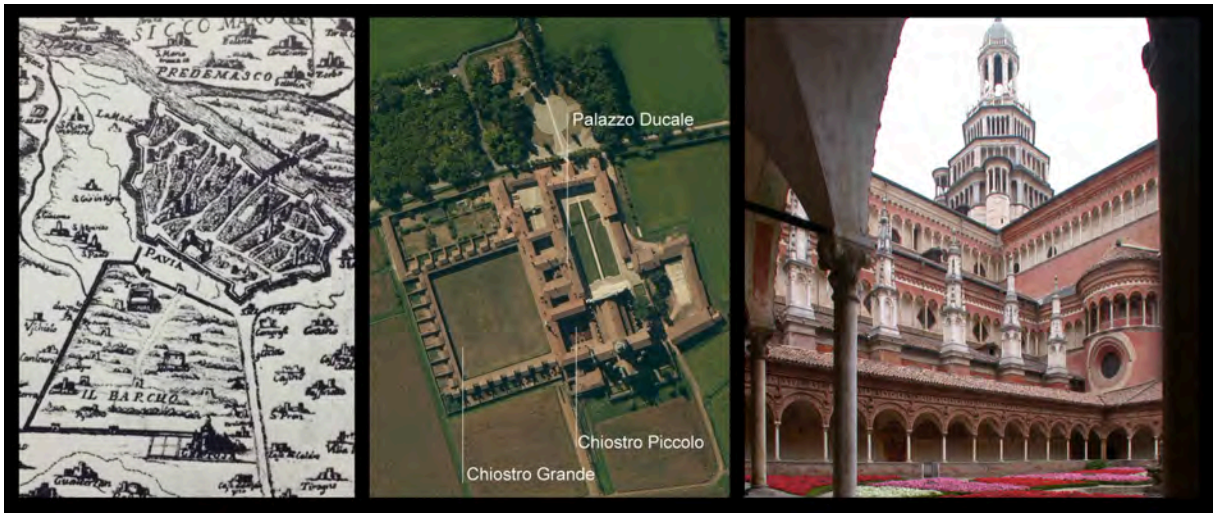

Fig. 1: The Certosa di Pavia in the Ludovico Corte's Map of 1624 (left), in a satellite photo (middle) and viewed from the Chiostro Piccolo (right).

2. The Chiostro piccolo of the Certosa and its building process

It is well known that the cloisters of the Certosa di Pavia, cornerstone of the monastic life, are ones of the highest example of the lombard architecture and sculpture in the Renaissance.

Placed against the north side of the church, the Chiostro Piccolo is, in the constitution of the order, the place of the collective life of the monks as the Chiostro Grande is intended to the hermit's life with its isolated and independent cells.

The description of the development of the works written in 1402 by the engineer Antonio de Marchi attests that the cells in the Chiostro Grande were the first part of the monastery to be completed. The cells are organized as single small house placed on three sides of the cloister. The situation of the Chiostro Piccolo was very different as its walls were built only for a few meters off the ground. On the east side were the building which had to be the Chapter House and on the upper floor the library. On the south side were expected the barber and the infirmary, while on the north side the big refectory.

The registers attest that the buildings around the Chiostro Piccolo were completed before the month of January 1426 and equipped with furniture, benches and wardrobes by 1428. In this time of the XV century the refectory was used as temporary church and the barber and the infirmatory as temporary refectory.

In the sixties of the same century, as they were working on the new church the settlement of the cloisters was definitive. The supports of the porches were made of stone and adorned with rich sculptural decorations on the capitals and the fronts. When in 1498 the *Gratiarum Carthusia* church was completed the buildings of the Chiostro Piccolo had back their original functions. In the latest quarter of the XVI century the spaces of the monastery were restructured taking substantially to the present arrangement. The building of the Chapter House and the library became the so called new or noble sacristy with a barrel vaulted big hall on one floor. The Chapter House was moved in the area behind the sacristy. The new library was placed where the infirmatory was, facing the south side of the Chiostro Piccolo. It is currently there and hosts a splendid collection of miniated graduals made between the XV and XVI century, the bookcase made in the XIX century which was lately restored thanks to private sponsors, and some paintings from the XVII century which were on the sides of the chapels in the church until the XIX century.

As known and reiterated from the historiographical sources and the present artistic literature the project, which gave the conclusive arrangement to the two under construction cloisters should date back to the early sixties of the fifteenth century.

Guiniforte Solari was in charge during this new building phase and made the related project. He succeded his father Giovanni as head of the building site and this is documented in the purchase and valuation of stones used in the cloisters [2].

Their appearance is characterized by the extended terracotta decorations of the elevations, which present similarity with the ones of the Ospedale Maggiore di Milano. This building site was also headed in that time by Guiniforte and his brother Francesco Solari and Rinaldo de Stauris were working there as sculptor. They worked also on the cloisters of the Certosa, like Vito Zani has underlined in his paper [3].

The simultaneous works, longer in the Chiostro Grande, are documented by the *maestri da muro* and by the delivering products made of stone such as little columns and capitals both wall and angular.

Deliverings for the Chiostro Piccolo were recorded in 1463 and 1464 by Giovanni da Cairate, Antonio da Lecco, Cristoforo Mantegazza and Francesco Solari [2] [4] .
The two Mantegazzas made about 40 wall capitals for the Chiostro Grande. In the Chiostro Piccolo is attested mostly Francesco Solari who made 27 wall capitals and worked on stone and terracotta elements [2] [5] [6].
Rinaldo de Stauris' artistic importance, who is the only one named as sculptor in the documentation of the small cloister from 1464 to 1466, is still discussed by the critics. There are those who consider him just an executor of other people's works (a document in 1464 recorded him like "*magister claustrini a fogliamine*") and those who acknowledge him also an autonomous identity [2].
Francesco Solari is mentioned in 1467 about his "*laborerio*" in the Chiostro Piccolo but the decorations had to be almost completed the year before when the two masters were paid for some paintings on the walls they made there.
The gold and painted finish of the precious and big sink made in terracotta is also documented in 1466. Placed on one side of the small cloister, it is made by Prospero Amadeo, brother of the more famous Giovanni Antonio Amadeo [2] [7] [8].
Of this terracotta sink with polychrome finish coeval and from the XIX century are particularly interesting the historiated part especially the scene of *The Samaritan at the well* on the big lunette and the one of the *Annunciation* in the two upper smaller lunettes. The sink was restored in 2005 supported by MiBACT fund, by *Soprintendenza per i beni architettonici e paesaggio di Milano* [9].
It is attested that all the decorations of the sink was made by Francesco Solari and a young Giovanni Antonio Amadeo, who worked in particular on the lunettes of the *Annunciation,* decorated with polychrome finish. Some parts of the sink were remade in XIX century. An example is Piero Pierotti's ones.
As it is said some minor part of the sink was rebuilt and restored in 1853 by Pietro Pierotti who signed and dated in the left angle of the bigger lunette[4][6]. He realised with his son Edoardo many casts both of the sculptures on the front and the terracotta ones in the cloisters. The casts were recovered and restored between 2001 and 2006 during a restoration campaign with MiBACT fund and coordinated by L. Lodi. They are exhibited in the gallery of plaster casts of the Museo wanted by Luca Beltrami from 1894 on, when as director of the *Ufficio regionale per la conservazione dei monumenti in Lombardia* worked for many years on the protection and the restoration of the Certosa [9].
Only a few years ago it has been found the notary deed under which in 1460 the young Giovanni Antonio Amadeo was employed for six years as apprentice by Giovanni Solari, Guiniforte and Francesco Solari's father [10] [11].
The hegemonic role of Solari's guild in the Chiostro Piccolo is proved also by the impressive marble portal placed on one side of the transept of the church and signed by Giovanni Antonio Amadeo. The closed bond between the young sculptor and architect Amadeo and the Solaris, which became kinship, is without doubt in the following decade one of the fundamental reasons of disagreement with Cristoforo and Antonio Mantegazza about the contract for the sculptures of the front of the church.
In the sixties of the same century in Lombardy the cloisters of the Certosa seems to be the most important center where the sculptural language was experimented, thanks to the innovator impulse of Francesco Solari and Amadeo.
The present appearance of the terracotta decorations in the Chiostro Piccolo has been made by restorations through the centuries, some intervention is attested even during the seventeenth-century. The most important restorations which involved some remakes took place in the nineteenth-century, since the twenties and thirties [12]. Further interventions of maintenance and restoration took place in the twentieth-century as said by the superintendent and conservator Gino Chierici in two important essays respectively in 1953 and 1959 [13] [14]. In these essays he spoke about periodically renewed treatments with a kind of wax dilute in the turpentine, which can't be shared anymore in the latest years thanks to the changes made in the treatment and restoration of the terracotta surfaces. It is interesting remember that they repeated this treatment for the last time in 1993 [12].
Some terracotta samples taken from both the cloisters have been examined with thermoluminescence and they proved that 14 statuettes in the Chiostro Grande are dated in the nineteenth-century while a bust in the Chiostro Piccolo is dated around the XVII century.
About these and other diagnostics surveys on the decorations of the cloisters please refer to Corrado Pedelì's important papers [15].
The portal through which from the small cloister one can enter the transept of the church, is a young Giovanni Antonio Amadeo's masterpiece, among his most famous works. Most likely it can be linked to a document dated 14 October 1469 in which the brothers Protasio and Giovanni Antonio Amadeo committed to give back to the certosa 20 Carrara marble pieces of 35 *centenari* which were given them " *pro ornamento et fulcimento ac laborerio strafforato fiendo in claustrino".*
It is the first monumental work of this sculptor nearly twenty years of age "*tanto orgoglioso da firmarsi con caratteri grandi il doppio di quelli usati nella interposta dedicazione dell'opera a Maria*"[3].
As noticed especially in the figurative part of the portal, Amadeo realized the most eloquent example

of linguistic modernity which developed from the Solari's gothic-classical style, removed the characteristics of mannerism focusing on an expressive concreteness and naturalism that introduces to the development in the Cappella Colleoni in Bergamo adding a personal and brilliant evocation of the ancient although without a direct experience in Rome [16].
In the latest fifteen years the Certosa had been the object of many restorations, thanks to MiBACT fund. These interventions included the restoration of the sculptures of the front, many parts of the roof of the church, of the Chapter house, of the guest house. It is included also the pilot project for the restoration of the west part of the Chiostro Piccolo, coordinated in 2006 by Carla Di Francesco who was at that time *direttore beni culturali della Lombardia*, and the diagnostics surveys illustrated in the mentioned volume of *Atti.* Furthermore between 2001 and 2008 Palazzo Ducale which hosts the museum has been entirely recovered. Pierotti's casts have been restored as the ones of other sculptors. The gallery of plaster casts has been rebuilt and opened again. It collects many casts of the sculptures and capital of the two cloisters which are realized with terracotta powder in the mixture in order to give continuity, even with polychrome finish, to the fictile decorations of the Renaissance [17].
Finally in the next months it will start the restoration of the terracotta decorations in the small cloister, thanks to the support of MiBACT which allocates funds for the Certosa. The project is based on restoration projects and surveys drafted by L. Lodi in collaboration with the architect Paolo Savio of the at that time *Soprintendenza per i beni architettonici di Milano* with the same criteria that guided the pilot site some years ago. Works to the roof sand the drainpipes in the small cloister are already done. These funds will include also intervention to the Amadeo's marble portal which is very deteriorated.

3. Degradation problems of the Chiostro Piccolo

The status of preservation of the Chiostro Piccolo has been studied and analyzed – above all from the Ministry for the Cultural Heritage, as it will be say later – both in the petrographic and mineralogical characteristic of its materials and in their conservative status, highlighting ways and processes of degradation. Particular attention referred to the fictile decorations on the external elevation which are particularly complex and problematic as they are constitued by ornamental motifs, low relief or in the round subjects subdivided in the arch lintels, in the moldings and in the cornice that crowns the elevations [15] [18] [19].
The dating of the decorated sufarces, made by Solari, is set from 1460, when the architectural structure of the cloister must have been completed. The Solaris' activities are documented at the Ospedale maggiore di Milano (together with Francesco and Rinaldo De Stauris) where the apparatus of fictile decorations has been related with the cloisters of the Certosa. More assonance about motifs, modules and alike elements is found in the monuments in Pavia such as the cloister of San Lanfranco, the church of Santa Maria del Carmine, the cloister of the episcopal seminary [6] [13] [20]. The petrographic and mineralogical analysis on the decorative terracotta stressed a different composition and origin of the clay that composes it. In particular clay found on site has been used for the series elements made with a mould (such as mouldings, phytomorphic motifs, subject in reliefs like angels, putti etc.). More refined clay coming from the Oltrepò Pavese has been used for the in the round subject which were handmade one by one (prophets' busts, monks, saints placed in the rounds above the imposts of the arches).
The preservative history of the decorations in the small cloister within the maintenance of the Certosa is examined in depth by specific studies [21][12]. It is useful here to recall the sequence of the interventions from the more distant that follow the conclusion of the construction of the building, to the more documented in the nineteenth and twentieth-century. It is important to consider the spoliations during the Napoleonic campaigns in particular the removal of the lead roof both from the basilica and the cloisters which wasn't immediately replaced with the current roof tile.
An overall program of maintenance started only in the first decades of the nineteenth-century during the Restoration. It was focused on the basilica but it affects also in a minor way the small cloister and its fictile decorations. These sequence of interventions happened from the nineteeth-century until today following essentially these directions: intervention on the roofs (remake of the supporting framework with a suitable slope for the roof tile included) and regulation of the meteoric waters by proper channels like rain gutters and downpipes in order to avoid damaging infiltrations on the decorations. During the nineteenth-century interventions were made on the fictile objects substituting the reliefs and the panels with copies together with localized interventions of restoration, stuccowork, adhesion with metallic pins (substitution of iron objects with brass ones). Interventions on the surface, originally polychrome follow until the nineties of the twentieth century.
From this comes to light historically how there was awareness about the need to take measures in order to safeguard above all with the moisture control. The gradual erosion of the decorated surfaces was particularly complicated because of the negative climatic conditions of the area where the Certosa is and the microclimatic ones related with the individual areas such as the small cloister. It was handled with periodic interventions of substitution and replacement inspired to traditional parameters and solutions. These latter were not enough accurate in comparison also with the cultural awareness

corresponding to the theoretical debate on the conservation in the time period in which the interventions were made, to the regard of the authenticity of the materials and the signs of degradation which are visible expression of this authenticity.
From this the awareness is born the need to safeguard the authenticity as necessary but not sufficient condition to the availability of the aesthetic and formal values within the material of the building, past interventions and signs of time degradation included. The operative criterion has to be the scientific knowledge of the degradation processes, the characteristics of the material related with its own resources and the external conditions. It has to be also the identification of the best efficient interventions for conservation, within the possibilities of the current knowledges, techniques and materials.
It has to be remembered the campaigns of preliminary surveys promoted and supported by the *Soprintendenza per i beni architettonici e per il paesaggio* in that time period and the *Direzione regionale per i beni culturali della Lombardia* ended in a pilot site in order to establish criteria and methods of intervention for a general program of restoration. In particular analyses have been made in laboratory in order to identify and characterize colourings and finishes of the decorative terracotta, which is a very delicate aspect because there are limited remainings of the original finishes and a complex layering due to the following interventions.
Further analyses have been done on the interaction between the materials, previous interventions, environmental conditions and degradation. They underline the particular situation of the small cloister surrounded by high built fronts that accents the character of a close system. This remarkably affects the vulnerability of the reliefs and the architectural surfaces. It has been studied also the identification of visible degradation forms on the base of the Normal lexicon, the interaction between the characteristics of the materials and degradation, the invisible degradation forms which need further detailed study on diagnostics.
A valuable work which is a necessary methodological precondition for the hypothesis of a general intervention of conservation which has to include the interety of the involved surfaces.
So that the precise and valuable acquisitions of the survey campaigns, which have been here recalled, become an operative project-program of intervention, it is necessary, like in every proper project of conservation, a detailed geometric survey in which materials, degradation events and interventions of conservation have to be located and documented.

Fig. 2: Degradation diagnostics of the portico (right) based on the controlled mosaic, edit by Agisoft Photoscan, from the 3DModel (left).

Fig. 3: Details of the fictile decorations.

4. The survey of the Chiostro Piccolo. Problems, methodos and procedures

As time passes by, from the XVI century to nowadays, many surveys of the *Gratiarum Cathusia* have been made. They are referred both to the whole complex and specific parts and show how the authorized personnel as architects, engineers and artists is constantly interested in this extraordinary example of the artistic lombard culture.

Nevertheless even the latest surveys done with the most accurate photogrammetric equipment don't seem totally suitable to describe the features and the state of preservation of the Chiostro Piccolo.

Indeed even the most accurate metric survey can't give back the value of an object characterized by plastic arts. The reason is its two-dimensional representation based on the traditional codes of the projective geometry in spite of the use of large scale and the plenty of details.The Chiostro seems characterized by a pronounced integration between architecture and sculpture.

This little courtyard, with 27 m long sides, is aimed to be a distributive connection between the places of monks' collective activities like the church, the dining hall and the chapter, and the cenobitic ones in the Chiostro Grande.

It shows how the knowledge about constructions handed down from the gothic lombard building sites melded with the spatial values that guided the research about the plastic arts in the early Renaissance.

In the cloister the clay brick without superficial glaze typical of the Romanesque Gothic tradition in Lombardy was used by Guiniforte Solari and his entourage both as a building and decorative material.

It was used like a building material in the shape of bricks and moldings in the costruction of the elegant arches in the perimetral portico. It was used as ornamental material for the frieze adorned with garland and putti of the arch lintels, for the 46 medals in the pendentives of the arches, divided in 12 in the north and south wings, 11 in the west and east wings.

The medals are ornamental round panels probably made by De Stauris from Cremona and they portray high relief busts of historical and biblical figures. With their strong three-dimensionality rich in chiaroscuro they articulate the inner front of the small cloister. The same kind of terracotta seems to be used in the following construction of the monumental fountain in the north wing though Giovanni Antonio Amadeo representing *Jesus with the Samaritan* and the *Annunciation* chooses a stylistic register characterized by a less marked relief. This decorative system is extremely fragile and subject to braekage and separation because of the friable nature of the material and its morphological structure. For this reason it needs a constant control and monitoring.

It seemed useful for this purpose and for the drafting of a planned preservation project to consider the realization of a three-dimensional digital model which will be able to be a complete descriptive and informative resource. It will be also possible to implement it with the latest events of degradation and transformation that will be happen in the future.

As a reverse *The picture of Dorian Gray*, the digital model of the cloister is to the Certosa as its "double", identical except for the temporary coordinate which keeps going for the monastery but is stopped in the moment of the survey for the model. The 3D model is been realized within a combined survey, which has used the potentialities in several different survey methods.

In order to have an accurate metric survey it has been done an altimetric and planimetric topographic survey using a total station SOKKIA FX – 103 with built-in laser and a total station TOPCON – QS Robotic Station with a topographic polygonal from a central point placed in the open air part of the cloister. It has been obtain a cloud of 550 point which has been elaborated with Meridiana Geopro software in order to have .dwg file format.

The traditional orthographic projection representation, that it has been obtained, is the metric base for the following process of acquisition of data, also metric, by photography.

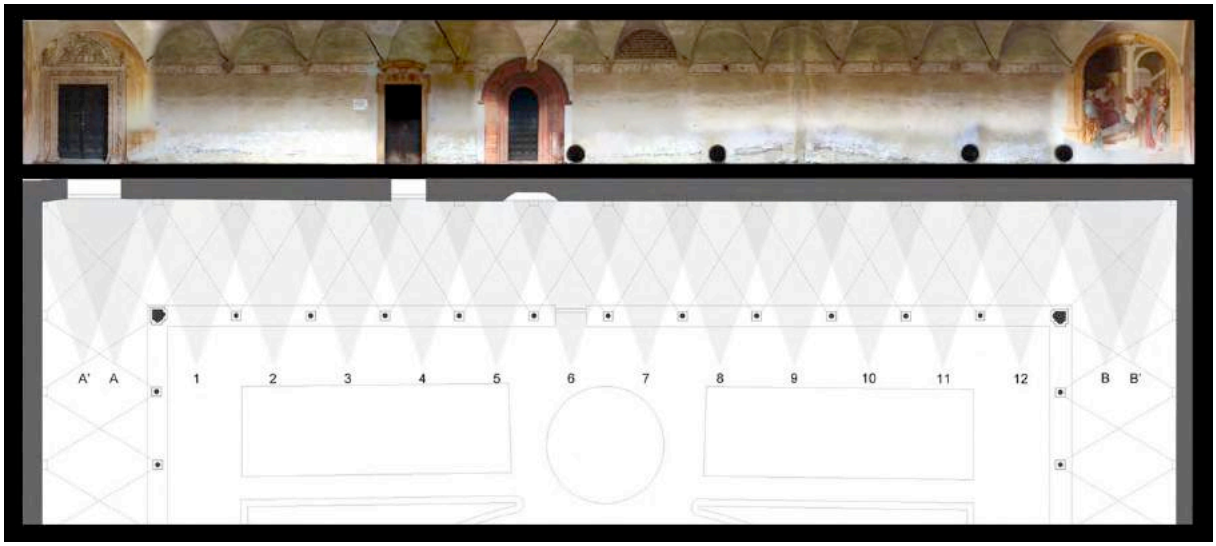

Fig. 4: Controlled mosaic of the inner elevation in the east wing and photographic shots planning.

This phase has been developed in two day long surveys. In order to have the same condition of lights for every wings the photographs have been taken by different person in the same time.
Furthermore considering the morphology of the object, the small differences in height and the impossibility to obtain full informations by an only picture each wing has been divided in different parts: the external elevation, the inner one and the low wall, which separates the covered walks from the garden. The inner elevation has been divided in a higher part and lower one, which includes the connection with the ground. The gripping points have been settled on planimetric and altimetric sketches and then measured by trilateration on site.
A Canon EOS 600D with a Canon EF-S 18-55 mm IS II lens and a sRGB colour space and a Canon EOS 6D with Canon 28-135 mm lens and sRGB IEC61966-2.1 colour space have been used in the north wing. The shots in the south gallery have been taken with a Nikon D3200 with a AF-S DX NIKKOR 18-55mm VR lens and sRGB IEC61966-2-1 colour space, the ones in the east wing with a 18 megapixel Canon 600D which has an APS-C 22,5x15 mm sensor, 18-55 mm lens and sRGB colour space. The pictures in the west wing have been taken with a Canon EOS 1000D with a Canon INC. 18-55 mm lens and sRGB colour space. The shots have been taken and saved in .jpg format. The focal lenght, the white balance, the opening of the shutter and the time of exposure have been changed depending on the part of the object, the time of the day and the weather. A superabundance equal to or greater than 30% has been guaranteed.
Specifically the survey of the north gallery is made by 52 pictures. Three shots have been necessary for the external elevation, the camera has been placed at a distance equal to 25.27 m and height equal to 1.60 m, 32 shots for the inner elevation divided in 15 in the lower part at a distance of 3.10 m and height equal to 0.30 m and 17 for the higher part at a distance of 5.16 m of and height of 1.45 m. The 17 shots that have been necessary to the survey of the low wall have been taken at a distance of 2.85 m and height of 1.00 m.
The survey of the south gallery has been made by 103 shots. Fifteen pictures have been needed in the survey of the external elevation at a distance of 26.24 m and height of 1.61 m; 25 pictures for the higher inner elevation at a distance of 8.25 m and height of 1.32 m, 38 for the lower part at a distance of 2.72 m and height equal to 0.70 m, 25 shots have been taken for the low wall at a distance of 2.72 m and height of 0.70 m.
The survey of the east wing is made by 61 pictures. Fourteen are about the external elevation at a distance of 14.50 m and height equal to 1.60 m, the lower part of the inner elevation has been surveyed with 18 shots taken at a distance of 2.70 m and height of 0.60 m, the higher part needed 16 shots at a distance of 4.50 m and height of 1.60 m. About the low wall, 13 shots have been taken at a distance of 2.70 m and height of 1.60 m.
The survey of the west wing has been made by 39 shots. Twelve pictures have been taken for the external elevation at a distance of 28.28 m and height of 1.60 m, 14 for the inner front at a distance of 8,83 m and height of 1.55 m, 13 shots about the low wall at a distance of 3.07 m and height 0.50 m.

Fig. 5: View of south gallery from the 3DModel of Chiostro piccolo (edit by Agisoft Photoscan)

The pictures have been processed with the software Agisoft Photoscan Pro, obtaining a 3D model from which controlled mosaics corresponding to the elevations have been made thanks also to the integration of with Rhinoceros Relise 5.1 with Photoshop CS 6. The controlled mosaics have been verified on the base of the topographic survey. From the 3D model it has been possible to have detailed pictures of the fictile decorations and the medals which has allowed to prepare basic drawings in order diagnose and highlight the events of degradation of the object.

5. Future development for the research and conclusions.

The survey and its restitution through the described 3D model is a cognitive and operative base for the general intervention of conservation of all the surfaces, from the terracotta to the frescoes, plaster and stone covering including the beautiful sink which recent studies ascribe to Francesco Solari and a beginner Giovanni Antonio Amadeo. The sink has been already restored with funds from the Ministry. For these reason the drawing files described in this paper were given upon request to the *Soprintendenza alle belle arti e paesaggio* which believe they are an objective and meticulous base in order to plan a project of conservation of the fictile decorations of the Chiostro Piccolo. This latter is supported by the Ministry who allocated funds of 7 millions for the whole of the Carthusian complex.
It will be defined also a work hypothesis concerning detailed studies combining BIM and GIS technologies in order to create an information system able to represent and analyse the single elements of the complex within the geographical, hydrographic and pedologic context. Each element will be studied as the result of the historical process which made it and at the same time of the different answer that the materials give through the time and the events.

Fig. 6: View of the frescoed corridor between the cloisters, from the 3DModel (left); example of degradation analysis of the medals.

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Neapolitan Modernism as a heritage to preserve and regenerate

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Abstract
The paper will focus on some examples of private architecture built in Naples during the 1950s. These architectures will be considered an expression of peripheral modernism reflecting the contemporary socio-economic changes. Post-war economic and cultural modernization led local architects to develop a certain form of rationalist language, which can be considered a sort of new language of Italian housing during the economic boom, especially when applied to private architecture.
This language, far from the experimentation and formal purism of the first avant-garde architecture, was characterized by a forced and showy variety in order to diversify the "housing product" and make it desirable to the new emerging middle-class; a remedy to the repetition and homogeneity imposed by the law of the maximum land use and standardization, which are the outcome of banal technology that reflects a lack of investment in construction and low wages for unskilled labour.
In this context, the prevailing housing model was the private apartment building, often coinciding with the "palazzina". Although most Neapolitan blocks of flats responded to the logic of speculation, there were several examples of blocks of flats designed by local professionals who were able to meet the needs of the manufacturers without giving up a certain architectural and environmental quality. The paper will devote its final part to these examples, in order to propose their conservation or regeneration.

Keywords: Reconstruction, Naples, modern architecture, apartment building

1. Premise
Modernism first came to Naples during the 1930s, when a Neapolitan current of Mediterranean rationalism clearly started to take shape. From this time on, in the *architecture without architects* [1] of the Neapolitan coast the principles of avant-garde architectural rationalism found an application *ante-litteram* [2]. In particular, thanks to the work of Luigi Cosenza and Bernard Rudofsky, who in architecture such as Villa Oro (1934-37) found a happy synthesis between northern-European influences and Mediterranean influences. In 1937, several factors contributed to increasing the *"febbre mediterranea"* [3], among which the publication in "Domus" of Le Corbusier's project for Villa Vismara in Capri [4] focusing on the recovery of nature and tradition, and the coeval project of the Villa in Positano, also designed by Cosenza-Rudofsky. Just one year later the Hotel in Anacapri, the outcome of the project partnership between Rudofsky and Giò Ponti, was designed. To all these works over a very short period of time many others should be added, including: Casa Malaparte by Adalberto Libera (1938), again in Capri, two later villas by Luigi Cosenza in Posillipo [5] and Villa Piscitelli by Giulio de Luca (1941) and the ideal houses by De Luca and Carlo Cocchia (1942) [6]. In these works the architectural research on Neapolitan residences is best expressed, in which the sky, the sunshine, the sea and the land became real project materials.
The settlement modes were all characterized by natural and landscape conditions with a close relationship between the inside and outside so that the outside came in and became part of the interior.

The relationship with the soil took on fundamental importance, and often contact with the ground was in gradients, so that the functional demands were developed vertically.
Patios, balconies and windows on the facades for open views of the landscape were recurrent, and the interiors were arranged accordingly: the living rooms directly looking onto the sea, the service areas at the back. The strong sunlight created refractive effects also through the use of bright colours for the facades or interiors and the use of polychrome majolicas.
The exhibition complex *Mostra delle Terre Italiane d'Oltremare* inaugurated before the beginning of the war was another important step towards a Neapolitan modernism, to which the young, newly graduated architects of the new Faculty of Architecture [7] contributed: Stefania Filo Speziale, Giulio De Luca, Carlo Cocchia, Renato Avolio De Martino, with the important professors Marcello Canino, Luigi Piccinato and Roberto Pane. Overall, it was an eclectic and monumental intervention with an exotic and colonial touch, but there were examples of modern architecture especially in the technical structures like the *Arena Flegrea* (G. De Luca), the Pavilion of Electro-technology (S. Filo Speziale), the restaurant with its swimming pool (C. Cocchia).
Another undisputed protagonist of the post-war generation, Michele Capobianco, took part in the project of 1952 for the restoration and reconstruction of the exhibition complex after the war and the bombings.
As regards the comparison between generations of architects, and how these relate to the rational language, Pasquale Belfiore writes: *For Canino, Guerra Chiaromonte and, in general, for the generation of fiftt□-□ear-olds in 19□□, rationalism was not received as a language but as a method to simplif□ the decorative and iconological e□travagance of classicism* […] *therefore academism without the arrogance of the architects more bound to tradition. S□mmetricall□, the soft rationalistic vein did not have such radical characteristics as to create irreparable contradictions, i.e., the non-emphatic modernism of the wor□s of Cosenza, of Cocchia, De Luca and Filo Speziale presented at the Mostra di Oltremare and ver□few other wor□s in the Neapolitan area* […] [8].
To more strictly rationalist canons, and especially to the German roots of *Siedlungen,* belonged the working class neighbourhood of the early reconstruction designed by Cosenza with Francesco della Sala, Raffaello Salvatori, Carlo Cohen and by Franz Di Salvo, Carlo Cocchia, Stefania Filo Speziale.
The early post-war neighbourhoods were, in fact, characterized by typological experimentation and industrialization of public housing.
Cosenza made these themes a dominant part of his research in these years [9] and the Torri Ranieri settlement (1947-57), built with the CESUN (Centro Studi per l'Edilizia), was the first experiment in prefabrication in Italy between the Ministry and the University.
Prominent in this vein are the public housing complexes in the Luzzatti district in Gianturco (1947), Cesare Battisti (1945), the public housing of via Stradera in Poggioreale (1948), the building in viale Augusto in Fuorigrotta (1950), the Stella Polare housing in via Marina (1951) [10].
As Alessandro Castagnaro says, their architecture was really new*: no longer buildings with a closed central court□ard with some wings eternall□ in the shade□no longer the "palazzine" adapting to the availabilit□ between one lot and another□no longer the romantic villas with costl□ maintenance□in short, no longer a whole anachronistic t□pe of building. Architecture became different: the units were lin□ed to each other in long lines to economize on the main structure, so that each apartment could have a view on two sides, and each could have a good e□posure, to avoid building man□ staircases* [...]. *These four or five store□ buildings, all strictl□ aligned, in a north-south or east-west direction, with a loggia or balcon□ at the front were the best Naples could offer from the 19□0s to 1960s* [11].
At the end of the 1950s, from the neighbourhood with a functionalist language (like Cesare Battisti), we can see the more "organic" neighbourhood, in agreement with principles of the APAO (Associazione Per l'Architettura Organica).
Among the Ina-Casa neighbourhoods, we can mention la Loggetta in Fuorigrotta (G. De Luca, M. Canino 1956-57), rione Traiano (M. Canino 1957-8), Barra, Soccavo–Canzanella (G. De Luca, 1957-63), Agnano (S. Filo Speziale, 1954-57) and Secondigliano (C. Cocchia, 1957) [12].
In general, the program of residential building, which started after the war and continued into the 1960s, involved many Neapolitan architects. The quality of the results achieved was repeatedly praised by the critics, and placed Naples in line with the international scene. Therefore, from the "continuity" with rationalism and adherence to neo-realism, the Neapolitan architects chose, as pointed out by Belfiore, a half-way mark *towards sound pragmatism* […]. *The results of this were not immediatel□ noticeable because the first e□amples emerged in the conte□t of a clearl□ functionalist language* […]. *Onl□ from the 19□0s, did the contamination from the original matri□ become more and more evident with suggestions offered b□ the Organicism, Neo-realism, and Neo-libert□ movements, which however would not overshadow the rationalist component* [13].

2. Boom and Reconstruction: local modernism

The 1950s and 1960s, which coincided with the reconstruction and the economic boom, were characterized not only by innovative social housing and low-quality architecture resulting from speculative builders and political malfeasance. There were, indeed, many examples of private architecture worthy of being listed within this brief examination of the history of Neapolitan modernism.
Among these, Villa Crespi by Davide Pakanowsky (1952-55) [14], which, like Villa Oro, consists of volumes with embedded and suspended terraces on a rocky base, hollowed and shaped for the purpose. Besides this example, it is possible to include other especially interesting family houses built in those years, such us Villa Moro by Giulio De Luca and Raffaello Salvatori at Parco Comola Ricci (1948-50), Villa Arata by Giò Ponti (1952), Villa Ferri by Vittorio Amicarelli (1953-54), Villa Trentaremi by Massimo Nunziata (1954), Villa Lidia by Carlo Cocchia (1955), Villa Maderna (1957) and Villa Bruni by Davide Pacanowsky (1957) and many others [15].
But in this period, the best Neapolitan architects not only designed single-family houses for the upper classes, but also collective residences for the emerging Neapolitan middle-class.
The general use of concrete and the beam-column skeleton, together with the lift, in short, modern technological innovations, combined with the demands of the housing market resulted in widespread condominiums in the Neapolitan territory.
The need to consume less land and create the maximum of square meters, together with the new building techniques, promoted the development in height and the thinning of wall structures, but mostly conferred a central role to the cantilevered balconies (unlike the lodges, not counted in cubic metres). Some architecture stands out in excellence in this scene and can be traced to a modern master in the sense of innovative [16] and, at the same time, properly local.
Among these, the works of Michele Capobianco, such as the palazzine of Parco Comola Ricci (1953-55), the palazzina in piazzetta Santo Stefano (1956-58), the Decina building (1956-60), the palazzine in parco Fossataro, among which the Inail building in via Manzoni designed by Franz Di Salvo (1948) and completed by Vittorio Amicarelli (1952), the building in via Nevio also by Di Salvo (1954) later replaced by Stefania Filo Speziale with Giorgio Di Simone and Carlo Chiurazzi, also authors of Palazzo della Morte in corso Vittorio Emanuele (1955) and, several palazzine in via Petrarca (1953-55) by Davide Pakanovsky, who also designed Palazzo “La Fontana” in via Cimarosa (1957).
In these architectures, in which through the apartment in condominiums the emerging post-war Neapolitan middle-class saw its dream of privacy fulfilled without feeling isolated, there are recurring elements with national patterns: the cladding of the facades with ceramic materials (Klinker) or stones (marble), the element of the great hall with gatehouse, where many architectural solutions were employed, in some respects "monumental" and often supported by interventions by painters and sculptors.
The particular characteristics of the Neapolitan houses have to do, not so much with the typological innovations, but rather with the settlement arrangements characterized by the relationship with the landscape.
Take for example the aforementioned Via Manzoni building designed by Di Salvo and completed by Amicarelli. The "in line" plan, where the network of the pillars divides five apartments per floor, is repeated to make up a kind of macro-structure overlooking the Bay of eight floors exploiting the unevenness of the hill of via Orazio [17]. The plans are identically repeated for the entire height, except for the presence of an atrium floor with pilotis that serves as an entrance from via Manzoni and breaks the prospectus in two parts *giving the colonnade the intensit□ of a belvedere between identical floors and giving the building the mass of two bodies, one on top the other, and □oined together b□ various* pilotis. […] *The t□pological principles, normalised b□ the demands of ma□imum e□ploitation of the land, describe a dense cartograph□ where the natural aspect becomes as precious as an archaeological find* [18].
Overall, even when the Neapolitan condominiums do not stand out for their innovative planimetric, typological or volumetric solutions, they are all arranged in relation to the landscape, integrated into the context of the differences in height of the hills, resting on the ground or perhaps clinging to a block of tufa and looking out onto the Bay towards South. This "crib" landscape, full of buildings down to the sea level, is a chief feature of Naples. In general, considering public and private housing built until the second half of the 1960s, *the issue of Neapolitan architecture can be located in a passage from functionalism to a sort of “critical” rationalism* [19].

3. Conclusions

We can affirm that during the 1950s Neapolitan architecture, like Italian architecture, was expressing itself in a modern code, which pre-supposed adherence to a rationalist language but which in effect was mostly unorthodox. Although, unlike the other Italian contexts, this rationalist language was in constant dialogue with the natural scene and in constant tension with the landscape, also as a result of the anthropogenic component considered. This architecture was not integrated into the landscape, nor constituted mimetic solutions, but rather was designed to be prominent on the natural scene.

The mythical relationship between the Mediterranean and rationalism did not stop after the war: also during the 1950s, when the dialogue between nature and artifice was recreated, the best examples of architecture were created. It was a kind of less strict rationalism, more open to Northern-European influences, even organic, and of course there was an exchange with the contemporaneous Italian model. For this reason, Neapolitan modernism shows us another side of a lexicon which had been considered for a long time universal, homogeneous, international and without contradiction, but which was full of nuances and exceptions.

It is, as has been noted [20], a modernism which seems *to casuall lin the dichotom internationalism regionalism* [21]. In reality, you can find this characteristic in all Italian contemporaneous architecture. Therefore, the “Italian Style” is a constantly particular and peripheral modernism compared to European and American modernism. For this reason, rather than focusing on the differences from the model, it would seem more appropriate to start from the influences, relationship, interaction, and “quotation”, even from plagiarism, namely from the different facets of the modern model.

Most of the Italian architecture built during the post-war period should be interpreted through these categories. Accordingly, like many others aspects of the city, Neapolitan modern architecture is a kind of example, often exasperated, through which you can identify many aspects of Italian culture. So in this other laboratory of modernism, the modernist challenge arrived gradually and later, but perhaps more strongly, and the city was catapulted into frenzied reconstruction, in which, however, in hindsight, important works were also carried out.

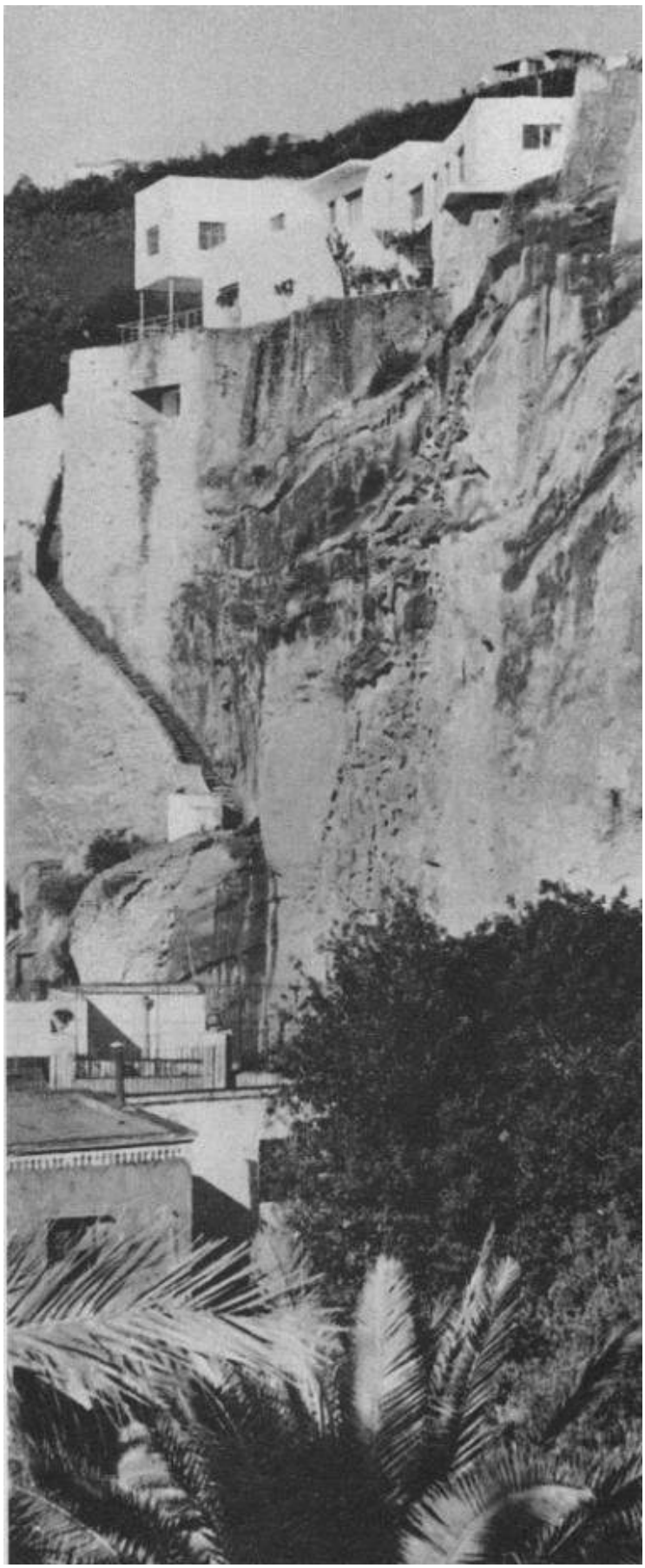

Fig. 1: L. Cosenza, Villa Oro, 1937.

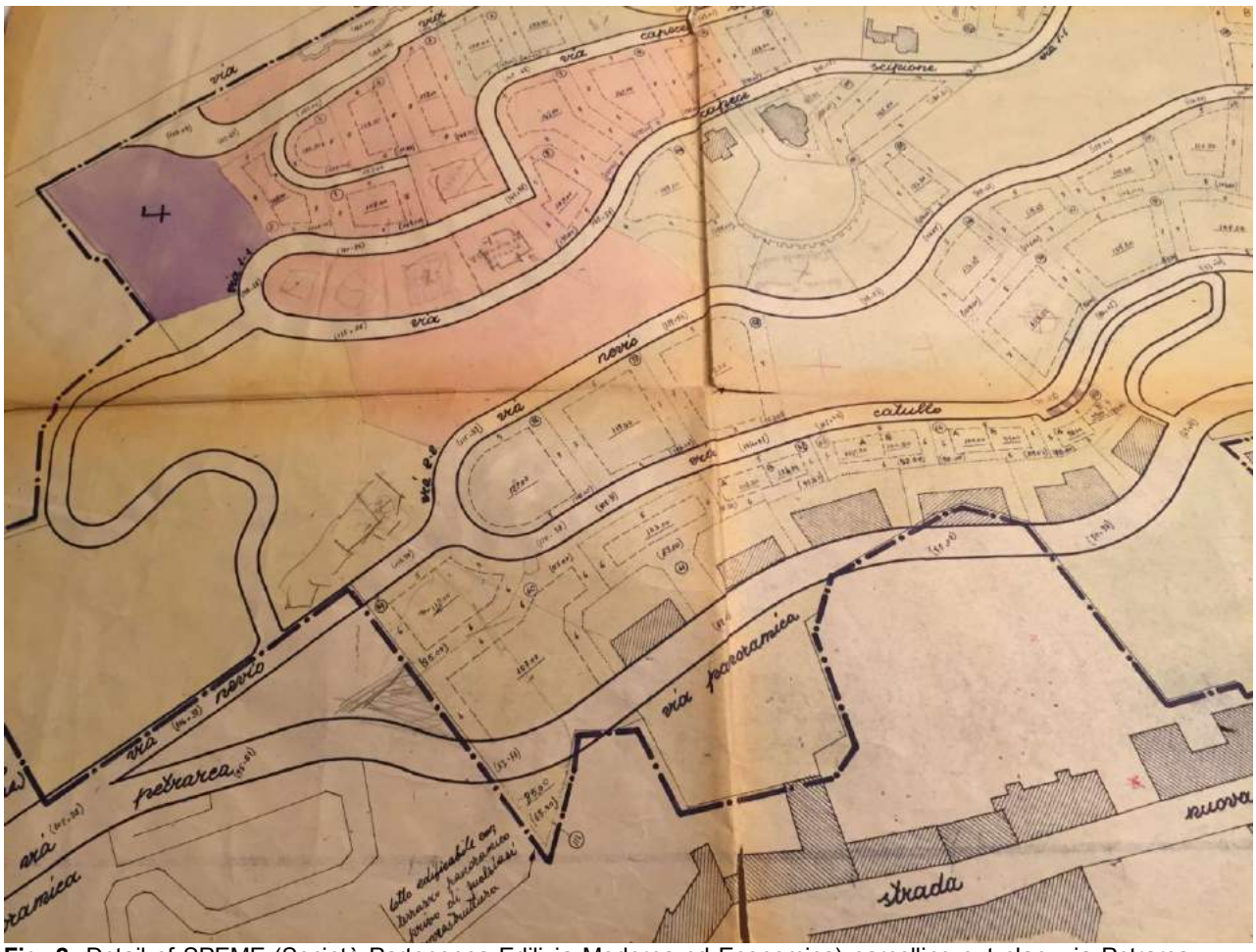

Fig. 2: Detail of SPEME (Società Partenopea Edilizia Moderna ed Economica) parcelling out plan: via Petrarca and via Orazio on the Posillipo hill,1960.

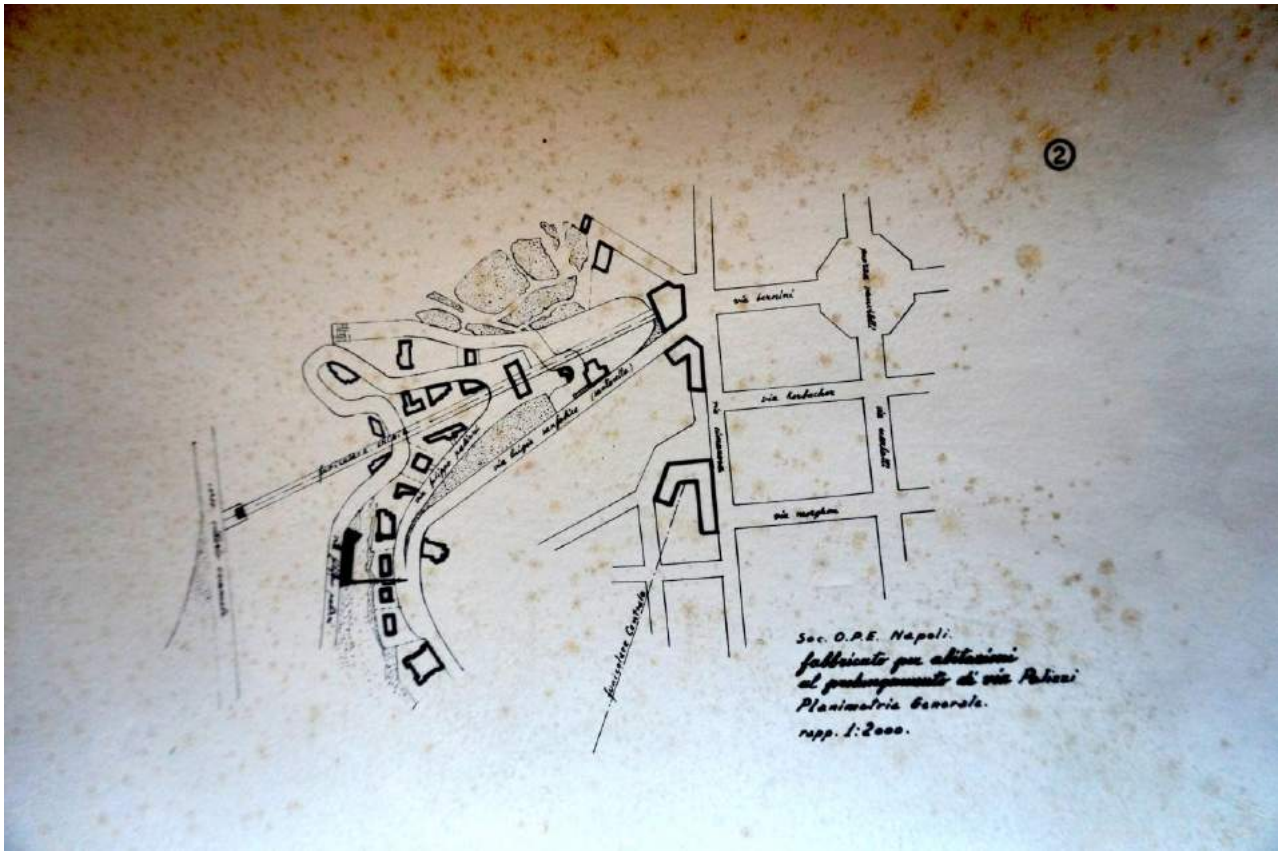

Fig. 3: C. Cocchia, Housing building in via Palizzi, general plan, 1956.

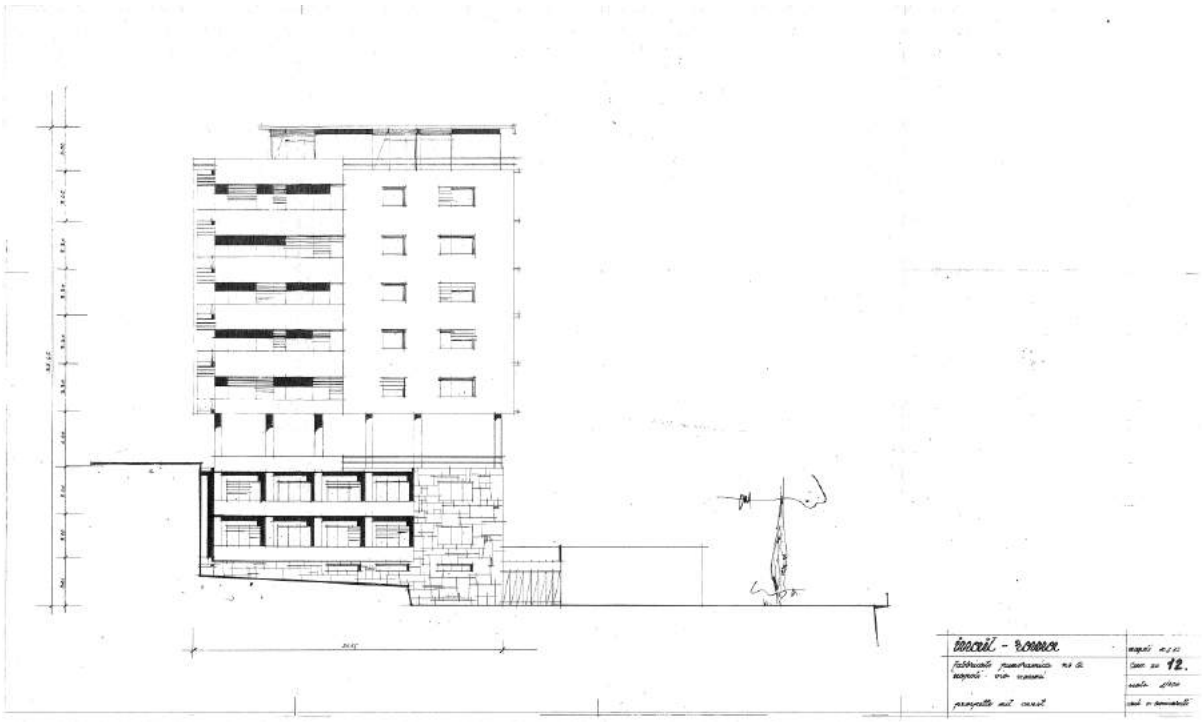

Fig. 4-5: V. Amicarelli, F. Di Salvo, Palazzo Inail, 1948-1952.

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New methods for the representation of landscape's design: open source and ancillary data in GIS database.

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Abstract
The study of a part of the territory from the finding, of ancillary data, the set of data make up the identity of the object under investigation.
Where do you find this information The approaching to archival research, bibliometric or computer, is not a simple action, you incur easily in error. The most common mistake is in the choice of the database, it is very important to have a culture of how and where to look for data, the choice of keywords that can bring results and know which store to find that information given.
In recent years the publishing of ancillary data has become a real form of technological development, so that CERN "European Organization for Nuclear Research," has opened an online archive session dedicated to open-date.
In the specific case of the Italian territory, we have seen how to deal a study based solely on the open-source data made available by the government entities, organizations, regions and institutions, such as the National Geoportal, ArcGis, Revenue Agency, Military Geographical Institute , DIVA-GIS, SINAnet-IPRA, CERN.

Keywords: Open source, ancillary data, database, surveying.

1. Introduction
Ancillary data is what is immediately present to the knowledge, first of all forms of processing, these are used to build the identity of the object to be investigated. Ancillary data used for this research are digital elevation models, orthophotos, vector data, the retrieval of this data is a critical step in the interpretation of remotely sensed information. The retrieval process ancillary data which the analysis of a territory is never easy. For this purpose it is necessary to have reliable sources where to find certified, updated and downloaded in real time. Within a complex territory a fair analysis starts from the procurement of ancillary data, necessary part of a survey both on a regional scale and / or architectural. Most countries make available to professionals and citizens, databases online that can be accessed to retrieve useful data to the structuring of a GIS project "Geographic information system" that encompasses the different Layers of knowledge. In the specific case study, it was seen as the government entities make available to all, given on-line based managed by institutions, regions and institutions, such as the National Geoportal, ArcGis, Inland Revenue, Military Geographical Institute, DIVA -GIS, CERN Open data Portal, SINAnet-IPRA where to find in it easy and immediate way the ancillary data required for survey and knowledge. Some of the data that you can found are: CTR, ORTHOPHOTO, DEM, PRG compound, Layer SCI (Sites of Community Interest), Layer SPAs (Special Protection Areas), Layer Networks and Infrastructure, Parks Layer, Layer Land use, Corine LAND COVER. Over the past few years, online database together with G.I.S. systems and remote sensing provide geographical disciplines and highlighted a number of analytical tools, information management. These technological tools, which have quickly extended objectives attainable by most of Earth sciences and Social sciences are a good tool to discretize and know places. (1)

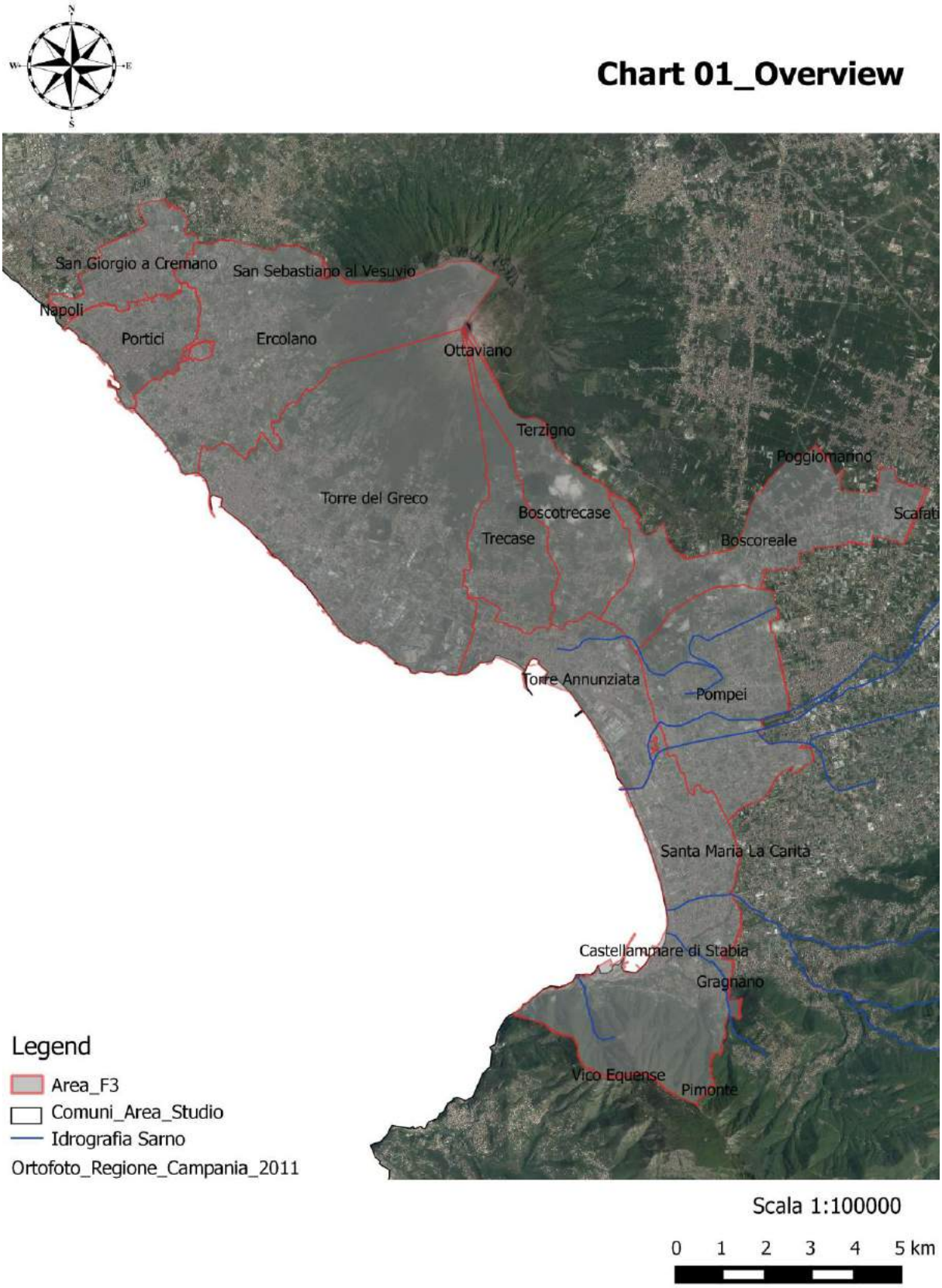

Fig. 1: Overview of Study area on orthophoto image (Regione Campania, 2011).

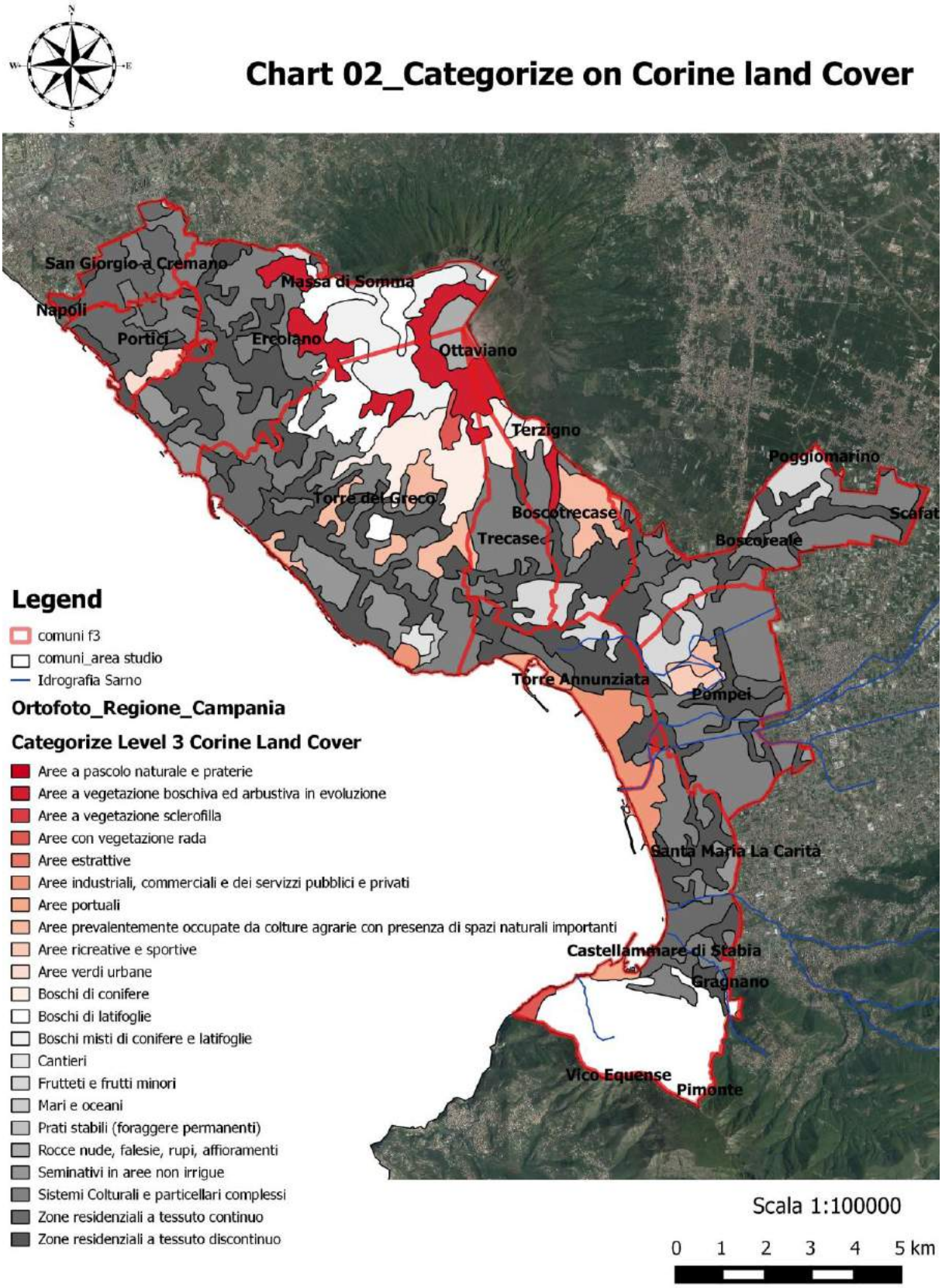

Fig. 2: Categorize on Corine land Cover.

Today the online database and platform G.I.S. represent the valuable tools for the analysis of the elements that make up a territory and for the implementation of the same. With ancillary data we will have the information needed to start the study of the territory, while the platform G.I.S. you can manage this information, both directly and indirectly. Directly because you can access the properties of each layer, to know all the layers that compose it, modify it and apply the update to a part or all of the component parts. While indirectly, means, put all the layers or rasters found and compare them with each other resulting in a local network personal database. ou can also create different thematic layers, merge them together, united, in order to perceive the area as one continuous shape, or at the same time you can instead analyze each layer independently, so as to return a discontinuous and broken territory all levels. The objective of this study is to show how in a complex area like that, you can use as a starting point for understanding the online database for the retrieval of ancillary data, the processing of these GIS platform, the recognition of the different information that encloses every data and subsequent processing, all enclosed within thematic maps.
The transformation of a continuous territory, viewable from raster images – thank to orthophoto in this case the Campania region - in a discontinuous territory, composed of different thematic layers, made available by the RTC (Regional Technical Map); these twisted between them make up the complexity of the elements present within an environment - be it anthropogenic, natural, semi-anthropogenic - all analyzable elements and implementable in time. ou can obtain the update from some of the ancillary data downloaded from the database by the institutions and regions, a user card of the soil to the date of the last orthophotos, identification of green areas, built-up areas, and gray areas that fall in the province of Naples. The identification of green areas and built-up areas is obtained through visual orthophoto cross-analysis with thematic layers, these can also increase with the design of the polygons within the same layer, while the gray areas are achieved from the difference between these two. The result of these analyzes as a product has multiple thematic maps, which concisely represent the magnitude of the places. This is achieved by defining the geometry-multiscale layers, a methodology that allows to investigate the reality of the territorial scale to the architectural work, regardless of its date. This type of analysis is a pattern of elements of different origin and dating, crucial for the planning and control of multi-sensor research, using analysis based on cultural consciousness and visual sensitivity. Crossed with the data already defined by different government institutions, that provide different levels of information available pertaining to the different spatial scales, it builds an updated database and always implementable.

1.2 Material and Methods

The first step to know an area is watched in its entirety, to know the relationship between the parties and the parties to communicate with the whole. In a complex reality like that of the Neapolitan province is necessary for its correct reading, use of planning tools and government as the CTR, PRG, PTR, thematic maps, Corine Land Cover, updated orthophotos and DEMs, made available on the database -line. Crucial in order to complete analysis and related data implementation, it is the use of government land tools that address a different scale, such as the paper land use which intervenes at a regional scale and Corine Land cover paper instead intervenes to European scales, they are used both in order to have complete coverage of the soil. The use map of the soil, tool that is realized in most cases on a regional scale, providing the cover and the transformation between the different categories of use, more frequent information for the realization of sustainable management strategies of the landscape-heritage environment and to verify the correct implementation of the different environmental and related environmental concerns policies of many sectoral policies such as (tourism, agriculture, industry, etc.). Therefore one of the main themes of land use maps is the transformation of the soil by a natural use for a semi-natural or artificial. These changes, in addition to determining the loss of fertile soil, causing further negative impacts to the environment, such as land fragmentation, reduction of biodiversity, changes in the hydrological cycle and changes microclimatiche.Inoltre identifies the spread of urban areas and related infrastructure, determining the increase of the transport needs and the related energy consumption, with a consequent increase of noise pollution, the air pollution and emissions of greenhouse gases.
The Charter Corine Land Cover (CLC) obtained from Corine project, provides a land use at European scale map. The latter was born in 1990 as a European instrument, specifically for the detection and monitoring of hedging characteristics and use of the territory, with particular attention to the needs of environmental protection. In 2000, the CLC card has seen the accession of 33 countries including Italy. The National Authority for the management of the project has been identified nell'APAT today ISPRA, national focal point of the European network EIONET. In addition, the Corine Land Cover, has five levels of detail for the discretization of the territory, for so allows specifically good view of the national territory, in fact, not all Italian regions have implemented the fourth and fifth scale of detail, which as I said previously, allow a reading of the territory in small scale graphics and for so great in zoom. (6)

These instruments have a duty to show us the proper way to go for knowledge, discretization, preservation, theming and future development of the area. Unfortunately they do not suddenly upgrade, means that downloaded data revealed no help in drawing database as outdated; This sometimes creates not only a slowdown but a misreading of the territory.
Therefore, it was concluded that, for these shortcomings, due to bureaucratic red tape, need to cross the different tools at our disposal by the public authorities, so that each tool go to eliminate or however to reduce the shortcomings of each other, so as to have an overall view of the temporal and multi territory.
For this purpose it has created a project on G.I.S. platform, where the ancillary data, retrieved from online databases made available by the institutions and regions were inserted. The G.I.S. (Geographical Information System) is a platform that allows the integrated collection of software and data used to view and manage information about geographic places, analyze spatial relationships, and model spatial processes. A G.I.S. It provides a framework for gathering and organizing spatial data and related information, so that they can be queried and can be implemented in tempo.4 The retrieved data were processed on open source platform, thus allowing the free study and also allowing for adaptations and extensions suitable for the transformation of a continuous territory in one batch.

1.3 Results and discussion

In this study we proceeded intersecting the orthophoto raster data of the Campania region with the dwg file of CTR, where the last update was in 2004.
The CTR "Regional Territorial Charter", comes from the need to have a thematic mapping large territorial-national scale, to be used as the basis of cartographic reference suitable for the knowledge of the territory and its natural resources, for the design for execution of the relative placing and development interventions. This need has been felt in Italy in 1935, the Italian Geodetic Commission became spokesman of this requirement, so that the individual characteristics and criteria that had as its goal the creation "General Technical Paper large scale of the State".
Therefore, the CTR stands as framing tool, address and dissemination of integrated interventions to determine the consistency and synergy of a territorial organization.
The Regional Territorial Charter consists of different levels of detail, such as roads, buildings, vegetation, hydrography and hydraulic works, transport, morphology, etc., All information necessary for the achievement of the aims of this study.
Management of data retrieved from the online portal will be stopped not with G.I.S. platform organizing them into groups, layers, so we have a clear structure of the data that you have, and only with proper organization can take a holistic view of the data available. The great amount of information is identified not only about the area of study, but the whole nation, the Campania region, or in the best case to the entire province of Naples, for so to lighten the project, the data must be "clipped" with on the study area polygon. It organizes the project on open source platform, you will only use the data that fall within the study area, this operation is carried out with the Clip command, which cuts all the information on the outside of the study polygon.
The operation must clips to extract the input information that overlap of clips entity. □ou use this tool to cut out a portion of an entity class as a model. This is especially useful to create a new class of entities, also known as a field of study or area of interest (AOI), which contains a geometric subset of entities or other type of more important entity. The choice to convert the layers from the CTR dwg files in shape file, for updating the data and the transformation from lines in polygons, is carried out through the analysis of the levels of the table that constitute the same, so as to bring out only the green areas and those built, drooping of the F3 and the Sarno Valley. For vegetation we were chosen the following levels: Citrus fruit orchards, vineyards, groves, Limit Zone Arborea, limit crop Agriculture, Forest Limit, Limit of Wood Cut, Green Private and Public Green. As for the buildings it was decided to intervene through the following: Building Generic Unchanged, Modified Generic Building, Generic New Building, Industrial Building Unchanged, Modified Industrial Building, New Building Industrial, Commercial Industrial Building Unchanged Unchanged in Building Construction, Building Changed in Construction, Building in New Construction, Building demolished or Ruin Serra Canopy or Canopy, Shed, Courtyard or Cavedio, Body Jutting, Containers, Dwelling Precaria, Gallery Under Building, Agricultural Building, Barn, Animal shelter etc ..After the identification and processing levels, it proceeded to the shape of the overlap of the CTR with the raster image of the Campania region, in this way emerged the changes of urban and extra-urban scenario that occurred over time.

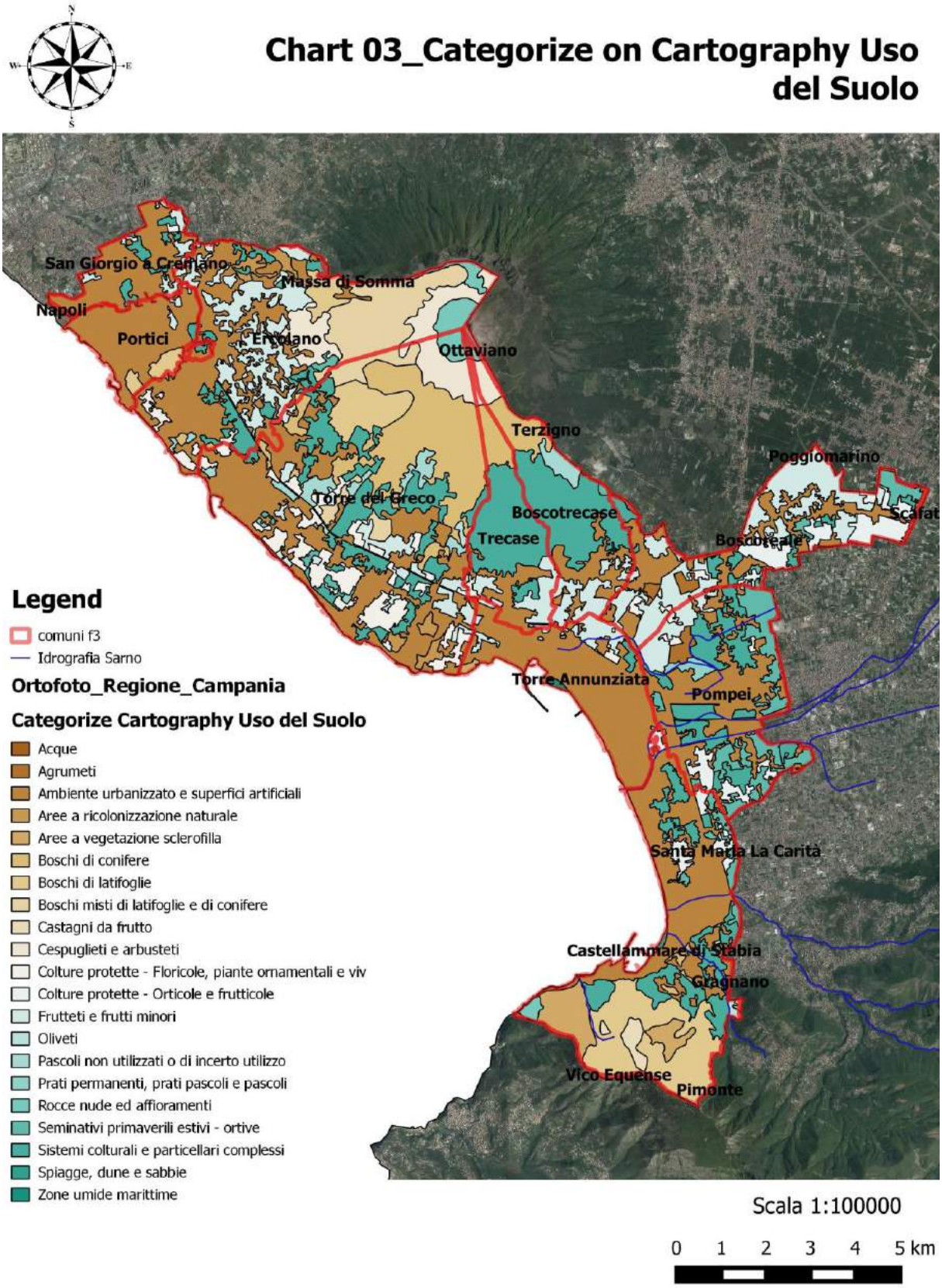

Fig. 3: Categorize on Cartography Use of Land

To make it even more tangible the changes over the years have created new shape vegetation and buildings, with characteristic geometric polygon, so as to allow secondly to make them intersect with the different planning tools and government. In this way it is obtained a discontinuous territorial scenario - no longer seen as a single raster image - but as a set of elements "layers" varied over time. To further increase the information obtained by the design of new polygons, and the sum of these with existing ones, follows the intersecting operation of these shapes with different planning tools and Government PRG as common, the use of paper soil of the Region Campania and Corine Land Cover map, previously subjected to the operation of clips. The Intersection command calculates an intersection of the geometry of a shape with the attribute data of a second different shape. Consequently the intersection operation that allows: two entities having an input - input vector - (from where we want to take the data attributes) and another shape - of intersection vector - from where we want to take the geometry, to obtain a third shape - output - which has the geometry of the carrier input and how - attribute data - that of the intersection vector. For easy and correct reading of the territory and the information enclosed in it, we proceed with the transaction id categorization. The correct symbology allows you to then represent the attributes of a layer in an easy and immediate. The categorization is done by choosing a specific field within the data table attributes, the field which is chosen depending on the information that we want to bring out the project and that we want to represent in a thematic map. In the specific case of the eight thematic maps were produced under consideration: 01. Structure of G.I.S. system, 02. Employee and Regional Summary of Layers Processed, 03a. Layer Buildings themed with PRG, 03b. Layer Buildings themed with Land Use, 04a. Layer Vegetation themed with Land Use, 04b. Layer Vegetation themed with Corine Land Cover 2012, 05a. Layer Grey Areas themed with Land Use, 05b. Layer Grey Areas themed with Corine Land Cover.

1.4 Conclusion

In conclusion it has been recognized as the online databases are a valuable tool for the retrieval of ancillary data, and how to correct structuring of the project on the platform, allowing to cross and extrapolate, physical, qualitative and quantitative contained within them, to be used as a specific object of study. The work has, therefore, resulted in the updating of the levels of vegetation, the Built present in some cities of the province of Naples, also gray areas were identified present in it. The data obtained made it possible to highlight the evolution occurred in the territory over the years, highlighting weaknesses and strengths, all elements necessary for proper development and governance of it. Therefore, by analyzing multicriter @, carried out with awareness and sensitivity, this study has set a real potential to support proactive ideas for sustainable tourism, based on the heritage of the territory.

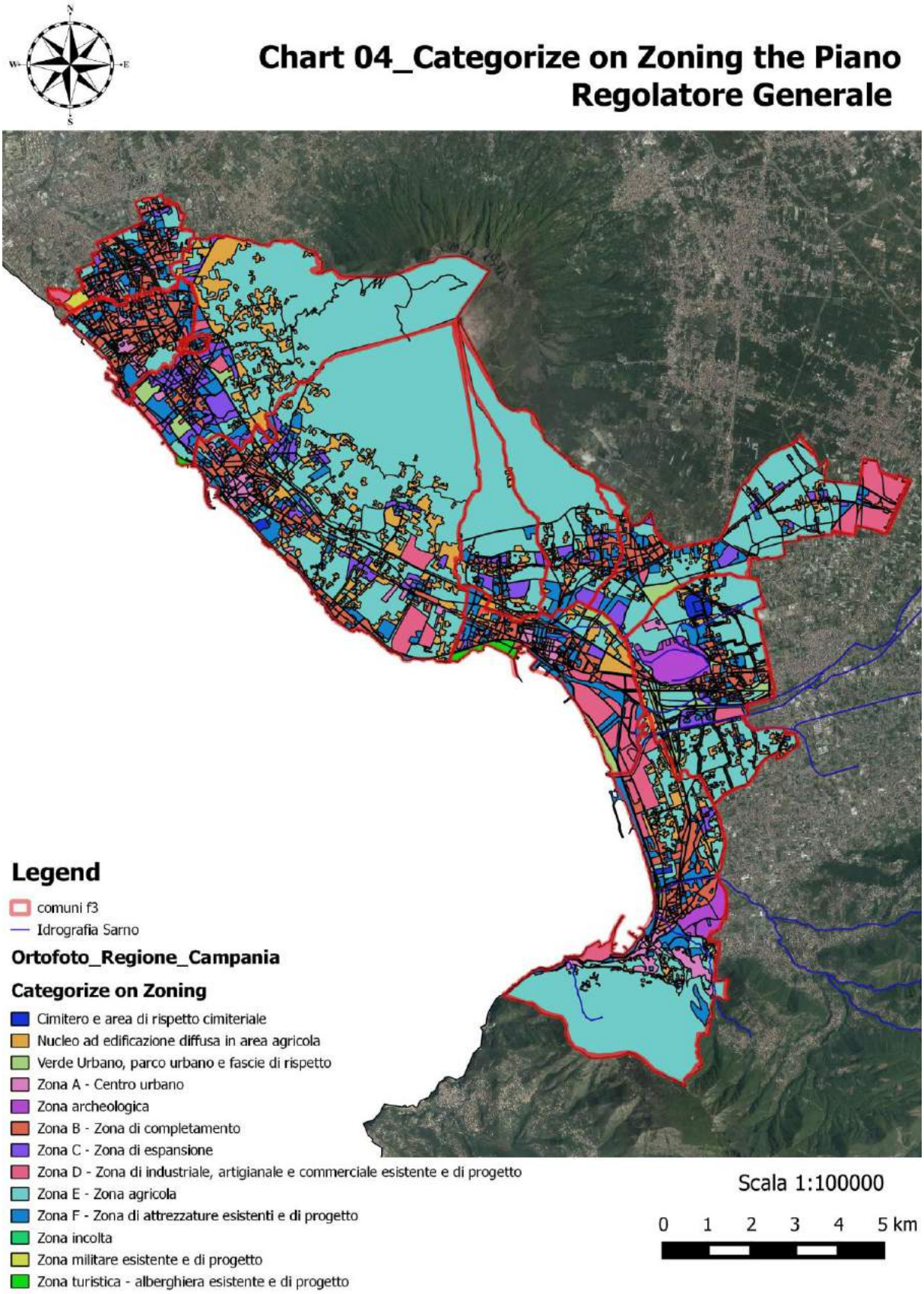

Fig. 4: Categorize on Zoning PRG.

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Surveying and mapping architecture and landscape's design, based on hyperspectral and true color remote sensing imaging

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Abstract
The paper aims to test and verify the potential of aerial hyperspectral and photographic remote sensing techniques for the delimitation and analysis of areas devoted to greenhouses verifying the overlap of the elaborate obtained through aerial survey with those made as a result of the direct survey.
The case study analyzed covers of an area between the towns of Pompeii and Castellammare di Stabia. The image of this portion of territory, taken from aerial multi-sensor platform, were processed with different techniques on innovative methods of semi-automatic detection of ground covers. The results obtained by the image processing procedure were compared with the data generated by direct survey of the places; in this way the indirect detection seeking confirmation in the direct one and vice versa. The comparison has allowed the advantages of the methodology based on the integration of remote sensing data and data relating to the knowledge on site investigated area. The direct survey allows you to return the map of the condition of the investigated area in that moment and typo-morphological chart, allowing you to create a database in which to enter information about the different types of greenhouses. Following of the aerial remote sensing is returned instead an image, a continuous plot in which it is necessary to discriminate, through algorithms, the different types of structures and ground covers. In this way it is intended to establish a procedure consisting of a different nature techniques that can resolve ambiguities of interpretation of remotely sensed images and provides faster results available in spite of the long survey time on field.

Keywords: Pompeii, surveying, mapping, hyperspectral remote sensing

1. Introduction
The paper aims to test and verify the potential of hyperspectral airborne remote sensing techniques and photo for the delimitation and analysis of areas devoted to greenhouses. The aim is to verify the overlap of the documents kept by the air relief with those made as a result of the direct survey. The direct survey was the first step of research because it allowed to create a typo-morphological chart of the detected greenhouses by using dedicated software such as GIS platforms. The first phase involved, in fact, the lay out of a map database, organized in different thematic layers, some of which are found at local regulatory authorities. The designed structure has been organized into 8 macro groups that merged the corresponding layers and specifically: 1) Base mapping, 2) ancillary data, 3) flight plan, 4) Study Area, 5) Detected greenhouses, 6) Hyperspectral remote sensing, 7) Photographic survey, 8) Processing data. The case study analyzed concerns an area between the towns of Pompeii and Castellammare di Stabia, a limited portion chosen as a test area for research. The choice fell on this portion of territory as heterogeneous or in part urbanized and partly devoted to green, also affected by a large number of greenhouses of a different type, by the presence of the river Sarno and track of the railway network. Heterogeneity is a key feature for the analysis phase because variability in the composition of the territorial elements allows you to view a wide range of spectral signatures ranging from bare soil, the river, the vegetation and the urbanized area.

The area of study is between the towns of Pompeii and Castellammare di Stabia, it is about 1 km. In this area 180 greenhouses have been recorded and cataloged including 161 in Pompeii and the remaining 19 at Castellammare di Stabia. These are territories particularly concerned by the presence of greenhouses strongly linked to the local economy for the production of the flower market. In the first instance the phase of survey in the site brought to the schematization of the different types of greenhouses spread on the investigated territory. For each of them a table of attributes was compiled, it contains information about the type of construction, the type of crop, property, height of the structure. A geometrically were identified six different types: flat, tunnel, pitched roof, gable roof and mixed. In the map below you can see the representation of the greenhouses on cartographic basis, distinguished by type in different colors. This phase was crucial for the organization of the geographic database by which to extrapolate the different thematic maps. Through a phase of critical interpretation of the different surveys you can produce different maps to be clear the reading of the natural phenomena and observe the relationship between man and his environment. These data are, in fact, intersected with different available mapped elements to highlight the interrelationships with elaborated themes. The phase of aerial survey followed and the processing of multi-level images.

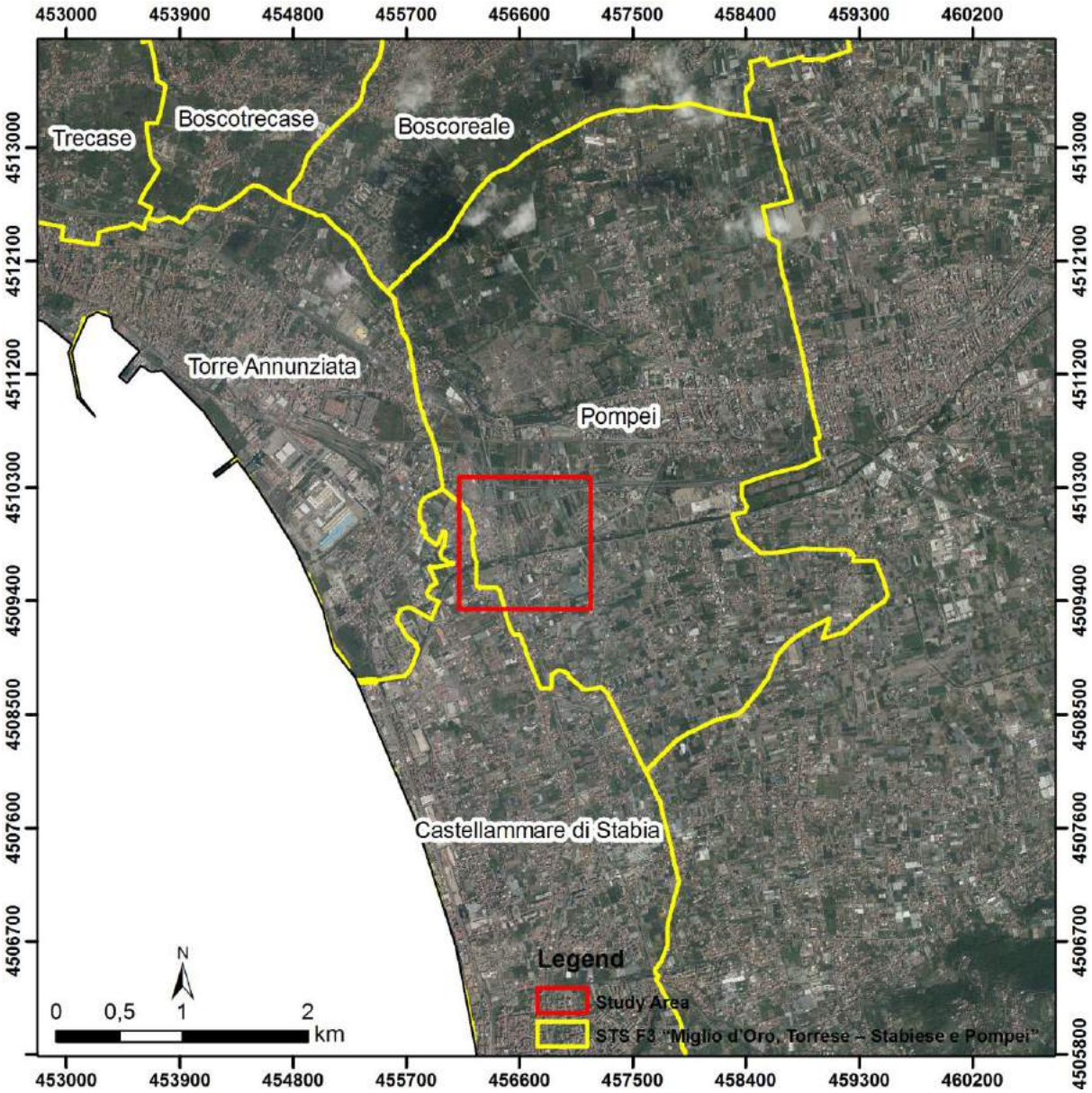


Fig. 1: Overview of Study area on orthophoto image (Regione Campania, 2011).

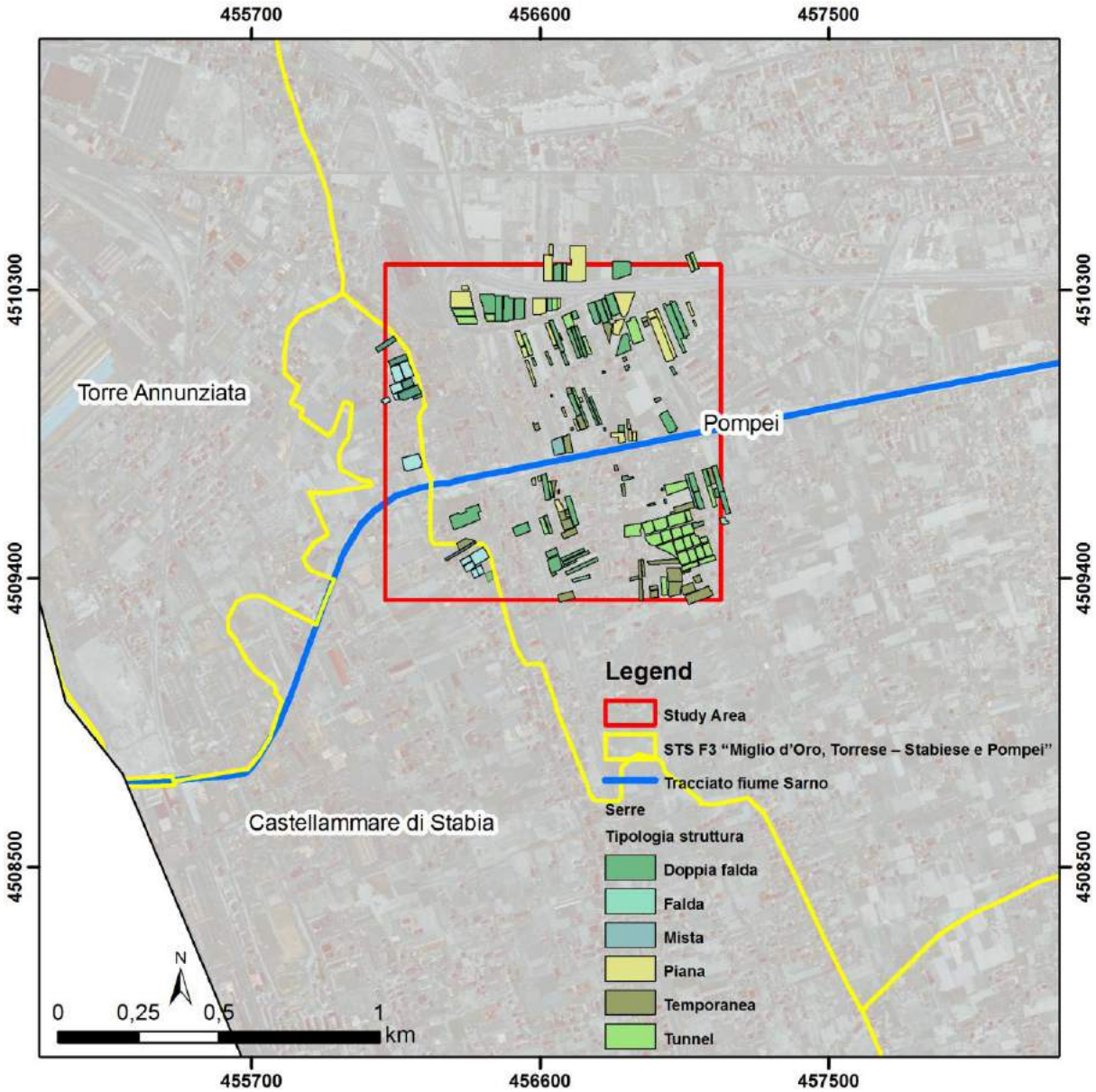


Fig. 2: Different greenhouses typologies on study area in the database on GIS system.

The survey was conducted through a specific campaign of aerial remote sensing with a sensor platform composed by hyperspectral sensor Itres CASI 1500, installed with the inertial platform INS and GPS antenna and high-resolution photographic camera phaseOne iXA, in December 2015. the integration of these sensors and comparative reading of their data opens a number of evaluation aimed at discretize the complexity of human and natural phenomena not easily detectable to the naked eye. The Itres sensor CASI-1500 (owned by Benecon SCaRL) is a hyperspectral sensor that measures the solar radiation reflected in the wavelengths from 380 to 1050 nm. It is able to detect in the spectral domains between the 'visible' and 'near infrared', divided into a large number of channels (up to 288) and having a 40□ viewing angle consisting of a linear sensor 1500 elements, with appropriate flight schedules allows to process images with a ground resolution up to 50 cm. Flight planning, under review, reported a resolution of 1 m. Furthermore, the photosensitive units and the CASI-1500 optical sensor can be configured in two different scanning modes: "spectral mode" and "spatial" mode. For this flight it was adopted the spectral configuration to 36 channels, which allows to maximize the number of acquirable spectral channels compatibly with the conditions imposed by the geometric resolution of the pixels to the ground (1 meter) and integration time required for detection of radiant energy. The selected bands are distributed evenly over the available spectral range.

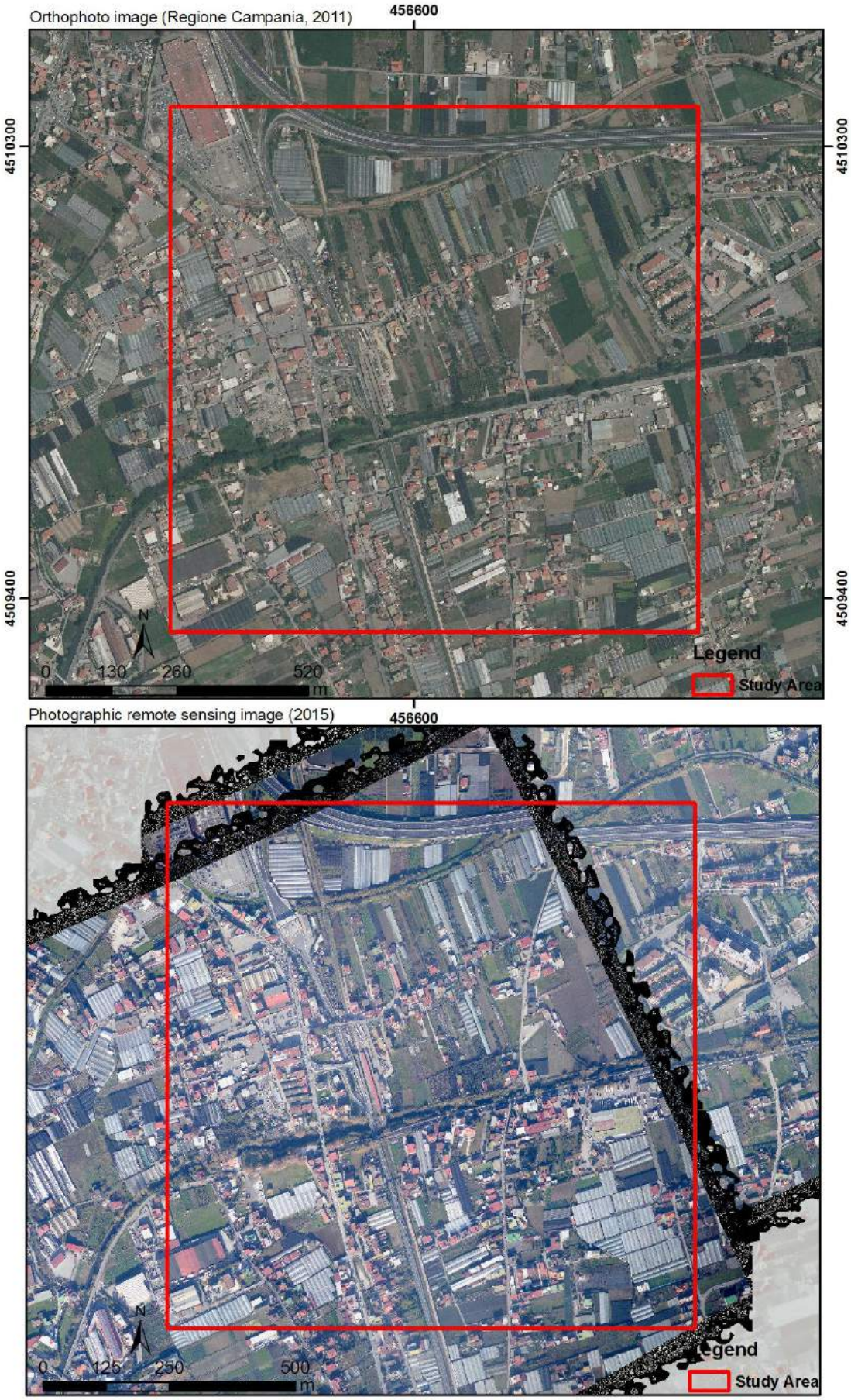


Fig. 3: Comparison between orthophoto image and photographic remote sensing image.

1.2 Material and Methods

In general, the hyperspectral data, taken by the airborne remote sensing, have been proposed and used for different purposes and in particular for the detection and mapping of vegetation cover in several parts of the world. The algorithm SAM (Spectral Angle Mapper Algorithm) is used for classification of different studies using high resolution satellite data. In this paper, we propose to apply it to the high-resolution data of hyperspectral sensor CASI ITRES 1500 for classification of vegetation cover and discrimination of the areas devoted to greenhouses. The possibility to have hyperspectral data have permits to operate between bands to create new images and extract consequently more information than the original, in fact amplifying the ability of the human eye. The elaboration between bands involving multiple channels at a time of hyperspectral data.

The most commonly used operations are arithmetic or the sum, difference, product and value. The purpose is to highlight the different spectral responses of surface coverings, in different portions of the spectrum, in this way the vegetation indices are calculated. For the case study we have been developed various techniques regarding innovative methods of semi-automatic recognition of ground covers. The results obtained by the image processing procedure were compared with the data generated by direct survey of the places; in this way the indirect detection seeks confirmation in the direct one and vice versa. In particular, it is easy to discriminate the vegetated surfaces from the other by dividing the near IR band and that of red. In these two portions of the spectrum, in fact, the vegetation shows high reflectivity in the IR portion due to the structure of the leaves and foliage. The same vegetation, however, strongly absorbs in the red for the presence of pigments such as chlorophyll. Its spectral behavior is connected to a good or bad health: the stressed vegetation respect to the healthy one, in fact, has a reflectivity higher in red and lower infrared.

To monitor the vegetation complex vegetation indices have been developed, the most used is the normalized difference vegetation index (NDVI) because its calculation is simple and fast. The NDVI image is calculated by the formula: NDVI □ (NIR - R) / (NIR □ R).

1.3 Results and discussion

In the case study, this operation has allowed to have an image with gradation from black to white. The vegetation presents high values of NDVI and is represented with values tending to white than to black areas which are purely urbanized. Through an operation of image segmentation it has been possible to create the corresponding polygons in drawing up the index so as to have a geometric representation of the data investigated. This operation is then followed that of the application of the algorithm SAM (Spectral Angle Mapper).

This algorithm is useful for the evaluation of the similarity between a measurement and a spectral signature as a reference. From a strictly mathematical point of view, a hyperspectral measurement to N channels is a vector in an N-dimensional space. The SAM calculates the existing angular distance between the measure and a collection of pre-defined spectral signatures, and attributes to the extent the same subject label of the nearest reference signature. In particular, it has been chosen as the reference polygon, as a reference spectral signature, as developed by the index NDVI vegetation with positive value in order to have an additional skimming of the initial data. It is noticed in fact as the SAM could better discriminate the vegetated areas from non-vegetated. This step was crucial in the search for areas in greenhouses since, allowing the perimeter of the green areas, allows you to exclude and discriminate them from those where there are greenhouses.

We have chosen to work this way noticed the heterogeneity of the greenhouses; the first test gave in put to the SAM algorithm a spectral signature of a greenhouse chosen as an example in the study. Following processing, however, the SAM has not produced a map corresponding to the reality of the places. Maybe this is due to the semi-transparent material of selected object and also to the heterogeneity of what stay under the transparent covering materials; not all the greenhouses in fact have the same type of crop. Then there is another problem the reflection of solar lighting and the angle of view. The SAM has, however, allowed, so expeditious, the perimeter of green areas and then, finished the elaboration in a mainly agricultural area, it is clear how this algorithm aids in discrimination and in the indirect survey of all the greenhouses present. At this stage of analysis the high resolution photographic image is another test to verify processing and clarifies any ambiguities generated during the operation carried out on the hyperspectral data. It is evident that, this image could guide the researcher in the field and make the analysis work more immediate and cataloging. The comparison between the two techniques allows you to highlight the advantages of the methodology based on the integration of remote sensing data and data related to direct survey of the area.

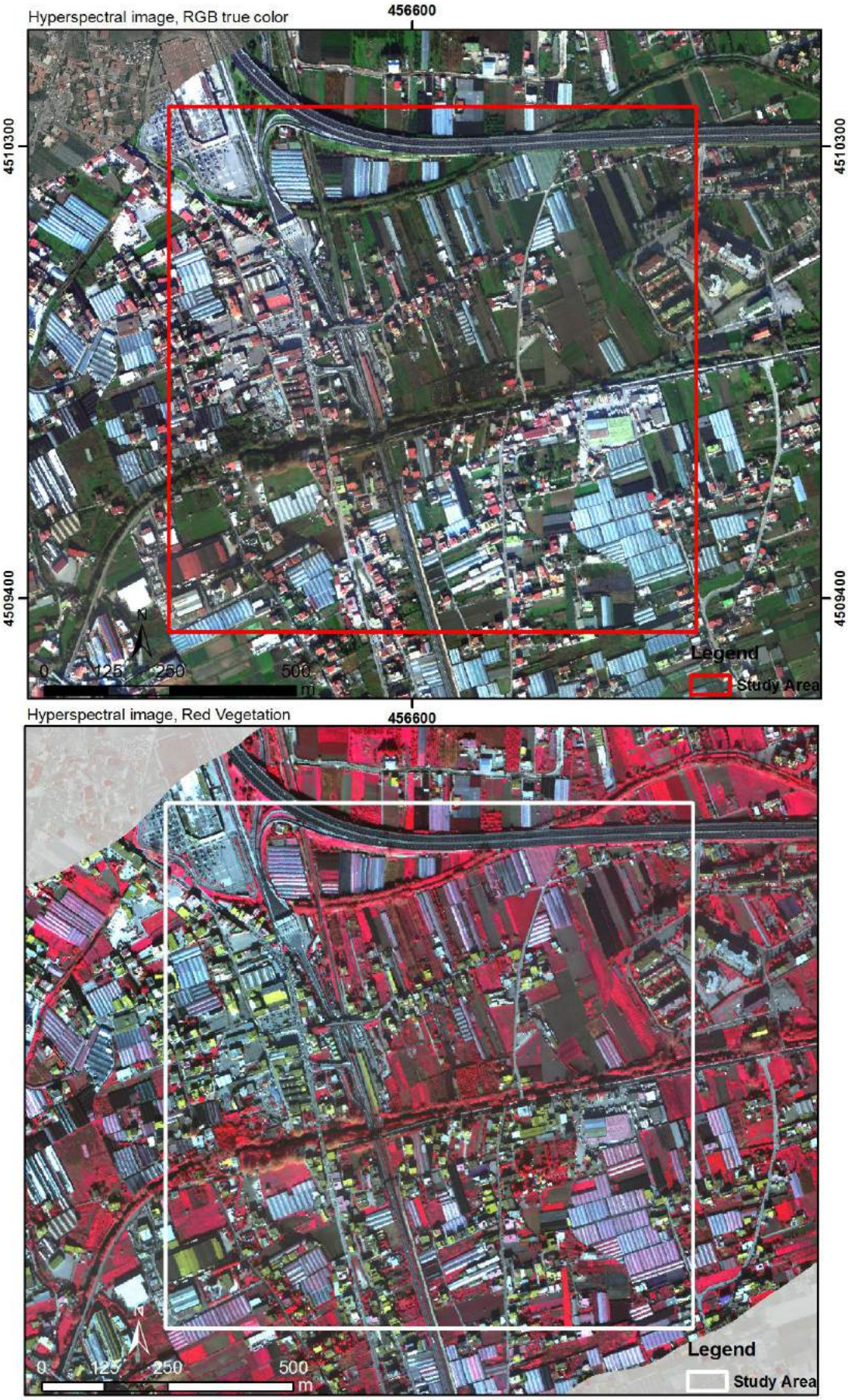


Fig. 4: Comparison between hyperspectral image (true color) and red vegetation image.

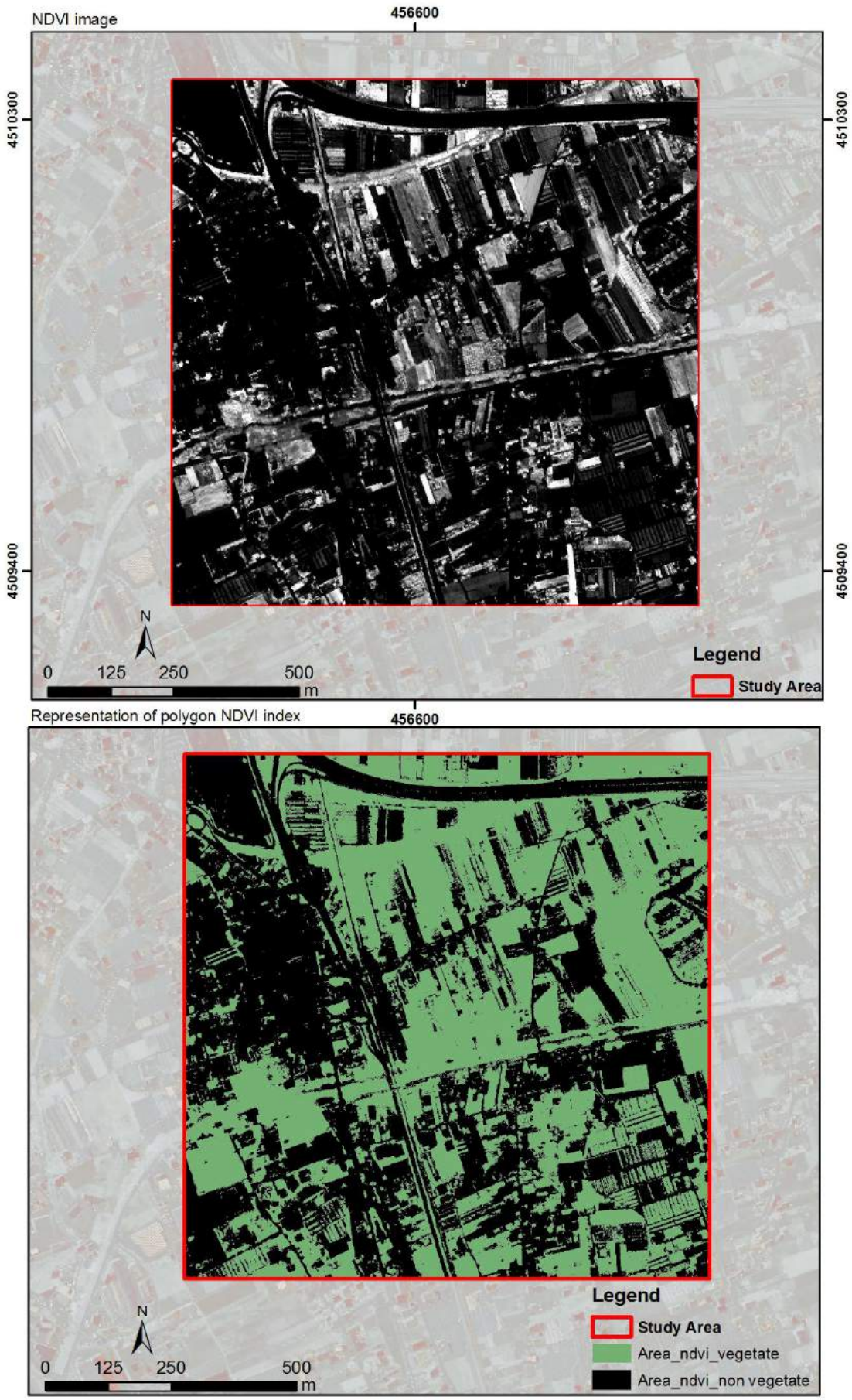


Fig. 5: Elaboration of NDVI index, comparison between the image and the representation of geometry on GIS sistem.

The case of the cover (in the figure 7) is interesting and emblematic ; It highlights the different types of analysis and highlights the need of comparison between different types of applications on the same data . NDVI can not totally discriminate specifically the populated areas from natural ones because it focuses exclusively on the NIR and IR bands . The SAM on the other hand , in the proposed figure, based on a greater information content, is able to provide a more detailed map of the different types of coverage. This refers to the difference between the data hyperspectral and multispectral ones; there is a clear correlation between the amount of data available and the capacity of the characterization of the study area .

1.4 Conclusion

The research aims to improve the data processing starting from the optimization of the flight plan and the sensor viewing geometry in relation to the lighting conditions in order to minimize the variability of the bidirectional reflectance. The study was an opportunity for experimentation, with the integrated use of the techniques and tools of survey, for the definition of a multidimensional and multi-scalar methodology that could be exported to other contexts. The comparison between the papers of direct and indirect survey allows to highlight the different methods; the first allows you to have a map of the state in that moment of the area surveyed and an typo-morphological chart allowing you to create a database in which to enter information about the different types of greenhouses while the elaborate obtainable from survey plane is an image, continuous plot in which it is necessary to discriminate, through algorithms, the different types of structures and ground covers. The study was aimed to defining a procedure consisting of a different nature techniques that can resolve ambiguities of interpretation of remotely sensed images and provide faster results available in spite of the long survey time on field.

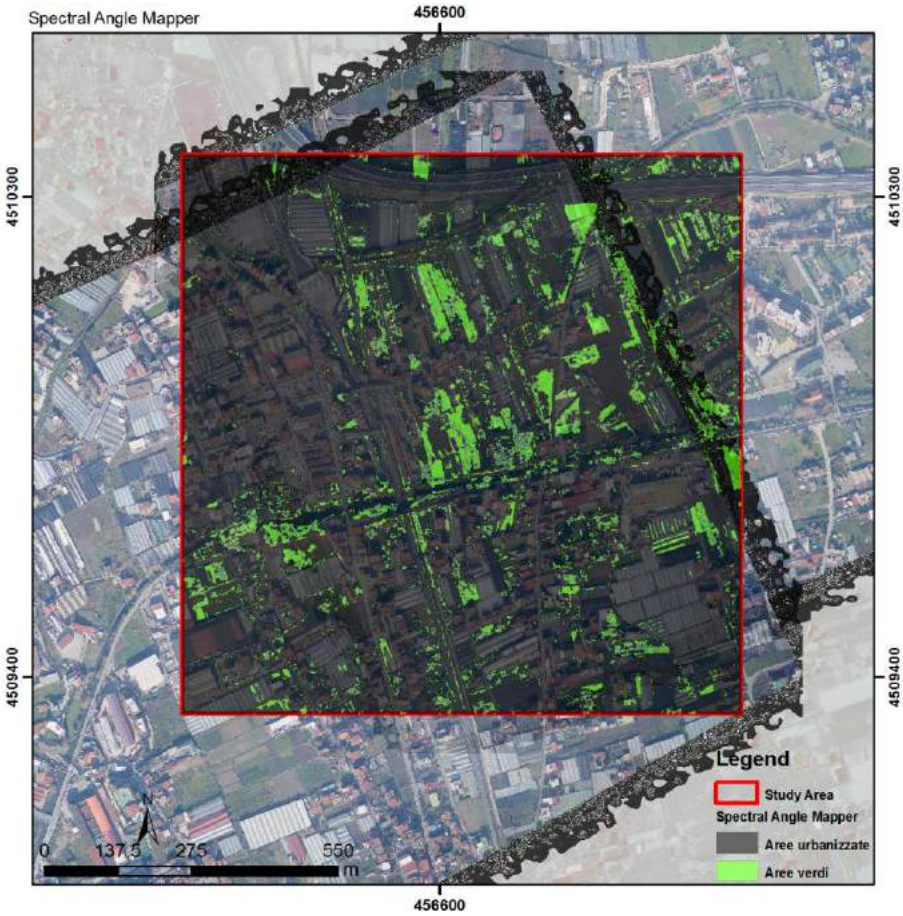
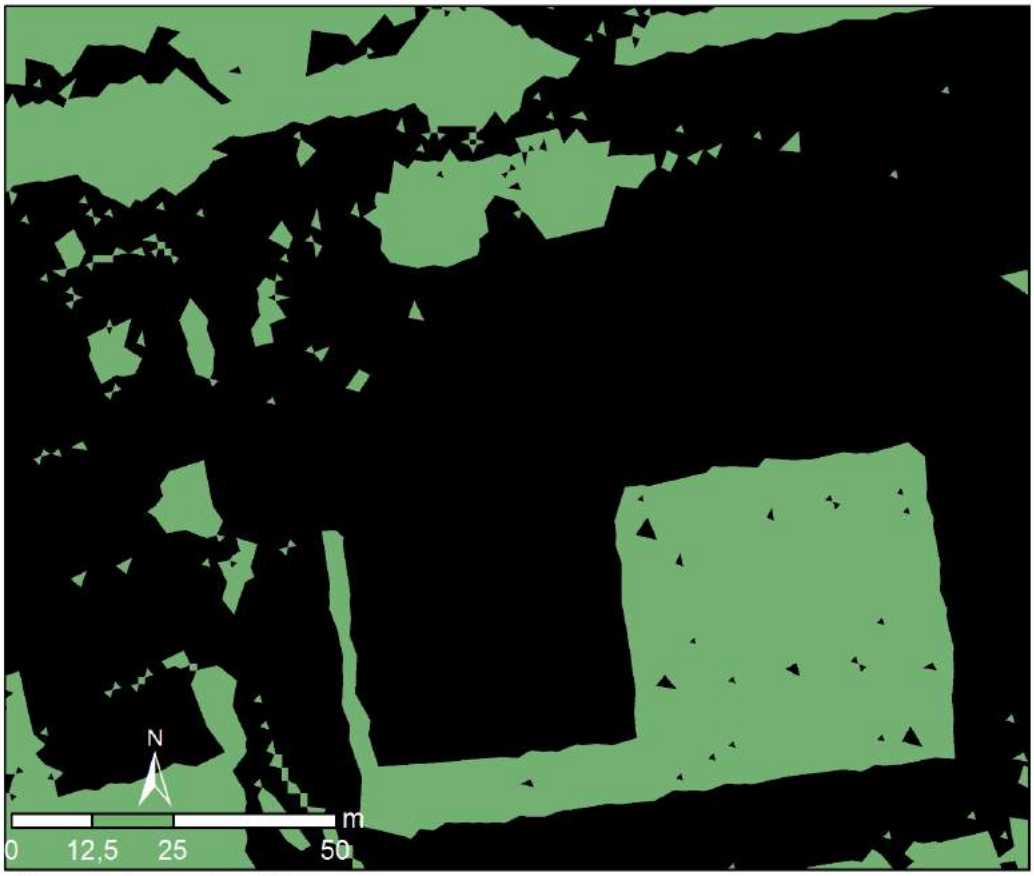


Fig. 6: Representation of Spectral Angle mapper algorithm.

Representation of polygon NDVI index



Representation of polygon SAM

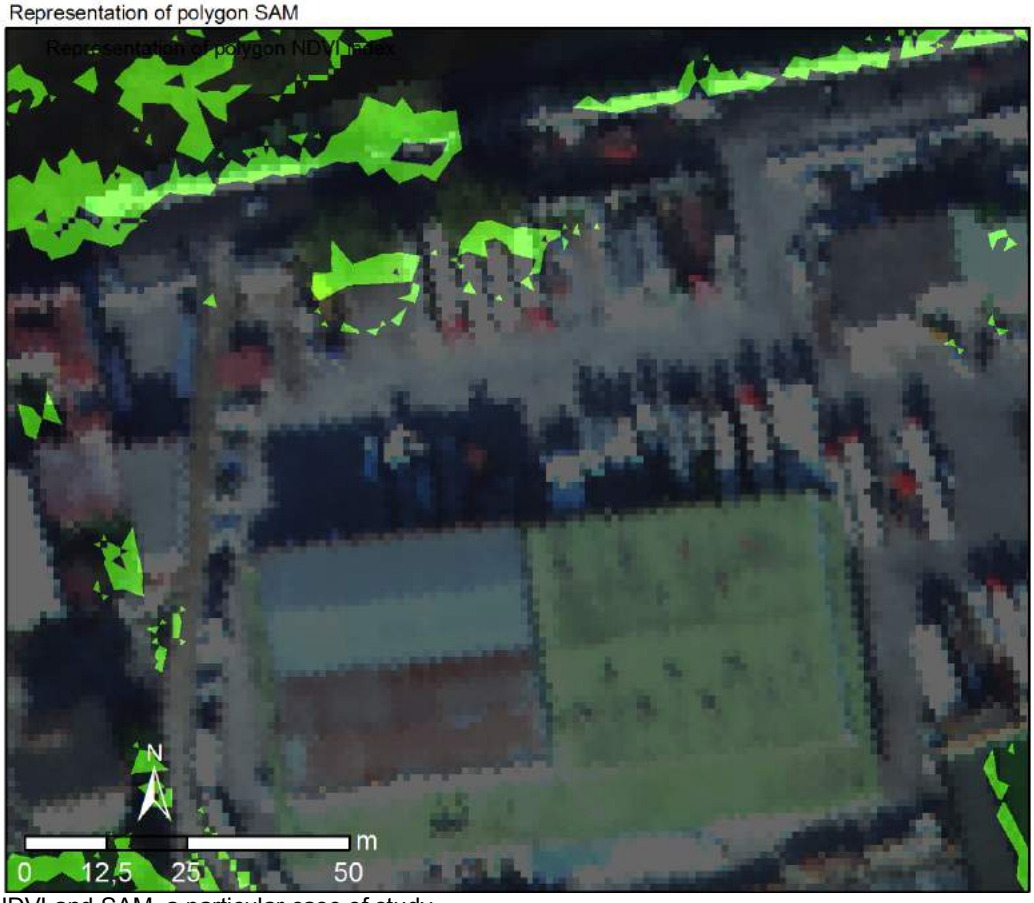


Fig. 7: NDVI and SAM, a particular case of study.

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The old Cardito's garden drawing remaining traces

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Abstract

Architectural survey is always the through for documentation and is set up as the first operation for an objective and indispensable knowledge. It is the instrument and the mean to investigate, understand and acquire forms and historical events knowledge directly from the surveyed object that becomes the itself principal document.
In this contribution, the survey aims to be an investigative tool for the Mezzogiorno rural settlements (South Italy) knowledge with little historical evidence. Specifically it was examined and surveyed in the Cardito town, in Naples province, the historical garden adjoining the castle, which today is profoundly changed and it is in a total abandonment state.
The research has moved to the building remaining traces surveying, restoring the historical configuration old garden and the restore road axis interrupted by the new buildings construction. The journey system that started in the current Garibaldi square, connected the main castle portal entrance to its courtyard, to the garden behind its and culminated in a ovate widening from which still extends another road axis called Belvedere street intersected by Vico del Giardino (Garden's street).

Keywords: Survey, drawing traces, historical garden, reconstruction

1. Mastrilli Palace and its historical garden

The twentieth century with intentionality and measure different has had a hostile attitude, or at least casual, towards the historical green areas considered each time as an obstacle to building expansion of the city, as a legacy of an anachronistic urban model, as inert and useless reserve space which prevented the satisfaction of the social needs considered more urgent.
Therefore, is during the last century that progressively disappear from the Neapolitan city gardens meant as "organic system" to the building connection, become isolated appearances and in many cases weakly protected [1].
This extinction or fragmentation of historical green areas involved specifically the city of Naples and its metropolitan area. In this paper, the research has moved to the historical reconstruction of the Cardito's garden analysis - known today as Mastrilli Palace - who owned an authentic and unique access system to the historical buildings of clearly Neapolitan derivation [2].
The garden is a privileged place of the artistic and intellectual design sense experimentation of every civilization. The theme of historic gardens conservation and restoration is complex, because in them the plant component is integrated with the architecture. Therefor, the survey is an essential element for knowledge aimed to their valorization [3].
The Mastrilli Palace construction can be placed between the fourteenth and sixteenth centuries, as reported in some documents of ownership transfers reported by Parente: King Ferdinand in 1479 gives Cardito to Iacobutio de Alexandro, who then sells this last in 1536 to his brother Cesare De Gennaro; in 1538 De Gennaro sells the Castle to Sigismondo de Loffredo that will remain in his property until the mid-nineteenth century [4].
Built along the Antica Belvedere street axis, in a parallel direction to the Roman centuriation track (Via G. Matteotti, fig. 1), in the past, he had a moat and crenellated towers, but over time has undergone

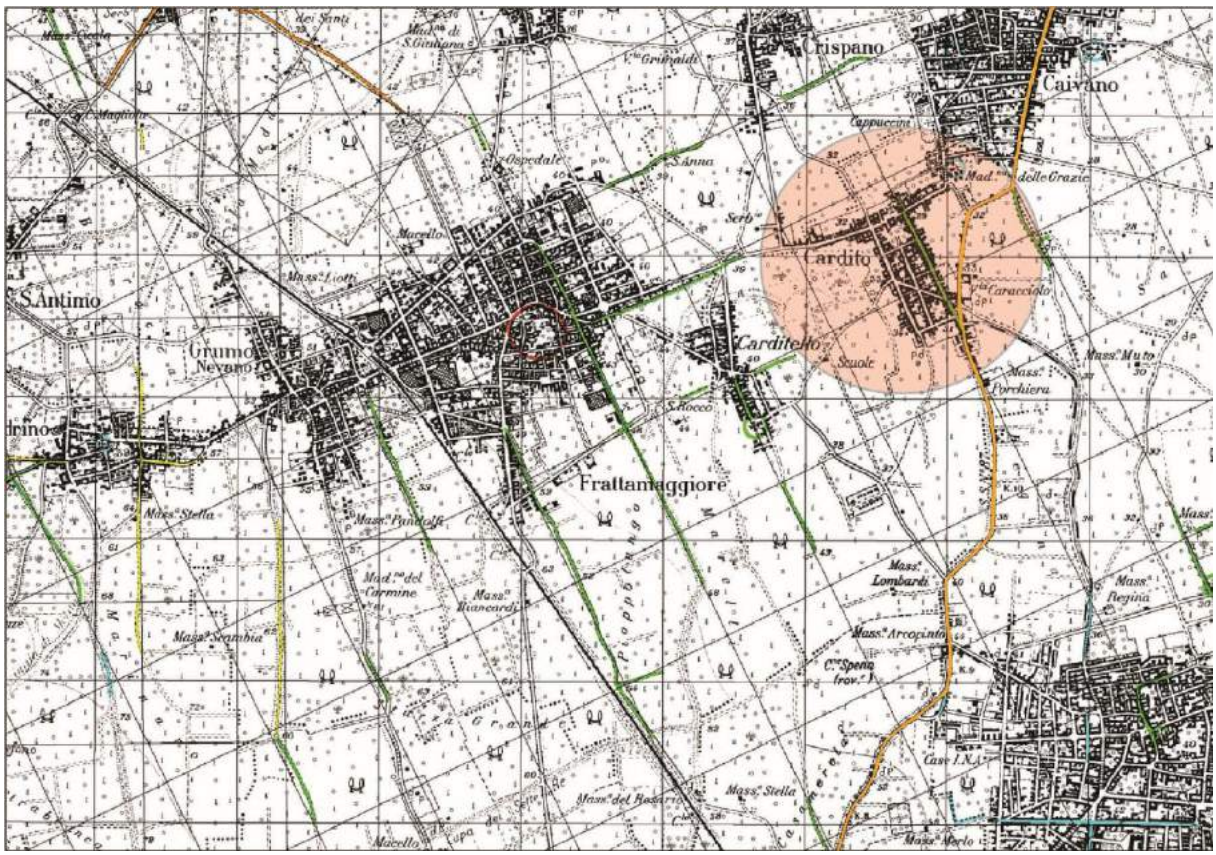

Fig. 1: IGM, Cardito territory with the Ager Campanus I and II, Acerrae-Atella I and Atella II centuriation tracks (Istituto di Studi Atellani, Rassegna storica dei Comuni).

profound changes ending to be adapted to civilian building. This castle took an interest even Luigi Napoleone III; but also it hosted Ferdinando II of Borbone, King of Naples.
It was an authentic museum for the paintings, canvases and ornaments that received. Among the paintings - an authentic Gallery - there were the most notable names, such as Tintoretto, Salvator Rosa, Palizzi; and what say about prestigious teacher Andrea Vaccaro and Luca Giordano, that in the castle had to stay long□ The Loffredo family, bought the Cardito feud with towered castle and well built, lived there until the beginning of 1700, when Prince Nicola Sigismondo moved to Naples.
The castle, in ‘600 century was really wonderful. In a hamlet of about 2000 people, dedicated to farming and the wine production, it represented the beautiful wonders place. It was surrounded by courtyard houses - all with garden behind - and this supports the hypothesis that in the past the green areas were projected elements more used, valued and protected (fig. 2). This is evident in the G.B. Pacichelli abbot description, which, by order of the king, after 1680, visited the entire Kingdom for cataloging all its beautiful and important parts, for making an inventory of the art works and for compile a report of the population conditions, structures, buildings and road network. The garden, which Giambattista Pacichelli abbot widely mentioned in the text "Del Regno di Napoli in prospettiva" [5] is decrypts as a magnificent artwork, of new manufacture, which it leads to the roman engineer perfection idea. Inside the garden there were statues and marble busts, sixteen fountains where the main of them was situated on the top center area with a large hollow and rich marble masks. Also the abbot remember the species of trees and flora richness. Below is reported the abbot text.
It is plain and open area, located in Aversa spiritual □urisdiction, productive of wheat and wine, among the sour li□uors of nature, with artifice gives to taste sweet □uice: rich principalit□ of the most Loffredo noble house, of which firstborns are Marchesi di Monteforte. Its streets in line form, hosted the copious population, with comfortable houses ad□usted in two □uarters, bright and cheerful: five miles from Naples [...] *In front of this church (St. Biagio) there is the noble Baron's Palace, with the entrance discovered along stretch road, the degrees of which, in the s□□ leading to two floor □uarters, divided b□ the principal room, in more rooms, balconies and arches, ennobled of rare paintings b□ e□cellent paint brushes, representing portraits. Sacred and profane stories, wood fables and flowers □o□es, some of immense size that the□ cannot pull out completel□* [...] *It has moats, prisons, factories, granar□, dovecote and service people rooms. But one thing that captivates province foreigners is the considerabl□ restored garden, which is reduced to perfection with the roman engineer idea and with considerable spending more custodians and creators. □e has the streets bac□ed b□ “mortella” trees*

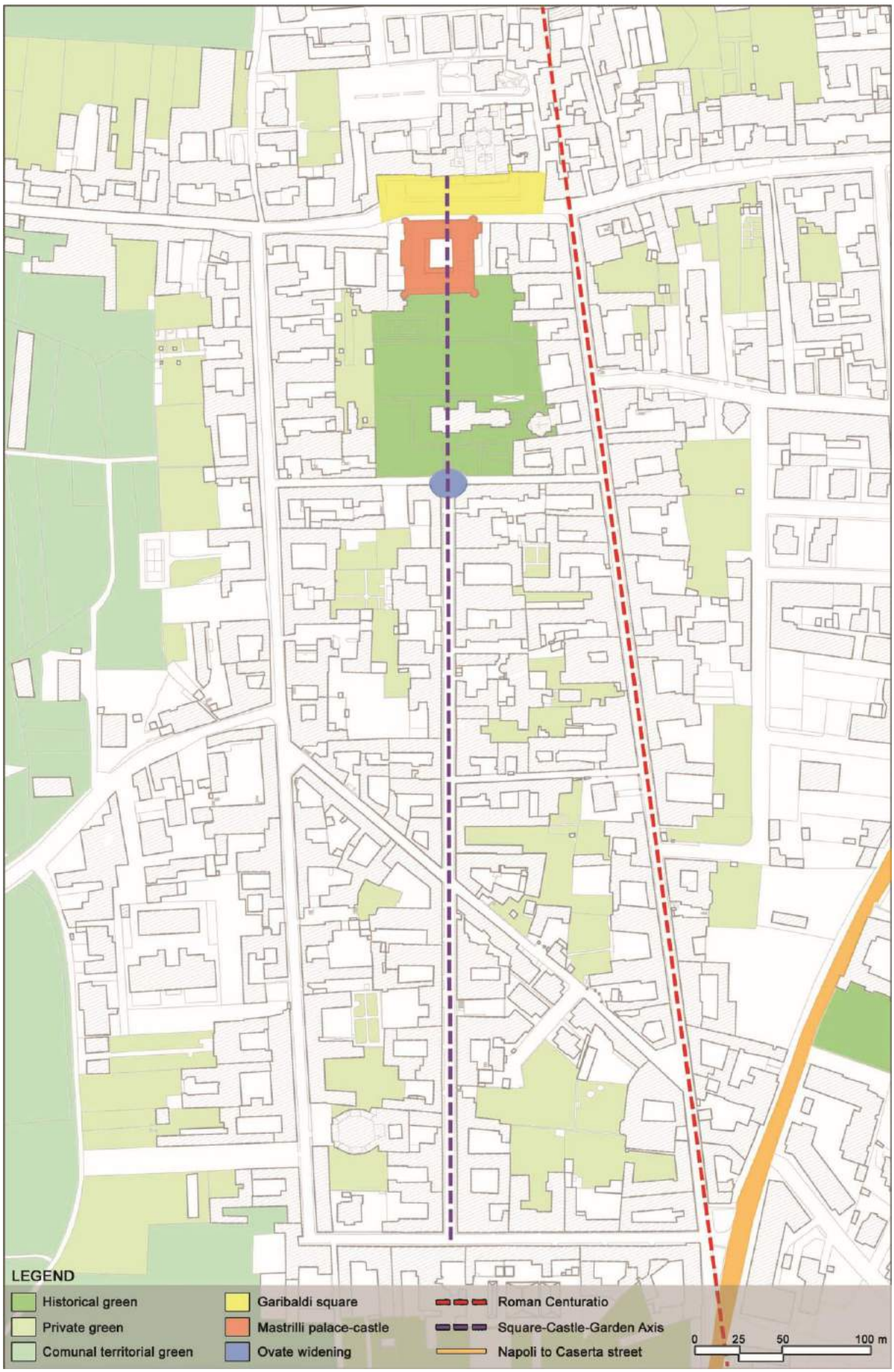

Fig. 2: Cardito territory with the green areas classification, architectures and streets axes.

Fig. 3: 1 G.B. Pacichelli abbot text in the “Del Regno di Napoli in prospettiva”; 2 moat castle and the Garibaldi square restoration project *(*Fusco Biagio: Il *Principe di Cardito Ludovico Venceslao Loffredo marchese di Monteforte)*.

that form recesses for statues and marble busts. It will give rise to si□teen fountains fed b□ reserve of more than two hundred barrels of water. The main fountain that □ou en□o□ from each side in a ver□ large hollow pla□s on the top area and ma□es □o□es with marble mas□s. It is adorned with a lot of anemones heads, buttercups, □asmines, and other flowers species: fill but wide lawn and curious beautiful tulips of ever□ color and size forming in the ground more the crests of Prince feats.
The ob□ect remains vague durable in a □nowledgealble boo□, that declares also the particular names: and in the time near to spring, with gracious welcome, we have seen all this and with various titled □nights we pleasantl□ observed with advantage Father Ferrari in his English Flora, where showed Mr. Nicholas Oudart. The□ will ta□e place, selected fruits, and more stronger, and □ou can meditate uni□ue delights throughout the □ingdom of best flavor (fig.3.1).
Nicola Maria Prince passed away in 1767: his son Ludovico liked to spend long periods in the castle, he called the palace his country house; in fact, in the period of greatest civic engagement, he often stood for several days, doing meetings and conference with his staff. From there he smoothly moved to reach, depending on the need, Naples or Caserta.
In the fifteenth century, in front of the castle, by the will of his ancestors, it was built the beautiful church of San Biagio and the Prince Ludovico, a fervent Catholic and practicing, wanted to give a tangible sign of his devotion.
In 1860 the castle was still surrounded on the sides and front by moat, which was filled only after 1866, when the province agency designed and built the road that connected the current Roma street with Madonna delle Grazie square, passing by the castle in the other side opposed to garden.
Attached there is a work plan which also shows the precise old drawing of the Garibaldi square. The memory of the wide moat was still alive in the early twentieth century, and older people, when they had to go in the current square, still used to say: "Jamme o fussat'a" (fig.3.2) [6].

2. The traces and sources survey as configurative analysis tool and historical-critical castle’s garden reconstruction

Architectural survey is always the through for documentation and is set up as the first operation for an objective and indispensable knowledge. It is the instrument and the mean to investigate, understand and acquire forms and historical events knowledge directly from the surveyed object that becomes the itself principal document.
The results analysis survey, the sixteenth century building was supposedly by square plan with an internal courtyard and garden, and it was accessible through an entrance hall disposed at the end of Old Belvedere street covered by a sail vault. So the castle main entrance was located on the south; the front garden was aligned with the Belvedere road which connected the old Cardito hamlet with the Naples city and not from the one currently used by Piazza Garibaldi.
In support of this theory is the evidence presence of the the ovate layout garden external wall - still exists – [7], in Belvedere street, that represents the entrance function to the castle from the garden (fig.4). The castle is halfway between Naples and Caserta. The Naples King, when was accompanied by court dignitaries, went to the Caserta royal palace, he sometimes stopped for resting. Royal and Court dignitaries visits, made it essential maintenance work to make the place worthy of such

receiving. The Prince Nicola Maria, in the sixties of the '700 century realized a complete restoration, giving dignity to the new structure, rather neglected in the past.
The opportunity to place the entrance to the new square and the Rock degradation state, may have been the reasons that led to 1761 extensive restructuring.
Mainly it was an extension, obtained by building a wall ring lining on all four sides on the existing building. Presumably in this period has been changed, with filling, the original guard walkway height. Probably even the wood's age-old trees and equipment with well-arranged space of the same, as well as the iron door of the old belvedere, everything was done by the Prince Nicola Loffredo general restoration plan, that arranged with enlightened mind, for really make beautiful this castle, which had been delight of the ancestors. With the restoration was defined the actual main facade, with a double portal to achieve a symmetrical configuration, with protruding cornices, a false 'stucco bugnato' basement and a series of seven windows on the main floor, which is marked in the corners by two large composite pilasters.
The corners was rounded to permit the two towers insert in north fecade that serve as view and then they stop at the first floor, joined to the ground with a particular bulge.
From current architectural system analysis you can show that in the sixteenth century there was definitely another floor in the bodies on the south and east of the building, as shown by the first floor sections: large and vaulted walls opposed to the west towers that present on the first floor a rustic wooden roof. Of course, that doesn't exclude that this building part has had an elevation on the top level. The corner towers bases are part of the old contruction system just as the discovered staircase in the northern front as the Pacichelli abbot shows.
In the mid-nineteenth century it was built the two battlemented towers elevation on the south elevation in neo-gothic style and the wall linings construction for the consolidation of the two front arches on the west side. Also during this period there was the west side staircase construction as part of the first floor functional distribution organization.
In the twentieth century the castle was severely damaged by the November 1980 earthquake and the others took place with its restoration. They were carried out very invasive consolidation work and devoid of any historical and aesthetic sensibility. It was removed the original pitched roof and was built a iron and brick floor at one meter and twenty more higher than the original floor.

Fig. 4: 1 Mastrilli castle-palace from Garibaldi square entrance; 2 view from courtyard to castle garden; 3 view from garden to castle courtyard; 4 actual garden's view.

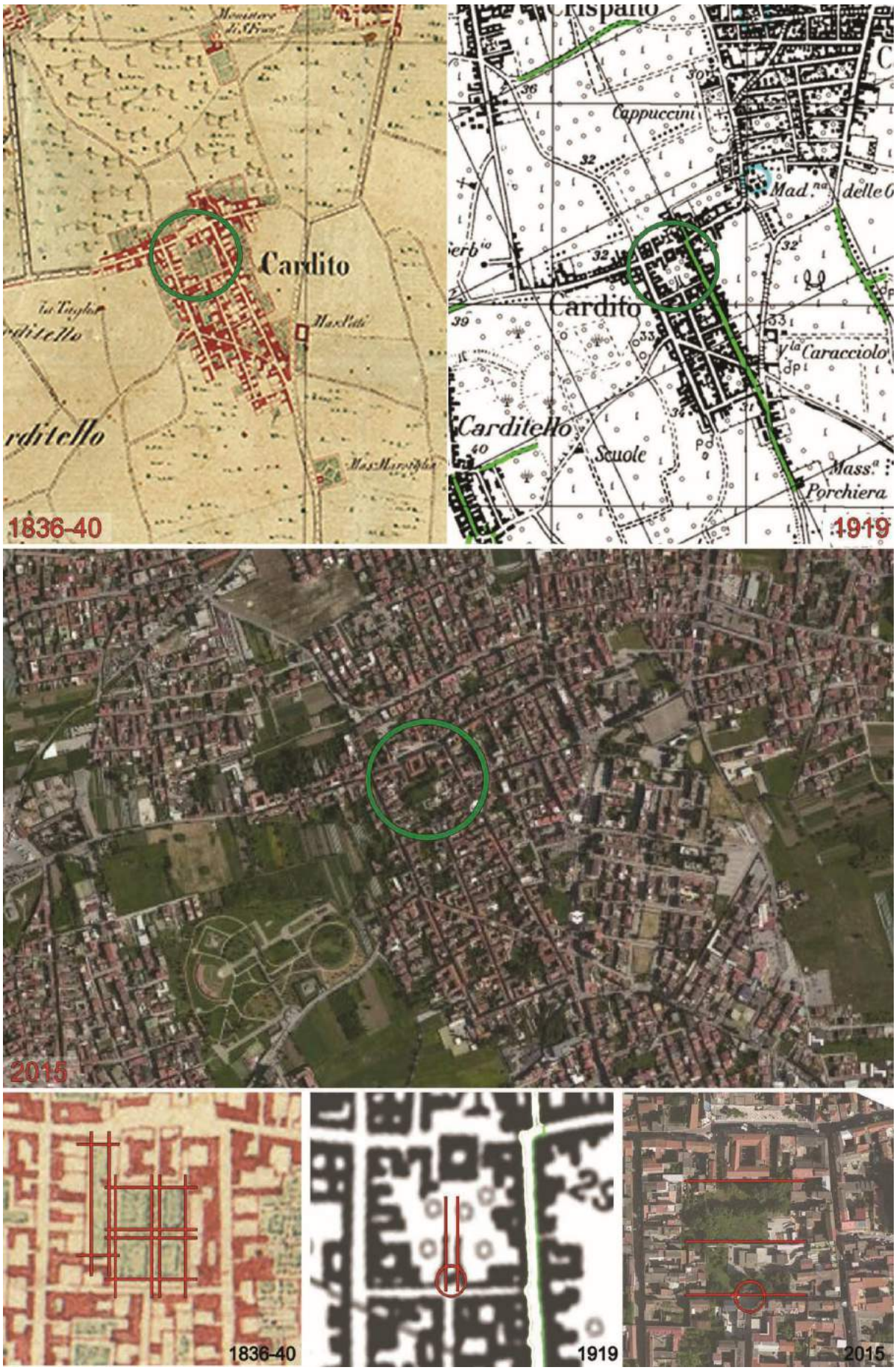

Fig. 5: Maps analysis which they were taken out all the garden traces and planimetric identification of the axes road that cross the garden (IGM 1836-40, IGM 1919, Bing Maps 2015).

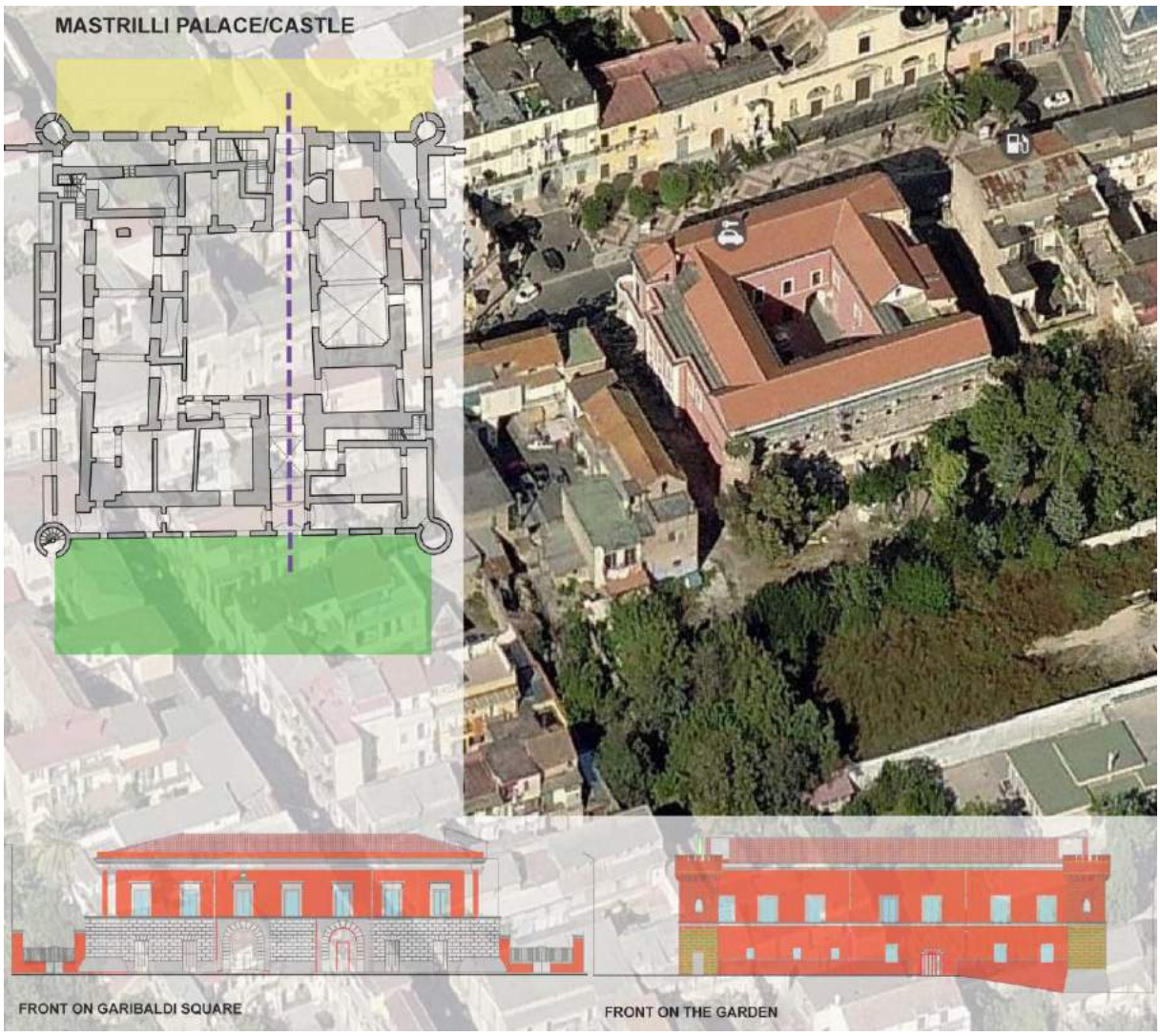

Fig. 6: Mastrilli castle-palace ground floor plant with the axis that cross the garden arrived to Garibaldi square; elevation fecade respectly in Garibaldi square and in the garden; image from Bing Maps.

The starting point for the identity construction of the Cardito historical garden's mapping was carried out through from the Military Geographical Institute maps survey. Specifically the maps that were analyzed were: the table of the 25 v series dating 1919, 184 I-NO (Aversa), and historical maps called "Disegni originali della carta dei dintorni di Napoli at the scale of 1: 20,000 performed in the topographic office of the former Kingdom of Naples in 1836 -40, Sheet 18, number 11.
The analysis of the iconographic sources started from the cartography of 1919. From this we see as is highlighted the ovate form of square which engages the street leading to the entrance of the building. Subsequently we proceeded with the 1836-40 cartography analysis, from which were extrapolated all traces, i.e. the identification of the size of green areas dating back to that time (fig. 5); the identification of the axes of the planimetric and the road that cross the garden, which crossed the castle and arrived at his back on the square (fig. 6). Probably this axis was extended beyond the square arriving to a further green area behind the church, creating a sort of prospective corridor consists of full and empty spaces, built and green spaces, public and private space [8].
Today, this prospective corridor is totally interrupted by the construction of the school in the '70 of the twentieth century, belonging to a female religious institute which by site inspection it was found the existence of the only trace of the old planimetric draw garden. This small portion was surveyed and later it was served as a model to the probable configuration and reconstruction of all the geometric garden layout. The reconstruction of this model surveyed obviously will be read in a purely geometric and indicative way, because it is a small portion survived from the negligence of modern speculation, and from the fragmentation of the buildings that have effectively split the garden into many and varied components each one become the 'private green zone' belonging to their palaces (fig. 7, fig.8).
Of course, the other traces can be further investigated in future in private green areas of the buildings with a new campaign of detection.

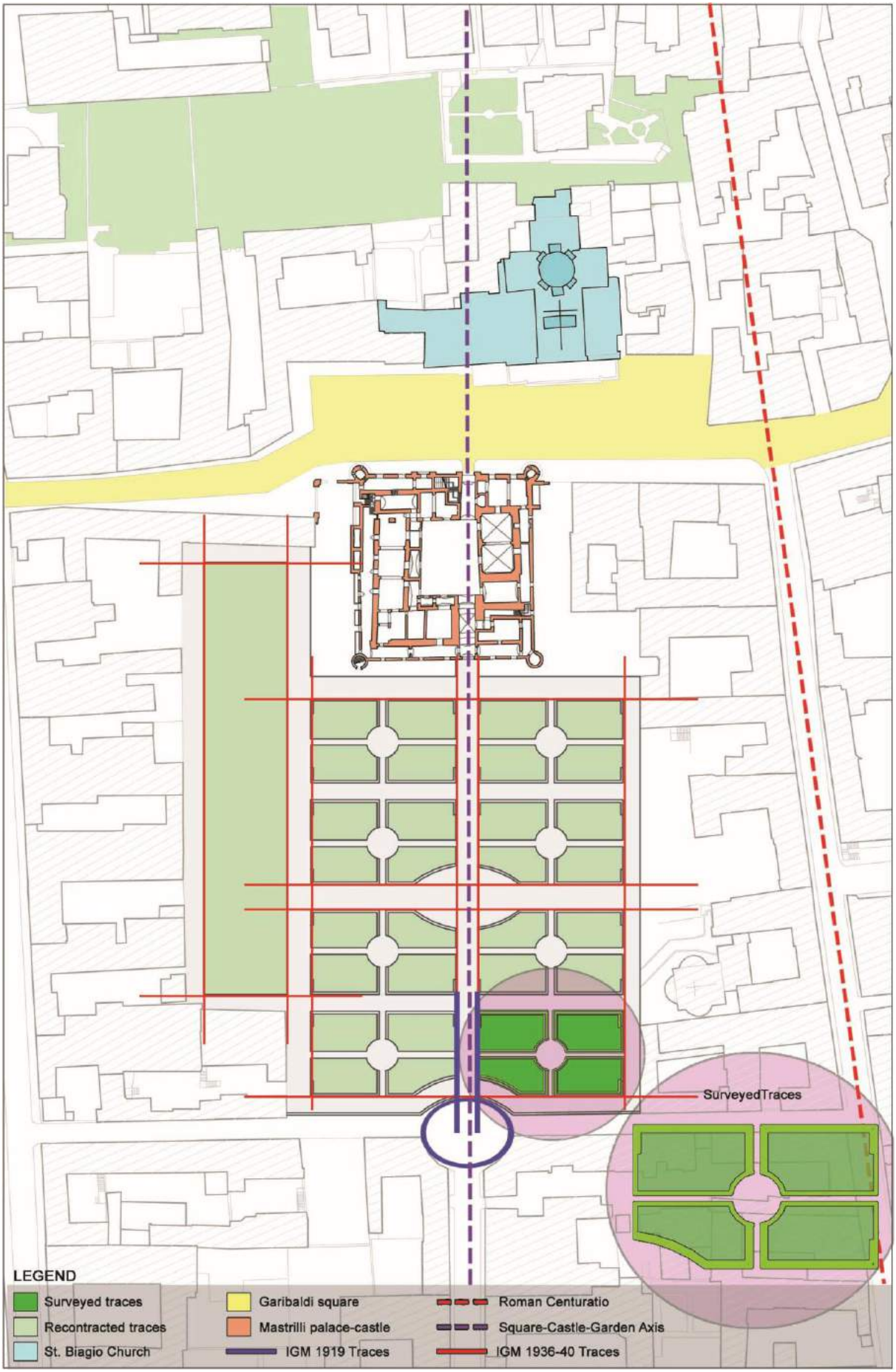

Fig. 7: 1 Garden reconstruction by the surveyed small portion in the female religious institute and the traces belonging to the IGM (Military Geographical Institute) maps.

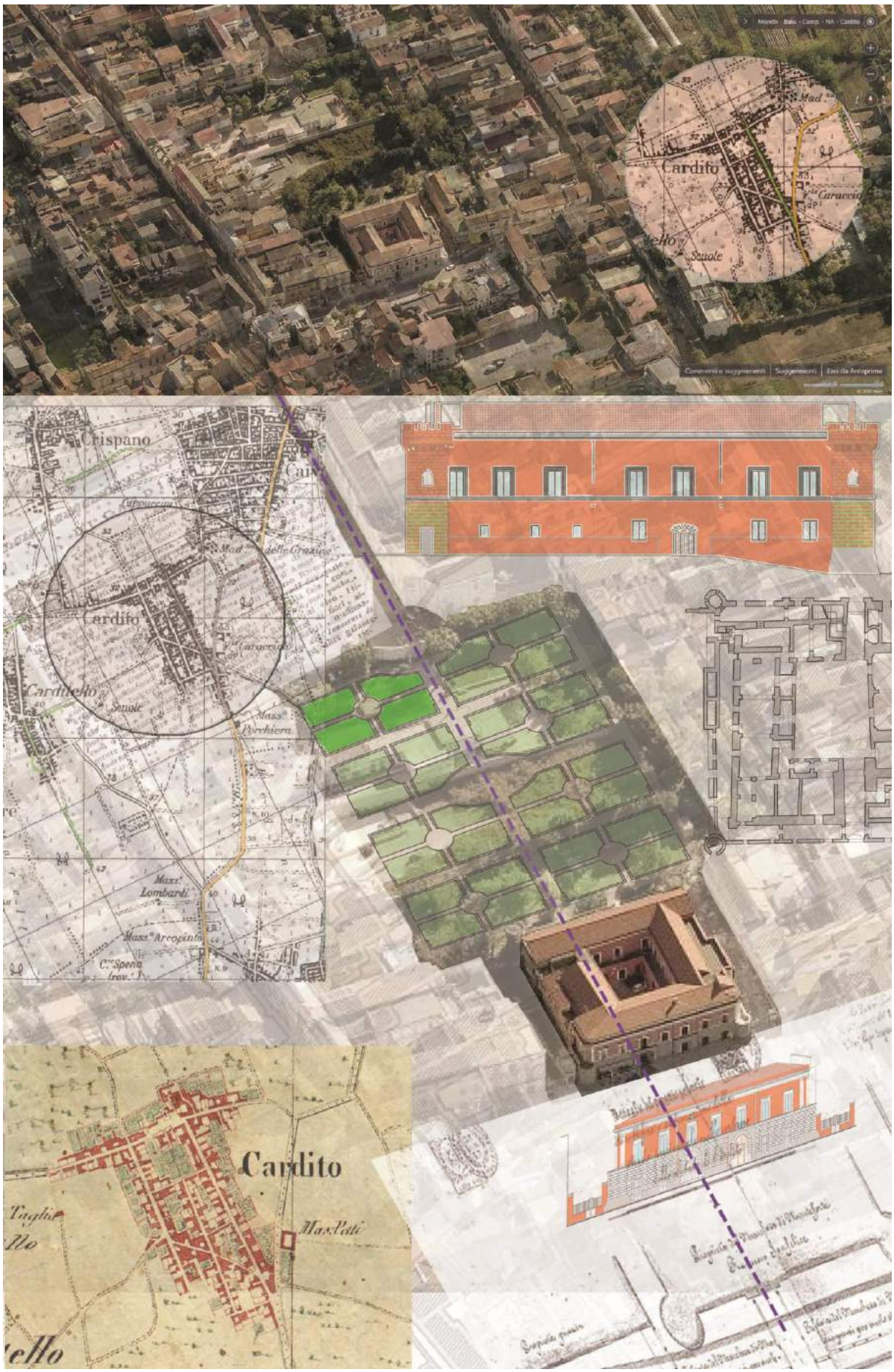

Fig. 8: Summary of the all surveyed traces of the Cardito's garden.

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Smart Design, Planning and Technologies
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Survey *multiscala* for the examine and architectural environmental representation of the area in the South of Naples.

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Abstract
This study concerns the project of analysis about the area in the South of Naples and is focused on the definition of multiscale geometry layer, essential for the planning of multidimensional research.
This method allows to investigate the reality from the territorial scale to the architectural object, regardless of its date, and is a plot of elements from different backgrounds. This plot is aimed at the realization of discrete models of reality in close relationship with the morphological complexity of the object investigated.
The breakdown of the territory in tangible and intangible parts and their respective measures are actions that, when combined together, allow the transition from an analog to a digital knowledge; each part of reality is enriched by the integration of different knowledge depending on the scientific skills upon which they have operated.
In this way, the reality is discrete, can be proposed in a new configuration as the integral of the knowledge that on it have been implemented. Specifically, the work lead to the establishment of a procedure for comparison and integration between the remote relief (data retrieval, processing of GIS platform) and direct (Scanning Laser), starting from the large-scale, the territorial, up to elements of architecture.

Keywords: Ancillary data, surveying, remote sensing, GIS.

1. Introduction L. ABATE, R. PARENTE

Integration of different techniques of remote sensing on the GIS platform are fundamental to study a wide range of issues related to the territory (large-scale) and also to the individual building (Small Scale). One of the aspects in which synergy story demonstrates efficacy is in the study of the use of soil characterization.
In order that a similar study is efficient, it is necessary the integration contemporary data with ones temporally previous, then support the multiscale analysis whit a multi-temporal study. [1] In order to do this operation, it is necessary the knowledge of different online database, open-source or not where it is possible to find reliable ancillary data as well as data regulated by government entity like Regions and Institutes, for example The National Geoportal, ArcGis, Revenue Agency, Institute Military geographic, DIVA-GIS, CERN Open data Portal, SINAnet-IPRA.

We used this methodology to analyze the area in the South of Naples, in which has been done a spatial-temporal analysis where different tools for different scale of representation have been used.
[…] *«Quest'azione conoscitiva si fonda sull'Ecogeometria, intesa come eco tecnologica della realtà, un modello in cui possibile misurare tutte le componenti e le relazioni materiali ed immateriali tra le parti, e restituire il territorio non pi come strumentale involucro da descrivere nelle sole matrici geometriche generatrici delle forme, ma come entità dinamica in continuo divenire* […] . [2]

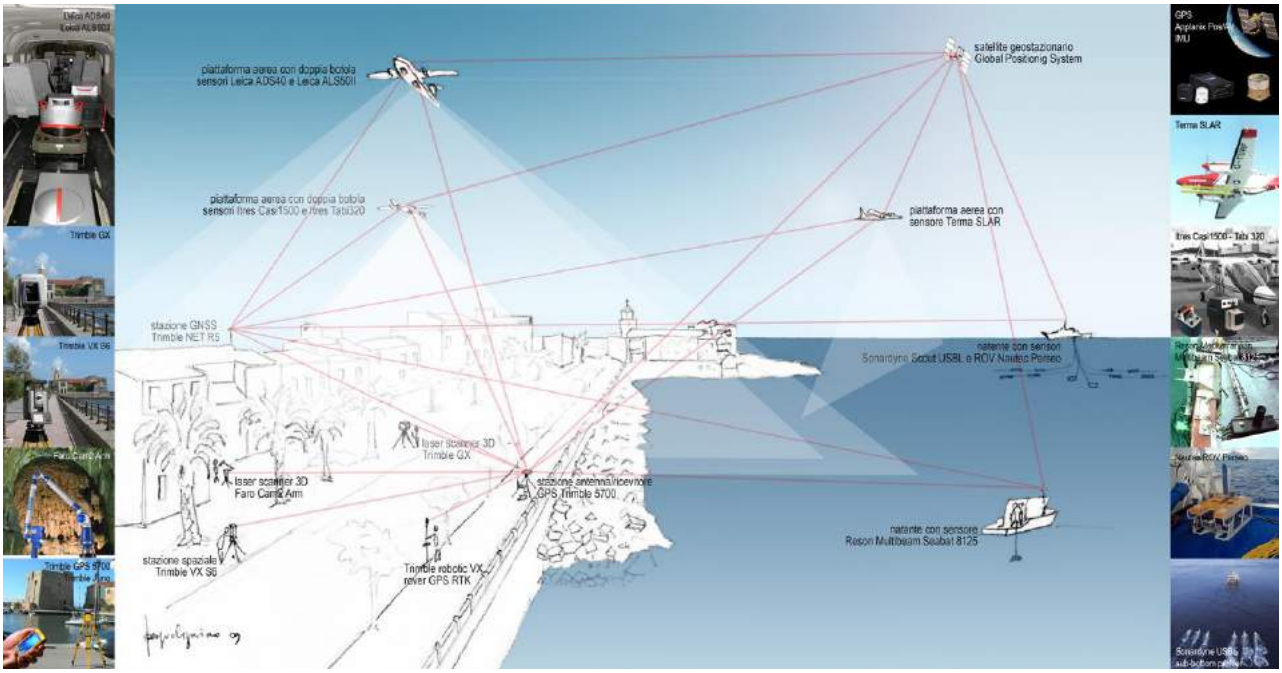

Fig. 1: P. Argenziano, *Itinerari di rilevamento digitale integrati multidimensionale nel Cilento*, in *Atlante del Cilento, Collana Rilievo o Progetto,* a cura di C. Gambardella, Edizioni Scientifiche Italiane, Napoli, 2009, p. 277.

Therefore the integral of competence comes from the integral knowledge, which is within the analysis multicriteri@, the integration of resources consist of the n scientific and technological tools skills, with the aim to combine ecology and economy in the context of cultural and environmental assets.
Detecting means 'measure' the territory for proper heritage management, break it down into n projectable size of corresponding layers that define it as a complex of cultural, artistic, environmental and landscape, in analogy to the person, to the country and constitute the set of chromosomes, from which each individual inherits a part from their ancestors. The transition, then, from an analog to a digital knowledge is possible through the use of increasingly computer science that increasing the tool box of the detector / renderer with increasingly innovative technologies, replacing almost complete analog ones *…Essa contiene strumenti che traducono le regole della geometria riomologandole al tempo* [...] . [2]
The growing evolution of relevant techniques and 3D modeling based on sensors, and development of ever more high-performance systems for the display of digital data highlight the value added by the use of these methods in the cultural heritage context. In particular it appears evident the active contribution that these technologies can provide in the interpretative stepo, for the preservation and data archiving, greatly helping to increase the level of preservation of cultural heritage through tools that help the tutelage of cultural heritage.
The opportunity to analyze an object as a whole, both from the point of view of the Earth that aerial view, is a widespread problem in the architectural and territorial surveys, because this operation allows to investigate the objects in a more detailed and comprehensive mode, helping the phase of knowledge and monitoring of the same. Today, innovative technologies based on multi-sensor platforms make this goal achievable thanks to the ability to acquire land and aerial data compatible with each other allowing an easier understanding and integration.
The study and the analysis, object of this paper, regards an area in the South of Naples and has highlighted the added value given by the use of methods in Architectural, Archaeological and Cultural Heritage fields.

It is evident the contribution that these technologies can provide in the interpretative step, in the preservation and archiving of data and the enhancement of the cultural heritage.
The interest on the various techniques and digital survey methodologies and modeling three-dimensional It resulted from the increasing demand, from their increasing use and from need to use forms of digital recording and archiving at different levels of scale and resolution. Obviously the use of these tools fits for a well-codified knowledge process, in which particular attention should be given in the stage of integration among the traditional methods and innovative ones.
Specifically,this procedure is done by integrating different technological platforms for the different scales of representation , starting from the territory until to reach the architectural product .
This activity has involved traditional and innovative systems for the survey and the natural and built environment representation.

1.2 Satellite survey L. ABATE

The disciplines of survey have honed over time the technical acquisition data in step with technological development from simple methodologies based on direct survey to those derived from descriptive geometry. The recently introduced technologies allow detect and represent three-dimensional objects with remarkable accuracy ranging from territorial scale and related sciences such as morphology, hydrology, urban planning, landscape etc., going to the architectural detail how structural systems, decorative elements, equipment textural etc . , until arrive to a complex discipline that concerns archeology. The territory of the investigation takes place in relation to the beforehand explained, through the Remote Sensing with sensors on aerial or satellite platform in the visible range , thermal , multispectral and hyperspectral , depending on the sensitivity of the segment with respect to the electromagnetic spectrum. Remote sensing did great progress by providing excellent resolutions and data increasingly capable of detailed classifications. The basic principle is related to the concept of solar radiation, infact every body reflects, absorbs or transmits depending on its wavelength characteristics, allowing, therefore, to define its spectral signature or the mark that distinguishes it unequivocally.

Fig. 2: Satellite survey: navigation (Galileo, GPS), territorial (Sentinel family) and urban system (Pleiades).

In recent years, both nationally and internationally area, the satellite surveying has quickly expanded and increased. In previous decades dedicate a GPS tool for a purpose that was not the military was a utopian thinking, but today we see applied daily for technical purposes this type of instrumentation, thus giving a new location to remote sensing. The technological evolution combined application for civil use has gradually identified a lane of more versatile use, in fact, this technology has rightly adapted to its new use, thus providing lighter files, increasing the autonomy of the sensors and of capacity registration data, thus changing also the market, which has adapted to the competition by creating the models, always high quality but still lower than the previous. Therefore the evolution of instruments It went in parallel with the survey techniques. The geodetic applications of constellation GALILEO, GLONASS and GPS, saw a sudden coaching the static survey and a post- processing at the survey in real time. We saw the birth of permanent stations, that has been initially identified only as " the basis of a rover " ," then joined at the technical " in real time with the network approach " , identifiable, in the widest possible sense of the term , with the acronym NRTK.[3] As it is known, the ellipsoidal height is attributed to the antenna phase center of the receiver, so as to reduce the stake to the reference elevation of the station point. To do this, it is necessary measure the instrument height with the technique described in the manual of each instrument. In fact, each manufacturer has its own measurement configuration of GPS devices. The choice of the reference elevation, should exhibit stability and uniquely identifiable. In the reality of the geodetic model, you use a procedure to switch from shares to those geodetic ellipsoidal.[3] □□ 1) the entire area affected by the GPS survey should be considered divided into contiguous triangles many of whose leaders were determined geoidal shares and ellipsoidal shares offset h (IGM vertices of I, II and III order and placed top one every 10000 ha); 2) in each of the triangles referred to in the previous point , the falling points of the GPS survey of which , of course , they know only the ellipsoidal units compensated; 3) for each of the triangles in question , calling with Ni □ Hi - hi the difference between the geoid and ellipsoidal portion in a generic point , consider the fictitious plane of arrangement of a plane passing through the three points considered and having in each of them the difference Ni it deserves. It will for each dummy on knowledge of three differences of the type Ni units. To arise for each of the fictitious plans two fundamental cases : A) the gap between the maximum and the minimum difference of the three N, no more than 5 cm ; in this case it is sufficient that the proportion ellipsoidal h of any falling within the triangle vertex is correct algebraically of a quantity Nm , the arithmetic average of the three N concerned , to obtain the relative geoid height H; B) the gap between the maximum and the minimum difference of the three N exceeds 5 cm ; in this case with an interpolation procedure for each inside corner you have to determine the difference N competing at this summit and consequently make its algebraic correction to its ellipsoidal h fee to obtain the geoid H". [4] As above said , the permanent station is now a reality that is used in different fields , this technology allows through satellite, the georeferencing of the territories and of artifacts , thus obtaining both the accuracy of the analytical data , which control of the object under investigation in the time, thus creating a database of information.

1.2 Aerial remote sensing □R. PARENTE□

The survey by aerial platform is between the satellite and terrestrial one, as a fundamental transition from a very large scale to one with a higher degree of detail. It is among the remote sensing techniques because it represents a methodology of investigation able to determine, at a distance, the behavior of the investigated surfaces, using as carrier of information the electromagnetic radiation. Born for war purposes, today the aerial survey is widely used in earth science, environmental investigations, in the historical and archaeological studies and more activities. This type of survey uses the latest digital technologies that have gradually replaced analog ones and gives useful elements for the analysis of the territory according to different interpretations. It is related to the type of instrumentation used on the airplane; there are different types of sensors: photographic cameras that recall the ancient techniques of aerial photography until recently developed sensors such as hyperspectral and thermal. The possibility, moreover, to simultaneously have these sensors amplifies the ability of the detector which is able to operate with a wide range of data and to direct the relevant activities according to the focus to be pursued. The multi/hyperspectral data will in fact be used for various operational scenarios: precision agriculture, perimeter building modification, localization and monitoring of landfills, monitoring of mining areas, locating illicit crops, monitoring networks and infrastructure, perimeter flooded areas. The integration with also thermal ones allows, as part of the building heritage, the evaluation of heat loss and the search for land and marine rescue. In recent years, the photogrammetric technique has had a growing number of applications. With the rise of digitization, which introduced photogrammetric scanners and digital photogrammetric stations, the ability to reconstruct spatially objects without physical contact with them, through the acquisition of metric and thematic data from aircraft frames, it has advantaged of a majority speed, reliability and

cheapness. The technique of photogrammetry is used in various areas: in the past, especially at the origins, it was mainly used in military field and in the preparation of maps, but now the areas in which it is used are varied, from architecture to engineering, from geology to archeology, use for police operations to cinematography. However, the main use of photogrammetry consists in the production of topographic maps, both in the form of topographic cards both in the form of orthophotomaps. To realize a photogrammetric survey of a territory is necessary that an airplane appropriately equipped get up in the air to fly over the area in question; during the flight, using a photographic camera placed at the bottom of the fuselage, it resumes overflown surface and attach it in the frames that were taken in succession at predetermined intervals. The result is a series of photographs that can be defined as the representation of an actually obtained by the interaction of radiant energy with the sensors. The electromagnetic radiation are at the base of remote sensing; the sun is the main source. By the mechanisms of interaction between radiation and objects it is possible to understand the nature and state of the earth's surface. The continuous set of radiation, ordered in accordance with the wavelength or the frequency constitutes the electromagnetic spectrum. The human eye is sensitive only to a small part of the spectrum, the so-called window of visible that extends from about 0.4 to 0.7 microns and corresponds to the rainbow. The visible contains all colors that we can perceive.

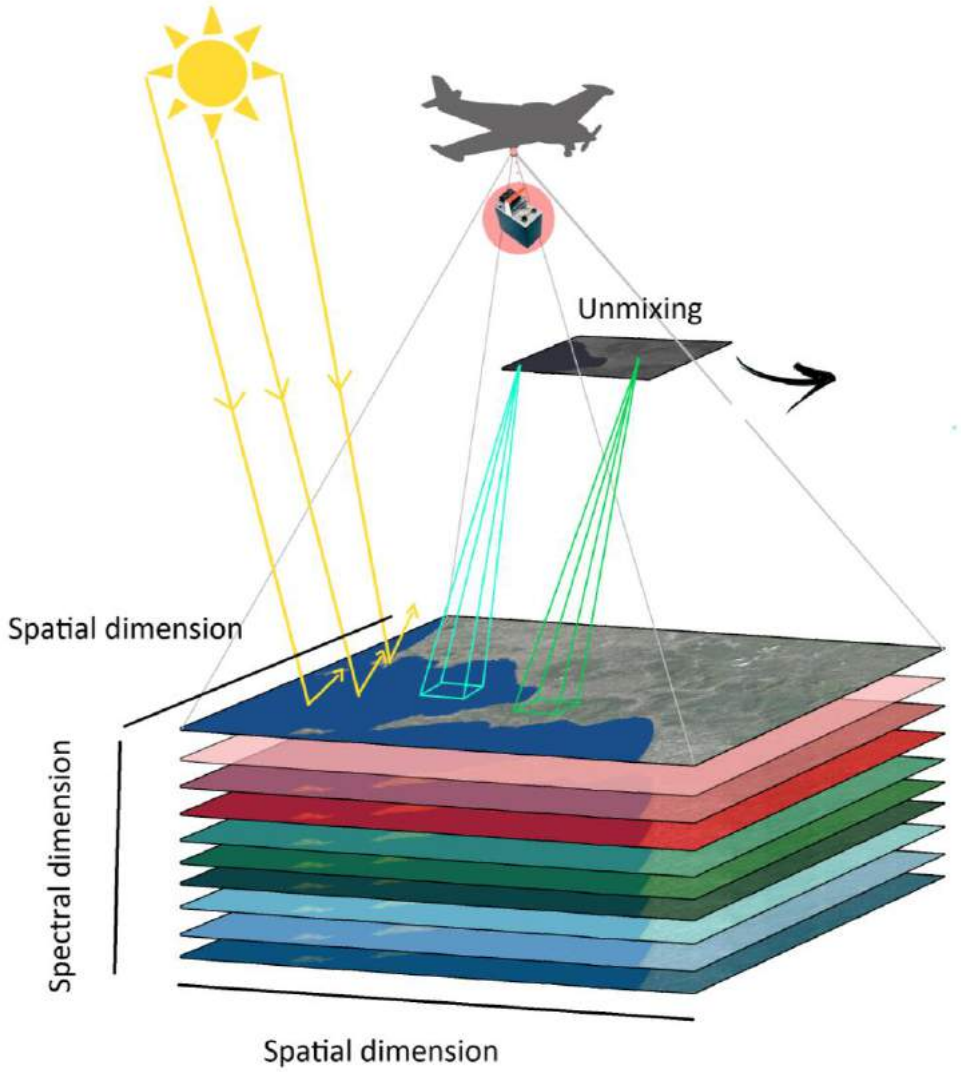

Fig. 3: Methodological workflow (a): from registration data to their processing in the multi-layer models, each layer corresponds to a wavelength synthesized in each pixel.

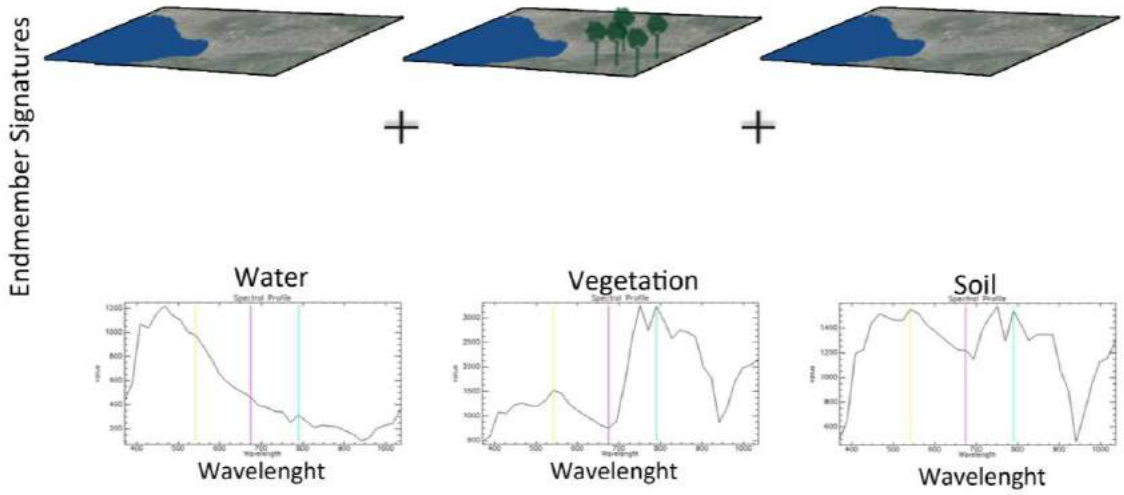

Fig. 4: Methodological workflow (b): the representation of individual electromagnetic spectrum.

1.3 Laser Scanner survey R. PARENTE

As regards the architectural survey, increased expectations have been directed to three-dimensional laser scan techniques; it is a system able to operate in a systematic way in acquisition speed (you get to thousands of points at second) and in the possibility to directly access the data in real time. The ability to detect with remarkable accuracy very complex geometries allows the thorough study of the constructive techniques, allowing the perception and analysis of geometrical details difficult to detect by traditional techniques. A three-dimensional representation leads to a complete and more intuitive perception of space. From a purely telemetry view, the same 3D laser scanner survey is an example of integration of information since in restoring the data phase are taken into account the measurements obtained through the integrated application of different sensors: inclinometer, compass, a photographic camera RGB values and laser sensor with range and scan settings (quality and resolution) variable depending on the specific nature of the instrument used. The numerical metric information gathered in Pompeii through GPS / GNSS technology, 3D laser scanner, photogrammetric method, concerned some of the most important archeological sites in the world. The opportunity to acquire information on the geometry of areas or a specific object, accurately, fast and non-invasive, is what characterized the survey of these artefacts. The integration and fusion of data acquired through these multi-sensor technology has made possible the design of comprehensive three-dimensional models and multiscale, which lets you study the same object is from the earth's position that air.

1.3 Finding Ancillary data L. ABATE

In research carried out for the integration of different survey techniques, eventually, but not least in importance, is the retrieval of ancillary data. Step needed for the construction of a database that allows to investigate a territory or a single building. The ancillary data present to knowledge, must be found before any form of processing, these are needed to realize the identity of the object to be investigated. To build a database identifier must find digital models of detail as DEM (digital elevation models), orthophotos, raster images, vector data, high-resolution frames. These elements represent a critical step for the interpretation of information gathered or to detect. The choice of the online database is not a simple thing, since often incurred when data they licensed and / or regulated, this step has the purpose of directing the correct consultation both for novice users and for those experts. To facilitate this should be known safe sites where to find updated data, open source and can be downloaded in real time. For so they were identified on-line database that are open-source where to find reliable ancillary data, as well as physical data regulated by government bodies such as boards, Regions and institutes, such as the National Geoportal, ArcGis, Revenue Agency, Geographical Institute military, DIVA - GIS, pktools, Geospatial Data Abstraction Library (GDAL), Orfeo ToolBox, SPDlib, CERN Open Data Portal, SINAnet - IPRA .

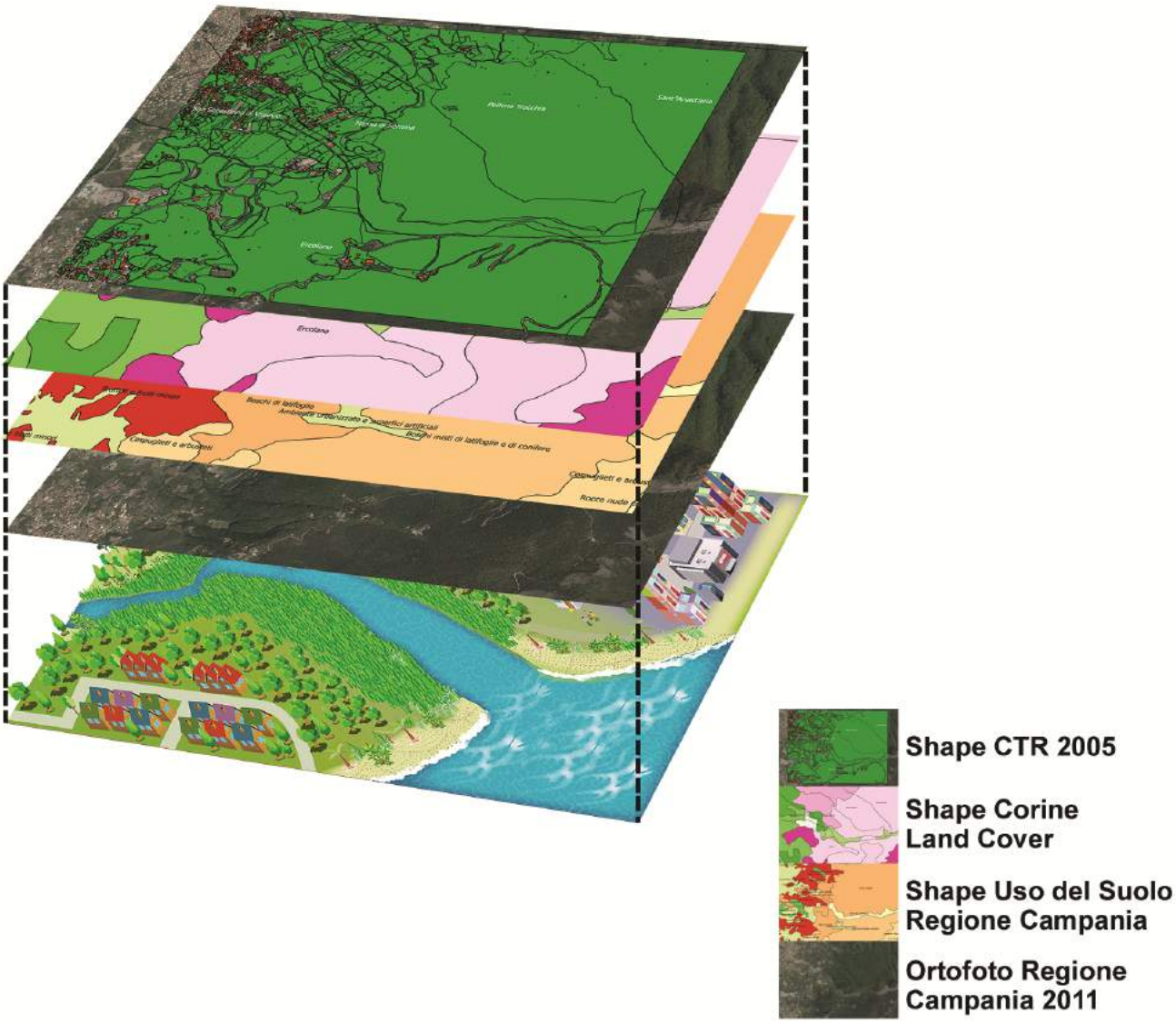

Fig. 4: Different layers of ancillary data in GIS system.

The proper organization and data processing can take place on an open-source platform as QGis.The Gis platform " Geographic Information System " is a platform that allows the integrated collection of software and data used to view and manage information about geographic places , analyze spatial relationships , and model spatial processes . A GIS provides a framework for gathering and organizing spatial data and related information, so that they can be queried and can be implemented over time. The first step to know an area is watched in its entirety, to know the relationship between the parties and the parties to communicate with the whole. In a complex reality such as the area defined F3 it is necessary for the correct reading of the territory, use of planning tools and the same government such as the CTR, PRG, PTR, thematic maps, Corine Land Cover, updated orthophotos and DEMs. The use of tools at different scale is very important, such as the paper land use which intervenes at a regional scale intersected with the Charter Corine Land Cover instead intervenes in European scales. The project Corine Land Cover (CLC) was born in 1990 as an instrument at European level, specifically for the detection and monitoring of hedging characteristics and use of the territory, with particular attention to the needs of environmental protection, which in 2000 saw the accession of 33 countries including Italy. The National Authority for the management of the project has been identified nell'APAT today ISPRA, as the national focal point of the European network EIOnet.These tools have the task of directing the correct method to go for knowledge, discretization, preservation, theming and future development of the area. Unfortunately their non- sudden update, turns what should be a relief to the analysis , a slowdown , therefore it was concluded that to make up for these deficiencies , we must let cross the different tools at our disposal by the public authorities , in so that each document go to make up the deficiencies of the other. The aim is understood that through a GIS platform is possible to intersect the ancillary data made available by the institutions and regions, they have on-line database that can be accessed to retrieve useful data to the structuring of the GIS project act analysis of a territory.

1.4 Conclusion

The paper was an opportunity to compare the different methods to study an area from the large -scale to architectural one. The goal was to compare the advantages of the survey as an analytical method from that satellite, the aerial remote sensing until architectural one. The integration of data from these different surveys lends itself to comparison with those available online. The opportunity to have a GIS platform to handle all the information about the study area is the best strategy for the proper management of the investigated areas, particularly for those of an important historical and artistic interest as the area south of Naples.

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Roman ancient Appia road in Irpinia Region: a cultural and structural heritage to be safeguarded

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Abstract
The paper allows to analyze the roman ancient Appia road. In particular it aims a knowledge analysis of the structural and cultural constructions existing on the Irpinia Region. The bridges who insist on this area are morphological and structurally different. They were built using different morphology and different construction techniques. The ancient road is very interesting culturally because it is historical memory of roman work. Despite the historical and environmental importance, in largely, the existing bridges are in a precarious safety and maintenance state. This for human carelessness and elapsed time reasons. The road is no longer used. The creation of a tourist route that enhances these Irpinia's strengths and carry the light the historical engineering Roman period opera is important action. The bridges will be described in this paper will in a later research work the creation of their B.I.M. models. To know the reasons that led the Romans to build these structures like strategic points it is important point based on a careful knowledge process. Given the importance of road stretch, the Club for UNESCO in Avellino is studying the likely proposal to candidate it for world heritage of humanity. To possess the Roman engineering is a privilege for the Irpinia Region. In this paper will analyze the structures like bridges that will be the base on which to work for future research program on Building Information Modeling and the structural analysis of bridges.

Keywords: Bridges, Roman structures, cultural heritage, safeguard

1. Introduction
The paper allows to analyze the roman ancient Appia road. In particular it aims a knowledge analysis of the structural and cultural constructions existing on the Irpinia Region. The bridges who insist on this area are morphological and structurally different. They were built using different morphology and different construction techniques. The ancient road is very interesting culturally because it is historical memory of roman work. Despite the historical and environmental importance, in largely, the existing bridges are in a precarious safety and maintenance state. This for human carelessness and elapsed time reasons. The road is no longer used. The creation of a tourist route that enhances these Irpinia's strengths and carry the light the historical engineering Roman period opera is important action. The bridges will be described in this paper will in a later research work the creation of their B.I.M. models. To know the reasons that led the Romans to build these structures like strategic points it is important point based on a careful knowledge process. Given the importance of road stretch, the Club for UNESCO in Avellino is studying the likely proposal to candidate it for world heritage of humanity. To possess the Roman engineering is a privilege for the Irpinia Region. In this paper will analyze the structures like bridges that will be the base on which to work for future research program on Building Information Modeling and the structural analysis of bridges.
The paper will make an excursus into the Irpinia stretch of the Appian road, trying to give an answer to the questions born during local knowledge in seismic areas.
The structures are born on land classified as being high seismic risk and therefore they are subject to decay as well as by age and lack of maintenance (virtually abandoned), also weatherability and seismic action under catastrophic event.

In this case it is difficult to assess the chances to prevent their ultimate demise in the earthquake, but with appropriate structural analysis it can virtually creates future loss scenarios and entire Roman structure behavior under vertical loads, earthquake, wind action etc ..

2. Roman ancient Appia road

The Via Appia constructed by the Censor Appius Claudius Coecus, in the year of Rome 441 led from Rome to Brundusium. It has been successively repaired by Augustus, Vespasian, Domitian, Nerva, Trajan, Antonius Pius, Valens and Pius VI.[1].

This road is the “spine” of all southern Italy and it reflects the design strategy of the ancient Romans.

The bridges illustrated in this paper concern the region Hirpinia. This stretch is witness to the war between Roman and Sunnis (343 ed il 290 a.C.). At the end of the first two fights, Appio Claudio Blind builds (traditionally from 312 BC) the first stretch of the road that his name will be called and Appia linking Rome to Capua. The battles between Romans and Sunnis continue and the road suddenly begins to deviate in the mountains that had benefited the Sunnis in the fighting. Rome continues its long-term strategic outflanking maneuver and encirclement of the Sunni territory, aiming to isolate it from contact with neighboring populations and potential allies. The street was created to make easily accessible territory despite the difficult topography [2]. After fifty peace years, Hannibal invaded the southern Italy. After the Cannae victory (216 BC), the passage of Hirpini and Caudini the side of Carthaginians, while the other Samnites remain loyal to Rome. To victory over Hannibal follows retaliation against Hirpinia. Again control of the territory is perfected through the extension of the Via Appia was built probably around 190 BC, the stretch from Beneventum to Venusia. At the beginning of the Christian era, the great Appian Way was created and it connected Rome with Brindisi.

Strabo describes two ways:

"Two roads lead to Rome: one that you can only go by mule across the country of Peucezi, Dauni, Samnites to Benevento, on which lie the city of Egnatia, Caelia, Canusium and Herdoniae; the other passing through Taranto, clipping a bit 'to the left and increasing the distance of about one day, which is called Appia and is more suitable for carriages to pass. On this street are located the city of Uria (between Brindisi and Taranto) and Venusia on the border between the Samnites and the Lucanians. Both these roads starting from Brindisi reach Benevento. From here in Rome is called Appia and passes to Caudium, Calatia, Capua, and Casilinum Sinuessa. The entire distance between Rome and Brindisi is 360 miles".(Figure 1)

The Appia is also one of the most famous monuments of the Roman genius. The most-watched hypothesis is that of Lugli (The road system of the Magna Grecia, Taranto, 1962), which coincides substantially with that of Mommsen: the Appian road was divided into two branches one to the north continued for today Flumeri and one further south for today Frigento. The Appia stretch goes from Beneventum to Venusia. According to the Peutingeriana Table are known the three stations Aeclanum, Sub Romula and Aquilonia and pons Aufidi is a bridge on Ofanto crossing and also other two Roman bridges on Ofanto are identified near Pietra Oglio (territory Aquilonia) and near Conza.

Fig. 1: The Ancient Appia road (red line) and the Appia Traiana road (blue line). (image available by www.tusciaromana.info).

In figures 2 and 3 are shown two roman bridges.
The first one is the Annibale bridge or Saint Anna bridge (I sec.a.C.) in San Mango sul Calore (AV). It is 60 meters size with three archs structure. Now one part of it is collapsed because the river that ran under was deviated.
The second one is the Saint Spirit bridge or devil bridge on Appia-Traiana road. Today only one rest was founded. In 1970 its inscription was found near it and today it was preserved in the Provincial Musem of Avellino.
The construction features of the Roman bridges reflect structural engineering greatness of the time. The construction began from foundations and piers which were proportionate to the width of the arches. These were much larger than most had to withstand the water pressure and the piers were as strong as they were high and wide arches [3].
The Roman bridges in Irpinia have the common characteristic of being stone, mixed stone and bricks.

Fig. 2: Annibale bridge or Saint Anna bridge (I sec.a.C.) in San Mango sul Calore (AV).

Fig. 3: The rest of the Saint Spirit bridge or devil bridge on Appia-Traiana road (image available www.terrenet.it).

3. Roman Briges in Irpinia Region: seismic safety and preservation of cultural heritage

Roman structures present along the stretch where the Via Appia meets the Irpinia region are characterized by being in a poor state of repair and they are located in areas with high seismic activity. It should do some observations about the relationship between the conservation of the Roman bridges and the danger that they run coming up in seismic area.

There is the possibility to limit the potential damage that could cause an earthquake□

How could it be safeguarded a structure consisting of a few ruins so as not to permanently lose its identity under seismic action of cultural heritage□

Some key figures reported in Reeds-Cresme report on "The state of the Italian - Seismic risk and industrial buildings territory", presented October 9, 2012 in Rome at the headquarters of Ance expose a situation not very pleasant.

In Italy, the high seismic risk areas are:

- 44□ of total area (131 thousand square kilometers)
- 36□ of common concern

In areas with medium seismic risk living:

- 21.8 million people (36□ of the population)

for a total of 8.6 million families who are living in about 5.5 million buildings including residential and non-residential. But the risk of damage and casualties is amplified by the high vulnerability of the Italian state housing, built for more than 60□ before the entry into force of the first earthquake standards, in 1974.

Foremost among the earthquake-prone regions it is the Campania where 5.3 million people live in the 489 municipalities with high seismic risk.

Follow Sicily, with 4.7 million people spread across 356 municipalities at risk, and Calabria, where all municipalities are involved, for a total of about 2 million people.

In three other regions of Italy the phenomenon is significant, with more than 1 million people exposed to high hazard:

are Lazio (1.9 million people), the Marches (almost 1.5 million) and Emilia Romagna (almost 1.4 million).

In the territory share high seismic risk is estimated to fall 10.7 million homes and 5.4 million buildings:

- the predominantly residential buildings correspond to 86□
- non-residential buildings (schools, hospitals, hotels, churches, shopping centers etc.) or unused account for 14□. The regions most affected by the problem of exposure of the housing stock to the seismic risk are essentially Sicily and Campania.

In Sicily there are almost 2.5 million homes in the highest risk areas.

In Calabria they are exposed to risk: 1.2 million homes, 610,000 buildings for use predominantly residential and 116,000 non-residential buildings or unused [4,5].

In addition to the natural risk, therefore, a factor to which the actual risk condition of the facilities is the state of preservation of the buildings.
In Italy 68 of the buildings was built before 1981 (7 million of heated buildings) and the remaining 4 million buildings were built in the last 30 years; more than 2.5 million residential buildings in poor or mediocre condition of these more than 2.1 million buildings constructed before the introduction of seismic regulations.
The consolidation methods applied to cultural heritage are varied and range from traditional to innovative using modern materials.
The Roman bridges on the Appian Way are in masonry and for that reason the techniques necessary to apply for their recovery / preservation must meet certain criteria.
The various techniques are multiple schools of thought: some people want to make sure to intervene going to highlight the new intervention with the use of different materials or with different dimensions (for example on the facade with swings).
But when working on important and significant structures like Roman bridges, it is to pay attention to the materials that are used.
It is probably for this reason that in Irpinia instead to preserve and make available these structures is preferred abandon their functional aspect (driveway so as practicable roads) and letting are valued only as a cultural heritage.
The man hand who often has done evil and spend time with the weather activities did not safeguarded Roman bridges in many cases find themselves in neglect conditions.
For groped to defend the bridges by the earthquake action, a virtual reconstruction would be necessary with the most sophisticate existing instrumentation. Based on a detailed historical analysis and an accurate survey would be virtually it restituiore the structure as a whole and specific structural analyzes submit soto earthquake to assess the behavior. The problem is evident when treating structures like that of the Holy Spirit such that presents only a remnant arc [6,7].

Fig. 4: Roman bridge phases reconstruction (image available by http://www.romanoimpero.com/)

4. Conclusions

The Roman bridges like most of the historical sites are often regarded as past symbols.
The Roman engineering prowess should be useful as inspiration for the future buildings.
Settis, in the conference "The protection of heritage and landscape in Italy: a long history, a crisis of great relevance" held Sunday, May 29, 2012 the first Art History Festival in Fontainebleaui Castle raises a debate about the issue of costs for the cultural heritage preservation as if cultural goods are a burden to the community.
But the Roman bridges like other past testimonies are proof of the sense of belonging and should not be seen only as an economic burden on the national budget ..
The quality of the cultural heritage in Italy is high. Italy was the first to integrate the protection of the landscape and cultural heritage in the fundamental principles of its Constitution [8].
The new legislation is going to change the approach with the existing assets. Initially there was talk of the nominal life of the building (the period within which the validity of intervention project).
In 2009, the user is conformed to these requirements.
At ministerial level later in 2011 there have been changes. He wondered the user based on the capacity of the structure as it is the nominal life.
The ministry has removed many buildings the need to intervene and this has changed the cultural structure of our country.
Through structural modeling I can calculate the safety index (□ 1 the structure has more than what is asked) but this is a very long speech that this paper will not expand.
Summarized the seismic hazard of our territory (maximum expected earthquake in terms of acceleration) it is defined in a map nationally recognized and determines the existence of territories subject to high seismic risk. Irpinia is a southern Apennines region that is high seismicity.
In the 80s the earthquake shook the whole territory and the difficulty of maintaining and safeguarding property like Roman bridges was evident.
The Club for the Unesco of Avellino wants to intervene in the road axis enhancement of the Appian Way and especially wants to turn a projector on those Roman structures worthy of being known internationally.

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Roofing interventions in the Pompeii Tragic Poet House

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1. Abstract
The structural restoration interventions in the archaeological site of Pompeii have been performed since the beginning of excavation in the area. In the last century the old wooden roofs erected in the late 1800s were replaced with concrete structures similar to the old ones, realized after the Second World War. A systematic study of these structures is lacking, despite the number and the significant role they play in the stress state of the ancient masonry. The structural role of these concrete roofing structures in the Pompeii buildings and atrium and in the suburban Villas is examined in this paper. Starting from a detailed geometrical and historical analysis of the concrete roof, the impact of the restoration interventions actually present in the archaeological area of Pompeii is examined in order to assess the actual seismic vulnerability of the buildings. As a case study the entire structure of the *Domus* of the Tragic Poet (masonry walls and concrete roof) has been analyzed by means of a finite element code.

Keywords: Masonry, finite element analysis, rc interventions, archaeological areas

2. Introduction
Archaeological constructions have rarely come down to us in their original configuration: they have almost always been profoundly altered by successive mutilations and transformations, giving them a new configuration and state of equilibrium as ruins. In some cases strong interventions have been made in order to rebuild the original construction. This makes archaeological remains the object of complex, interdisciplinary studies involving archaeologists and applied scientists [1]. Unfortunately archaeological sites have been subjected to far too many ill-considered, invasive interventions in the name of conservation in flagrant contrast with the ancients' construction culture. This was especially the case during the second half of the 20th century, thanks to post-war reconstruction and the boom in house building [2]. Moreover, some restoration projects have been closer to an architectonic reinterpretation of the ruins than a scientifically grounded reconstruction [3]. Several interventions were made by reinforced concrete and actually the scientific debate is mainly about opportunity and durability of these interventions [4]. Apart from the problems linked to the time-dependent damage of concrete [5, 6], another question regards the variation of vulnerability and in general the static impact of these interventions on the ancient masonry structures [7], as the recent collapse of the *Schola Armaturarum* testifies.
The first structural interventions in many Pompeian *domus* involved the replacement of old wooden roofs with concrete structures similar to the old ones. Several of these roofs realized in particular on the atriums are nowadays visible.

Emblematic case is the *Vettii Domus*, in which in the immediate post-war years a wooden roof erected in the late 1800s was replaced with a structure of the same dimensions in reinforced concrete [8, 9] This intervention was badly structurally flawed and was done using an inferior cement, so that it is now in very bad conditions [10, 11]. In other cases, like the Tragic Poet *Domus*, the atrium roof is in better conditions, although some traces of damage are present.
In general the approach to the analysis and interventions on archaeological heritage should be carefully calibrated [12]. A Pompeian atrium is only a limited part of the complex structure of the *Domus*, so that the cultural discussion about the quality and scheme of the roof cannot be set apart from the structural analysis of the whole structure of the building [13]. In other words the key issue is the influence of the material chosen for the roof on the ancient masonry stress state and durability [14], since the archaeological parts of a Pompeian *Domus* are the remaining walls of the building [15].
This paper deals with this last aspect, showing the results of a finite element analysis on the whole *Tragic Poet Domus*, in order to assess the influence on the ancient masonry walls of two distinct materials for the roof of the Tuscanic atrium: wood and reinforced concrete. It is shown that the structural behaviour is not significantly affected by the structural material chosen.

3. History of the roofing structures of the atriums

Before the discovery of Pompeii the structures of the houses were unknown, so that Vitruvius' third chapter of sixth book make sense only after the excavations. A simple comparison of pictures in the editions of *De Architectura* before and after the Pompeii discovery is clarifying [16]. The XIX century drawings, generally based on the results of excavations are in many cases suggestive [17]. In the initial phase of the excavation of Pompeii in the middle XVIII century the realization of the roofs was made in order to create on-site protection for statues, paintings and other artifacts: in 1771 the covering of a room in the House of the Surgeon is documented [18]. Several representation of thatched or wooden roofs on the remains can be found in the traveler books. [16, 19, 20]. Giovan Battista Piranesi (Figure 1) was among the architects who represented the *Domus* with reconstruction hypotheses: his first surveys date back to 1778, published and engraved by his son Francesco in 1804 [21, 22].
During the XIX century the archaeological area was enlarged and roofing in particular cases was allowed: " An appropriate amount of rafters and clay shingles should be ready in order to cover the buildings that can withstand the weight and are worth the expenses… " can be read in the 1811 rules [18]. An outstanding work on the Pompeii site during the XIX century was carried on by the French architect Francois Mazois [23], who since 1809 lived and worked in the archaeological area. In his masterpiece on Pompeian ruins the study of a Tuscanic atrium's roof can be found: details of the wooden structure are reported on the plan and section (Figure 1). Mazois was the first to develop a reconstruction of the Pompeian atriums. His proposal for the structure of the Tuscanic atrium is actually considered one of the most significant. The Piranesi scheme involves four beams superimposed two by two, while Mazois proposes only two principal wooden beams. It must be noted that while Piranesi makes reference to Vitruvius, Mazois makes direct reference to Pompeian ruins, although without more details (excavation data, indication of the *Domus*). Considering the significant dimensions of the atriums, it is possible that there were four structural beams, in some cases with support struts at the end. In both the representations the rafters are simply supported on the beams.
Large interest in the building aspects is shown in the XIX century excavation documentations [24, 25, 26]. In the 1852 summer a roof was excavated along the Via Stabiana so that in the following publications more detailed descriptions of the roofing techniques can be found. The Sirico Home is a key point for the atrium roofing.
The first photographs date back to the end of the century, when the archaeological area amounted to almost 200.000 square meters. An entire chapter of the book by Spinazzola [27], director of Pompeii for a decade at the beginning of last century, is dedicated to the roofs. "Neglected, non only in the Pompeian excavation, and with limited knowledge sources, this part of the research – the roof, that apart from the revelations about the internal structure of a building, can change the aspect of a city….". Moreover, the limited attention during the excavation of the roofs can " produce as a result the total lack of ceiling fragments and (information about) their structure, due to absence of definite excavation data. So that in the Silver Wedding Home, whose excavation began in 1890, the atrium first restoration was completed in 1892 and only fifteen years later a strong restoration intervention was made (Fig. 3). This great attention to the excavation results [28, 29] together with studies on roofing lasts in the following years [30, 31].
With the Maiuri direction a large number of roofing interventions is documented [32, 33]. Among them, peristilium and atrium of the Villa dei Misteri were significantly rebuilt on the basis of evidences found during the excavation, as testified in Figure 3, right.

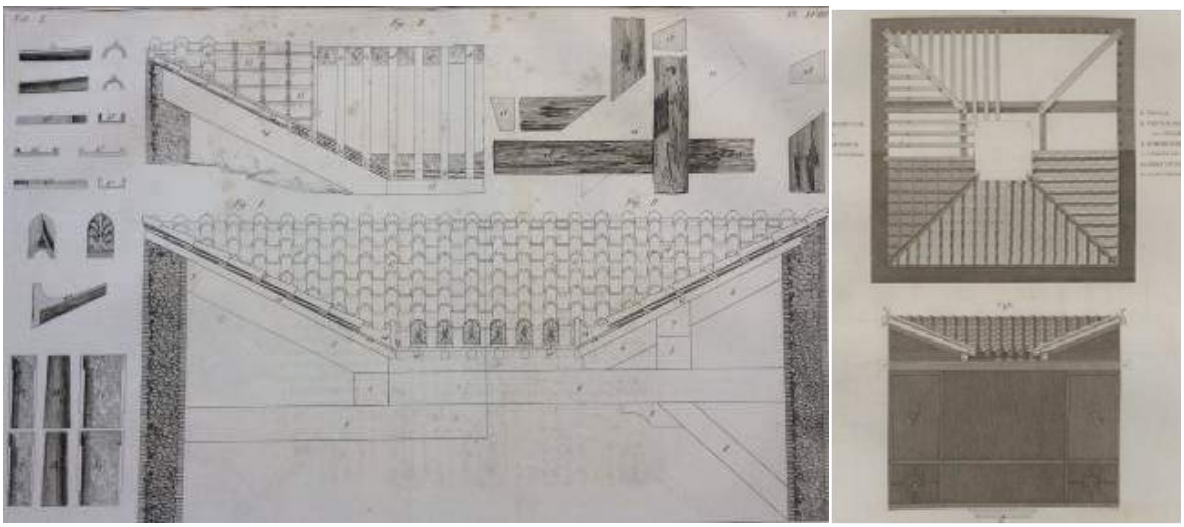

Fig. 1. Giovanni Battista Piranesi: Demonstration en grand de l'atrium toscan suivant l'explication de Galiani d'apres le texte de Vitruve, PL. 18, vol I (left) and F. Mazois, Essai sur les habitationes des romains PL. 3 (right, Library of Superintendency for Pompeii, all rights reserved).

A particular attention was given to the structures of the roof. The restoration of the torcolarium structures in the Villa dei Misteri was designed by eng. Luigi Iacono with reference to the ancient roof for the geometry of the elements and based detailed studies of the connections with the masonry walls. Information about the interventions can be found in the longitudinal section of the Villa in the book by Maiuri, where a detailed picture of both the ancient masonry and the rebuild one is presented [34, 35].

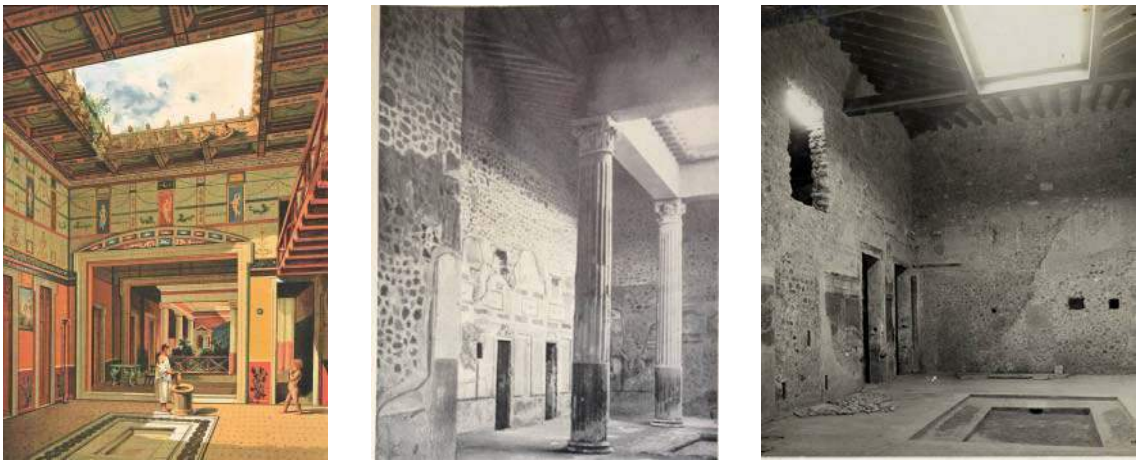

Fig. 3. Reconstruction of the atrium of a Domus (left, Di Scanno, G. Saggi di restauro, Library of the National Archaeological Museum in Naples. In Italian); Atrium tetrastylum in the Silver Wedding House (center). Restoration of 1892 [33]. Tuscanic atrium in the Villa dei Misteri in 1929 (right, permission of Ministry for Cultural Heritage and Activities – Photographic Archive of the Superintendency for Pompeii).

In the two decades among 1960 and 1980, as the photo archives testify, several reinforced concrete roofing structures were built to replace the wooden ones. The r.c. principal elements were combined with pitch pine rafters [36]. In Figure 4 a picture of the work in progress for the r.c. roof of the Villa dei Misteri is reported [37].

In 1983 the Pompeii Project involved a general intervention program: several different types of roofs were taken into account. Reversibility, respect of the ancient structure and the abolishment of massive r.c. interventions were the key points. Wooden roof structures were preferred in most cases: philological rebuildings were taken into account when the original geometry and structure of the roof was known. In these cases the original clay shingles and both chestnut and spruce beams were employed. When only global geometry of the roof was known, but the dimensions of the structural elements were unknown, glulam beams and modern clay shingles were allowed. When the original structure was completely unknown, protection structures, independent on the original masonry walls, were realized and allowed [38]. In these last years polycarbonate and steel roofs have been realized.

The above considerations are essential in order to understand the today state of the Pompeii *Domus* structural aspects. A complete map of the considerable number of different roof typologies actually present in Pompeii is not available. Materials, geometry, history of the successive interventions are not organized in a rational archive. The Restoration Charter of the beginning of last century recommended the use of modern techniques of the time, so that several r.c. roofing interventions, performed according the Charter Recommendations, are actually present in the archaeological area.

Fig. 4. Work in progress at Villa dei Misteri, year 1969 – (Photographic Archive of the Superintendency of Pompeii. All rights reserved)

Apart from the durability problems linked mainly to the protection of the r.c. structures [39], a large debate in the scientific community regards the structural aspects of the r.c. roofs [40]. Since wood and r.c. are the most diffused materials in the archaeological area, perhaps a more detailed analysis about the structural performance of both the materials in the seismic case could be a starting point in the scientific debate about the necessity of substitution of the r.c. roofs with different structures. It must be noted that all the upper part of the *Domus* atriums have been rebuilt and the ancient Pompeian masonry represents only the lower part of the walls, so that the seismic vulnerability should be regarded only from the point of view of the human safety and protection of original mosaics and paintings. An eventual collapse without damage to artworks could only bring back the walls to the original ruins state [41].

4. The case study

The case study is the *Domus* of the Tragic Poet in Pompeii, also known as the *Domus* of the “Cave canem” for its splendid black-white mosaics with a dog [42].

Fig. 5. The tragic Poet *Domus* at Pompeii and actual configuration of the *Domus* of the Tragic Poet’s roof (photo by the authors)

The *Domus* is a complex building in which the Tuscanic atrium occupies the central area, like in the most part of Pompeian *Domus.* The actual roofing structure of the atrium (Fig. 5, right) is composed of r.c. beams with wooden rafters and clay shingles (Fig. 5). A photo of the *Domus* is represented in Figure 5, where it is possible to evaluate the corner position of the building. In Figure 6 both a rendering and the mesh for the finite element model are shown.

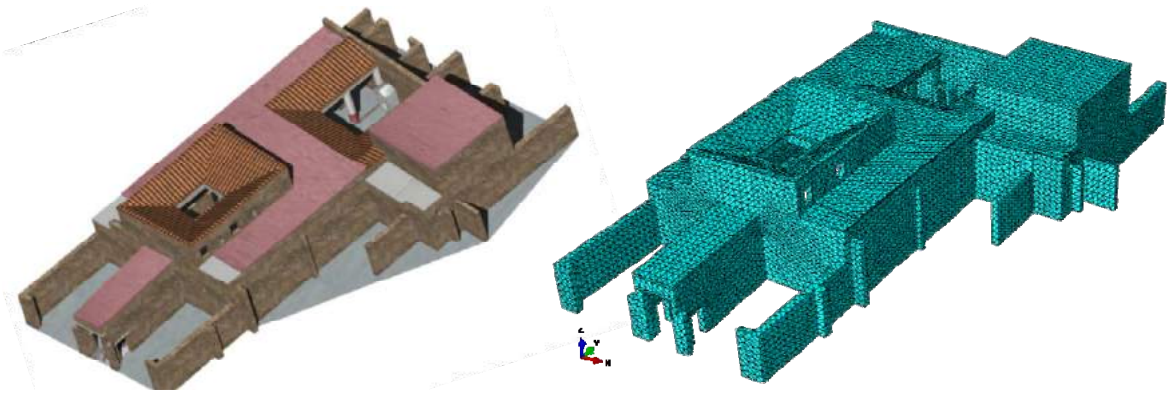

Fig. 6. Picture (left) and 3D mesh for the case study (right)

The FEM analysis has been carried out by means of ABAQUS©, the whole structure has been modelled with solid tetrahedral elements C3D10 with medium dimensions 0.4 m. Different constitutive parameters have been taken into account, as reported in Table 1.

Table 1. Mechanical properties.

Mechanical properties	Masonry	R.C.	Wood	Steel deck
Density, ρ [kg/m^3]	1937	2500	550	400
Elastic modulus, E [N/mm^2]	1140	30000	9800	6000
Poisson's ratio ν	0.2	0.16	0.2	0.2

The analysis has been performed in case of two different structural systems of roofing for the atrium: an ideal wooden structure and the actual r.c. one, leaving unaltered every other element of the *Domus*. The structural geometries considered are analogous, since the actual r.c. atrium roof is a copy of the original Roman one. In the following images the analyses results involving the r.c. and wooden roof are reported in the left and the right side of the picture, respectively, to allow comparison in the two structural cases examined.

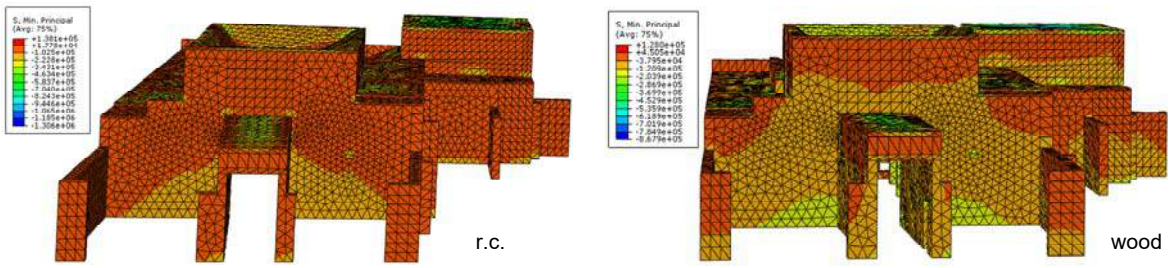

Fig. 7. Principal compressive stresses due to self weight. Detail of the front view

Two static load conditions have been considered: the first one due to self weight only and the second one involving ashfall deposits on the *Domus* [43]. This second condition has been excluded from the discussion, since the ashfall deposits considered separately from the seismic actions give limited information about the vulnerability of the *Domus*. In Figure 7 a detail of the front view with a map of the principal compressive stresses due to the self weight is reported. As it can be desumed, the stress state in the ancient masonry is somewhat similar, and this is true for all the *Domus* masonry.
Dynamic analyses have been performed considering the seismic action along the two principal axes of the *Domus*, involving a PGA 0.244 g and masonry tensile and compressive strength equal to 0.1 MPa and 3 MPa respectively.
A similar condition can be evaluated in Figure 8 reporting the principal stress maps in the case of selfweight and seismic action along x-axis. In Figure 9 a detail of the atrium roofing structure stress state is picted. The stress scale allows a discussion on the influence of the two structural systems: as it can be noted in this case too the stress values are of the same order.

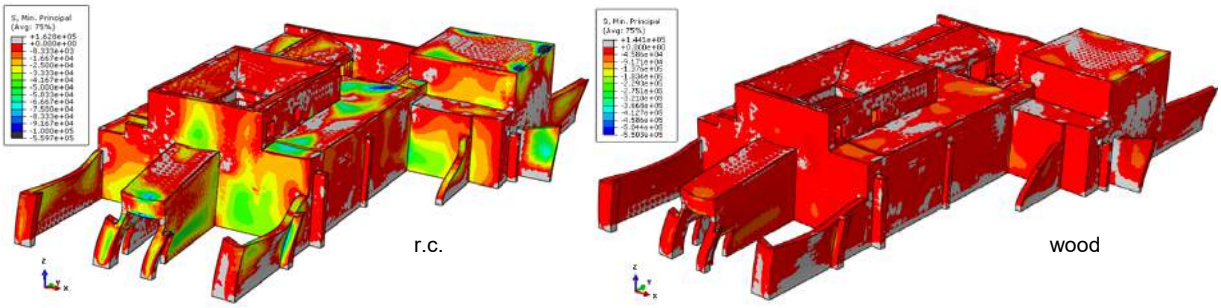

Fig. 8. Distribution of stresses in the case of selfweight and seismic action along x-axis.

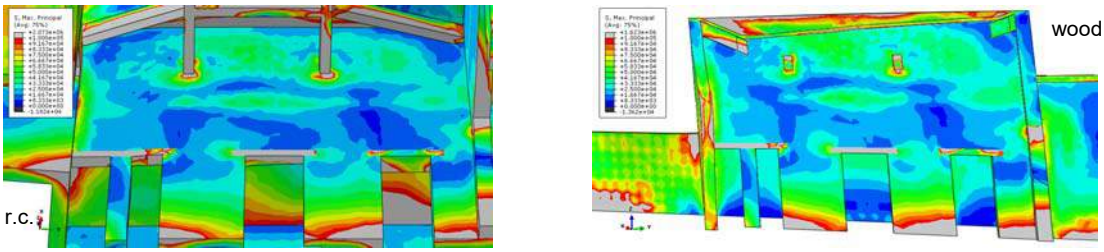

Fig. 9. Distribution of stresses in the case of selfweight and seismic action along x-axis. Detail of the atrium roof

The seismic analysis according the y-axis does not give more information, due to the larger inertia of the *Domus* in this direction [44]. Nevertheless, a similar comparison is reported in Figure 10, in which the same values of maximum principal stresses of the same order of the previous ones can be evaluated.

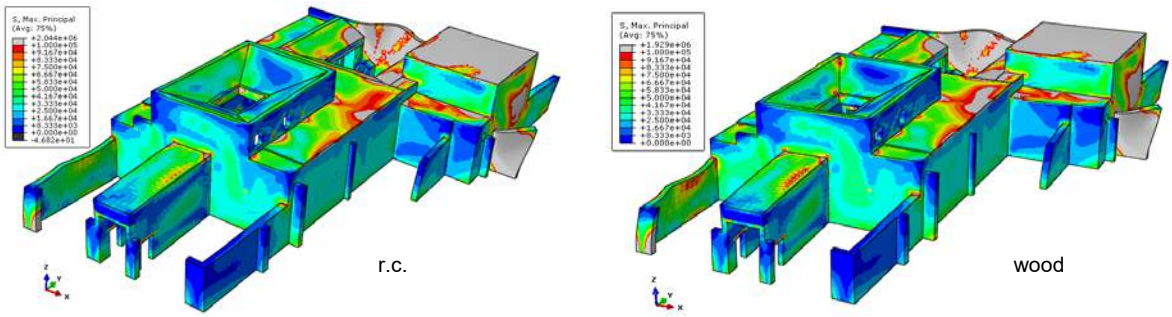

Fig. 10. Distribution of stresses in the case of selfweight and seismic action along y-axis

A dynamic modal analysis has been performed. The first 8 modes of vibration involve only limited structural elements: in general all the masonry walls departing from the central block of rooms and the vestibulum. A representation of the first mode of vibration, where the vestibulum is involved, is reported in Figure 9.

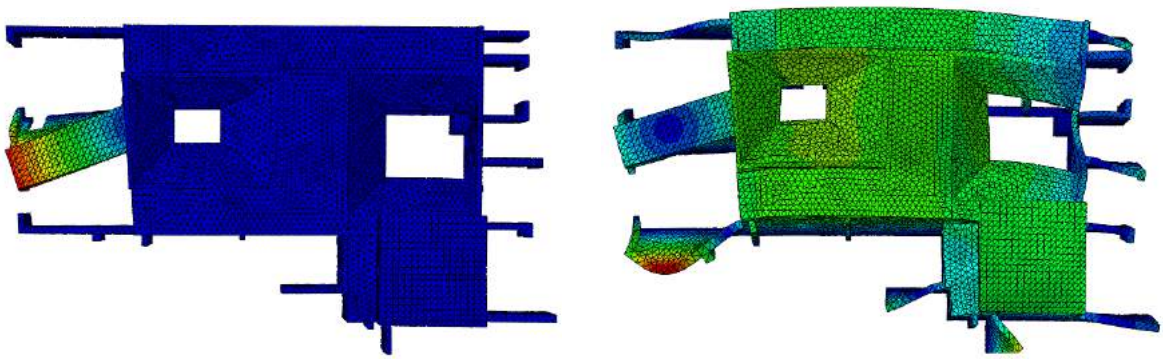

Fig. 9. First (left) and ninth (right) mode of vibration according the x-direction

The eventual collapse of the peripheral masonry elements makes the *Domus* become a more compact structure around the central atrium, since only the ninth mode of vibration involves almost all the house, atrium and peristilium, as it can be seen in Figure 9.

5. Conclusions

Roofing interventions actually present in the atriums in the archaeological area of Pompeii have been examined in this paper in order to assess their structural reliability. An historical survey has been presented in order to evaluate quality of materials and structural approach in the previous restoration interventions. In general, the restoration interventions until now performed tend to respect the original structural geometry, while different materials have been used during the decades.

As a case study the entire structure of the *Domus* of the Tragic Poet (masonry walls and concrete roof) has been analyzed by means of a finite element code. The r.c. roof structures on the Tuscanic atrium have been compared with geometrically similar wooden structures. Their impact on the ancient masonry do not seem significantly different. Archaeological, aesthetical and durability considerations have been excluded in this approach, leaving room only for the stability and vulnerability questions.

6. Aknowledgements

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Fragile upland environments: the need for preservation, valorisation and innovation of natural and built elements

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Abstract
The twentieth century has witnessed the progressive depopulation of high-altitude mountain territories, where human occupation has always and only been circumscribed to the summer season.
In the last fifty years, we have relied upon legislative measures and national and European financial incentives to induce men to return to the upper reaches of mountains, but these areas continue to be forsaken.
With the objective of implementing appropriate policies to promote and preserve the territories, legislation has not always produced positive and comprehensive results. With the exception of tourists, human presence at high altitudes is increasingly occasional and sporadic, thus determining the loss of the territory's historical naturalistic and environmental values along with its accompanying environmental, anthropic and cultural values. The present condition of distress has led to requests for specific policies and guidelines to promote the conservation and innovation of Alpine territories.
The need has thus emerged to define and trial innovative design tools in order to conserve, maintain and give leverage to natural and artificial systems through an integrated and multi-disciplinary approach and with the cooperation of private and public actors.

Keywords: alpine architecture, sustainability architecture, tourism, conservation and valoritation.

1. Introduction
During the 1900s, the population in mountainous areas dropped progressively due to a number of factors including the altitude and relative climatic and pedologic conditions and the abandonment of all those activities which formerly integrated the meagre income from agriculture and livestock farming. The exodus from high altitude upland areas, always “lived” during the summer season only, was particularly substantial.
All those systems located in areas with complex orography characterised by infrastructure intended for minimal habitation or temporary shelter of men and animals were neglected.
Although seasonal between the woodland and the vegetation line, life once led to the creation of cattle and sheep trails and tracks, buildings of various sizes, fences and stockades, dry-stone walls, rudimentary water supply systems and small aqueducts. During the time spent at high altitudes, man was continuously and constantly employed in improving the territory.
Neglect of natural and artificial elements has revealed the fragility of high altitude upland areas and we are now witnessing the cancellation of man’s constant and continuous work.
The abandonment has also led to expansion of the woodland towards the valley floor with the slow and unstoppable cancellation of the meticulous and intense work of man to eliminate the woodland to obtain ever greater surfaces for cultivation.
A reduction in crop diversification at high altitudes has made the landscape more uniform. As the complex landscape mosaics created by subsistence economies are no longer a constraint, they have ceased to exist. To improve profitability, farming has become ever more specialised even at high altitudes, causing meadows to prevail and arable land to disappear.

The intense and diversified polyculture aimed at producing poor cereals (barley, oats, rye), wheat, pulses (broadbeans and peas) and textile fibres (hemp, linen) diversified the landscape which took on the colours of white, blue, red and above all various shades of green according to the crops.
As a result of the disappearance of many crops, the small scattered buildings are now redundant and their non-utilisation has led to functional and physical obsolescence. In the 1900s, tourism also had an ever greater impact on the landscape of upland areas. Large-volume buildings, cableways, ski runs, etc. were constructed, in many cases with no regard for the context, importing globalised models resulting in standardisation of the areas. As a result, the mountainous areas have lost the centuries-old natural characteristics which made every valley and every slope unique. They have become “at risk” components, given the increased concentration of production activities in the valley floors, proliferation of abandonment, globalisation of cultural and production policies and growing difficulty in managing and maintaining the natural and built heritage. Recently, there has been a growing awareness that the territory is not an inexhaustible resource, making us understand that these areas are unique for their complexity and diversity and high natural- environmental and anthropic-cultural values.
The fragility of mountainous areas induces us to propose preservation and valorisation measures which require definition of analytical and design instruments to safeguard the landscape and wide-area cultural heritage.
We need to define and experiment innovatory design and planning instruments to valorise, preserve and maintain the natural and artificial systems through an integrated multidisciplinary approach with collaboration between the public and private sector.
It is therefore important to analyse the residual material and immaterial potentials in those buildings and environmental contexts whose settlement and construction characteristics are the expression of a relationship between nature and artifice, which thus contribute to defining the genius loci of these places and whose degradation may make identity and memory impossible.
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2. Upland landscapes

Summer pastures ("alpeggi") and seasonal alpine farmsteads ("malghe") are fundamental environmental, economic, social and cultural components of the alpine landscape, places where man and nature meet. They symbolise an environment unique for its complexity, diversity and high natural, environmental and cultural values.
The areas occupied by the summer pastures also testify to the local typological, settlement, architectural and technological characteristics, just as those which developed on the valley floor where in many cases the settlement and architectural rules of the historic types have been partially cancelled by the globalisation which has standardised landscapes throughout Europe, creating the same buildings and the same spaces. The seasonal use of land and buildings at high altitudes and in many cases their abandonment have avoided radical modifications and many of these elements have therefore come down to our time with no interruptions in the process of constructing and transforming the anthropic environments.
As is well known, the morphology of these places is in constant evolution under the action of time and the climate (avalanches, snow slips, earthquakes, etc.) and changes in plant and animal species influence the architecture which varies according to man's needs. The themes of adaptation and transformation have therefore always been tackled in close synergy, despite the technologically modest solutions available.
Through his productive, social and cultural activities, the capacity of contemporary man to transform is without doubt much greater, to the point of representing an abuse of power, cancelling out the heredity transmitted by previous generations. The presence of man at high altitudes is still necessary today in order to govern the landscape and the land, but he must go back to following strategies appropriate to achieving transformation congruent with conservation, in a context of constant valorisation.
The principle accepted by society as a whole is contained in Community documents and the first of these is without doubt the European Landscape Convention (2000).
The articles of the Convention should be applied in all natural, rural, urban and periurban spaces. This therefore includes areas at the vegetation line whose characteristics derive from the action of natural and/or human factors and their interactions. Seen in these terms, defence and maintenance of summer pasture areas represent not just an opportunity for socio-economic development, but also satisfy the requirements for landscape quality, becoming in this sense everyone's right and responsibility in the spirit of the Convention, through participated decision-making processes integrating the landscape in land, urban planning, cultural, environmental, agricultural and socio-economic policies.

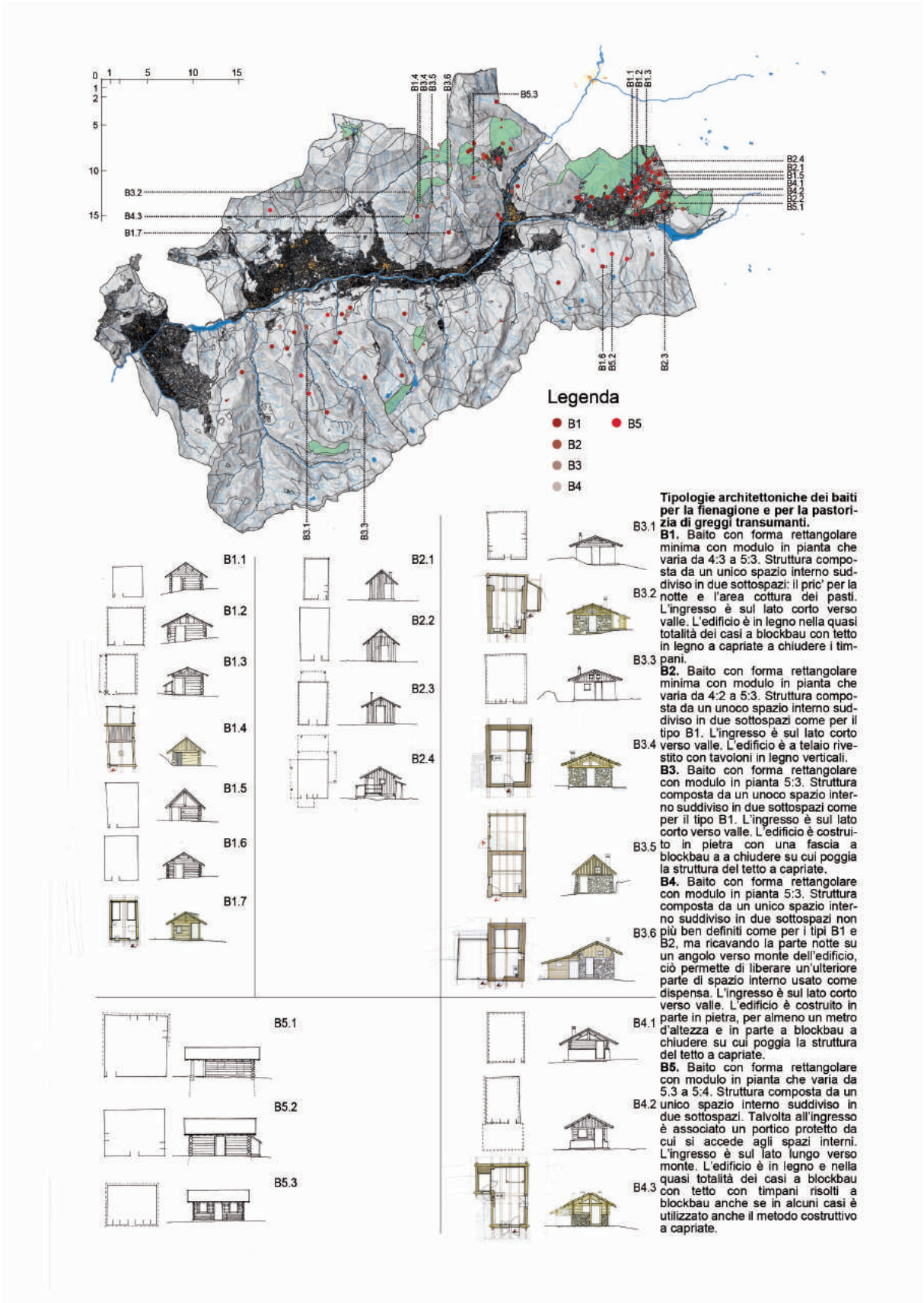

Fig. 1: The catalogue of "*baiti*".

The link existing between natural and anthropic elements of the landscape, the basis for the European level indications, is evident in the Cultural and Landscape Code (Italian Legislative Decree no. 42 of 22 January 2004). Today's more aware society has assimilated the need for greater sensitivity and global multifunctional valorisation considering both the built elements and their natural surroundings.

It now seems necessary to reflect a moment, particularly on what has been done in recent times, and to review the criteria of the mass tourism policy which characterised the closing years of the last century, aimed at economic privilege with the construction of hotels of conspicuous dimensions, doubtless very profitable in the past but today in crisis, due precisely to deterioration of the delicate man-environment-settlement relationship they violated. The search for a non-elitist tourism more respectful of that relationship must necessarily dialogue with the pre-existing rural heritage in order to safeguard man's presence in the mountains and the characteristic values of the man-production-environment bond.
New congruent principles must be identified leading to the re-use and re-functionalisation of summer farmsteads ("malghe"), alpine huts ("baiti"), and all other seasonal production structures, in an attempt to valorise both traditional aspects and the innovative potentials of participated or nature tourism, able to guarantee the right environmental and economic sustainability. Aware congruent valorisation must necessarily begin with precise and meticulous gathering and interpretation of knowledge about each seasonal structure and its surroundings, pasture or meadow, on a small and large scale, as a necessary prerequisite to safeguarding the culture which generated it and, in this particular case, the dynamics which promoted and developed the use of summer pastures over the centuries in mountainous areas. The studies must highlight the resources and potentials of alpine farmsteads in order to consider the activities to be associated with the traditional ones. The important potentials and possibilities for valorisation of these environments through sustainable measures are without doubt numerous, but there is a need for diversification based on local natural and cultural values. The objective is to create a network to integrate other activities in the alpine farmsteads of a given area so as to obtain perfect functional integration able to guarantee a good level of profitability. It is therefore important to achieve complete integrated conservation and valorisation of the upland farmsteads present in the alpine region.
This study therefore analyses current legislation, which should lead to the implementation of congruent conservation and valorisation policies, but which in fact has actually produced not always positive and complete results. With the consequence that, apart from tourists, the human presence in the mountains has become ever more occasional and sporadic, leading to a loss of local natural, environmental and cultural values. As they cover large areas, regulations cannot take the distinctive characteristics of particular areas into consideration and very often end up considering certain parameters only, never the complexity. We decided to undertake detailed study of a clearly defined area, the Trentino, a small Italian province in the Alps where the recently acquired sensitivity is verifying various strategies for preserving and valorising upland landscapes. this case in the Trentino, the aim is to propose guidelines for safeguarding and innovation operations to maintain a human presence in upland areas.

3. The complex and variegated legislation in force

The last hundred years have seen definition of a complex body of regulations covering various themes associated with seasonal alpine structures and their immediate surroundings. While all of great interest, rather than promote the conservation and valorisation of the biodiversity of alpine ecosystems where nature and rural human activities have been intimately intertwined down the centuries, they all have sectorial objectives, penalising the more far-reaching project with a global vision of the landscape.
From an initial analysis of the extensive legislation in force, it was immediately obvious that the legislation on seasonal alpine farmsteads at various levels always concerns individual aspects, in other words, it covers the buildings, or the surrounding production area, or technical matters associated with production of the products or management of the farmstead activities. Even in areas where society has deep cultural and economic roots such as the Trentino, there is no organic legislation or ad hoc consolidating regulation on management of alpine pastures.
Current legislation attributes maximum value to the sustainability of the transformations in order to improve stability of the physical factors of the area, the ecological balance of the forest and alpine environment and conservation of habitat and species biodiversity through balanced valorisation of the multi-functionality of the ecosystems.
At both practical and legislative level, recovery of the alpine sites has been promoted through the relaunch of economic activities associated with pastoralism and use of the summer pastures. Provincial law no. 4 of 28 March 2003 supported the farming economy through the launch of organic farming.
The legislation also covered alpine pastures and meadows, organising their management and defining their designated use and methods of utilisation through economic regulatory plans ("Piani di

Assestamento"), drawn up at municipal level and by the public institutions running the alpine estates ("regole") in the high valleys.

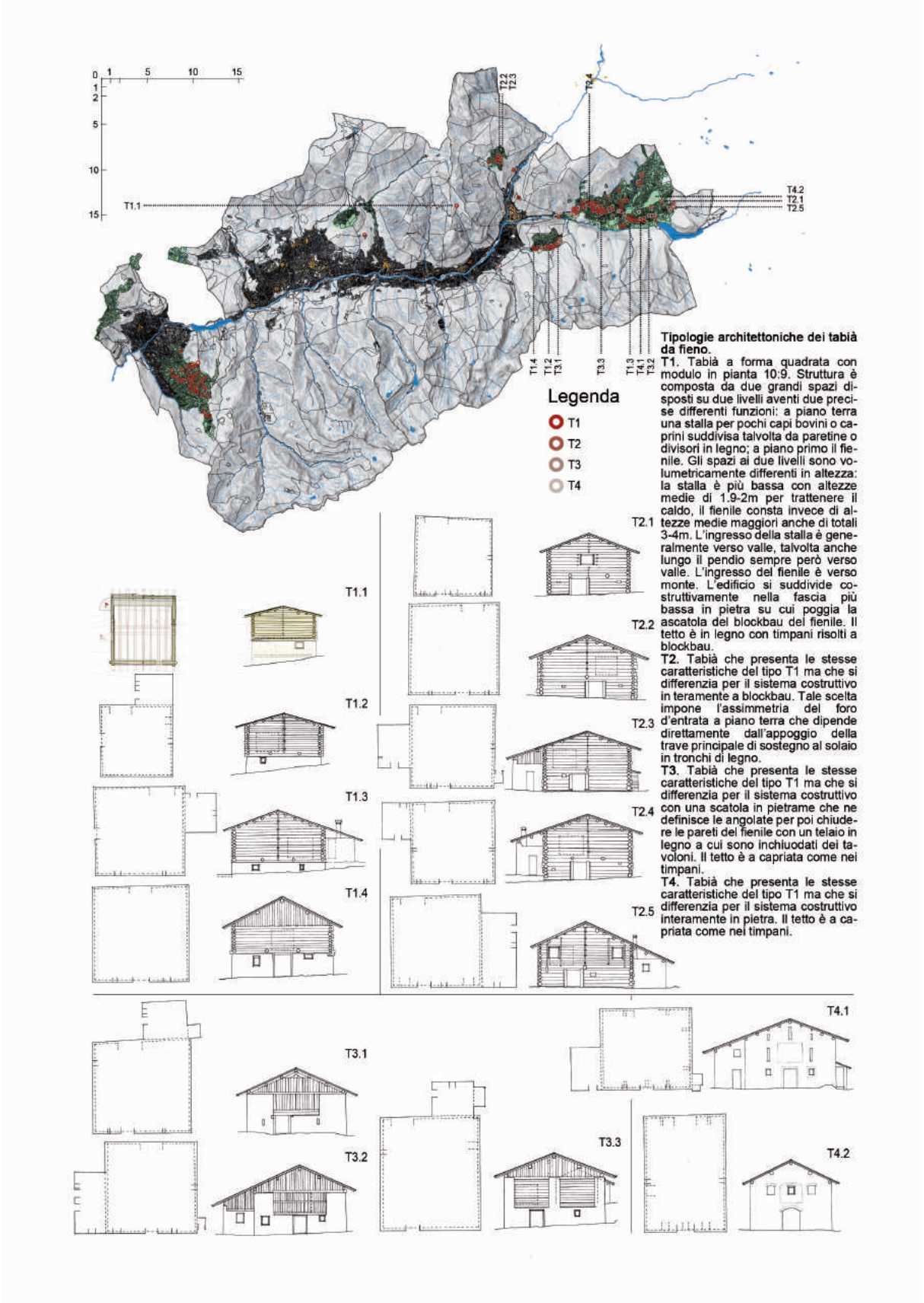

Fig. 2: The catalogue of "*tabià*".

In the case of pastures, the law defined the areas to be used by livestock and these also served as a reference for the payment of contributions by the Autonomous Province of Trento Rural Development Plan which globally managed the financing of structural measures aimed at preserving the buildings as an integral part of the cultural heritage of the alpine environment.
The aim of the legislation was to preserve rural activities, foundation of the Trentino culture and vital to maintain a minimum level of population, preserving the alpine environment and safeguarding the available natural resources as a precondition for consolidation and development of other economic activities and the recovery and use of marginal resources (rural tourism, educational farms). Recent years have seen the issue of a large number of hygiene and sanitary regulations regarding dairy production, aiming at modernising valley floor and alpine dairy farms and bringing them into line with standards.
However, in the Trentino, in many cases the need to comply with hygiene and sanitary regulations actually led to abandonment, rather than restructuring, of the farmsteads. The summer farmsteads were considered as equivalent to residential buildings, enforcing disposal of wastewater in cesspools or septic tanks and the transport of solid waste to dumps in the valleys. The provisions, fundamental to protect the integrity of the environment, in many cases blocked use of the structures, but subsequent regulations proposed more practicable solutions, developing the marketing of typical alpine products to keep the activity alive. The need to conserve alpine activities and thus the structures has been evident since the early 19th century when "Agricultural Societies" ("Società Agrarie") were founded with the task of promoting more modern practices in the rural world, pressurising the municipalities or the institutions running the alpine estates ("regole") to set up community dairies in the valleys to process the milk, including that coming from the summer pastures, into products satisfying modern quality and hygiene requirements, transforming the job of cheese making, until then a home industry, into a more rational system in line with the new market demands.
The Hapsburg regulations were taken on board by the Italian government and improvements to the marketing of farm products continued, but conservation and valorisation was then largely transferred to the legal provisions of urban planning, issuing regulations on local area and building scale, often without considering the necessary integration and complementarity.
Article 61 (General guidelines and criteria for regulating the restoration of upland buildings) of Provincial law no. 1/2008 (Urban planning and land management) indicates the methods to be adopted during projects to recover, preserve and valorise traditional buildings originally destined for agricultural, forestry and pastoral activities as the material testimony of the historical alpine landscape and therefore a wide-area cultural asset of the Province's alpine civilisation.
One of the objectives of the document is to draw up a census of all alpine architecture - alpine huts (cà da mont, bàit/o, fienile, tabià/tobià/tobiàdo, maso, masàdega), farmsteads, mills, forges and sawmills, even if abandoned or restored, structures outside towns and villages, whether in small groups or isolated at various altitudes in the mountains.
The document then proposes the in-depth study of existing structures, establishing the eligible types of building, the designated use and the possibility of reconstructing the layout of the complex, with precise operational guidelines covering sizes and construction technology.
This third planning level is becoming the most important tool for the comparison and validation of design choices as it identifies the existing heritage of alpine buildings to be restored, defining their conditions and the intervention methods in order to conserve and valorise them in respect of traditional local settlement and architectural models.
The guidelines and general criteria are aimed at safeguarding the environmental context. The admissible building operations must therefore be aimed at maintaining and recovering traditional alpine architecture and the relative agricultural and farming landscape, as the cultural and material testimony of the alpine civilisation, avoiding new urbanisation and modifications to the environment and landscape of the buildings and places. Recovery of the buildings must always be aimed at safeguarding their environmental context. The aim of this document is to arrive at a complete and structured overview of alpine farmsteads.
At present, only a few municipalities in the Province (generally those with the greatest tourism value) have drawn up and approved this document consisting of the census and regulations for implementation, but many other administrations still use the regulations contained in the urban planning schemes.
Alongside this, with Provincial law no. 4/2010, the Province intends to employ innovative technologies for tourism valorisation of the upland built heritage of "baite" or "cà da mont" located in marginal areas (article 37 Valorisation of mountain huts for tourism purposes using innovative technologies). This project involves the accurate restructuring for tourism and residential use of a number of mountain huts ("baite") in selected areas using the techniques of sustainability. The Autonomous Province of

Trento has also set up ecomuseums with the aim of valorising local culture and traditions, considering the possibility of combining the objectives of conservation and recovery of the traditional work environments with the material cultural heritage, thus linking the local styles of living and working to valorisation of buildings forming part of the local historical, artistic and popular heritage.

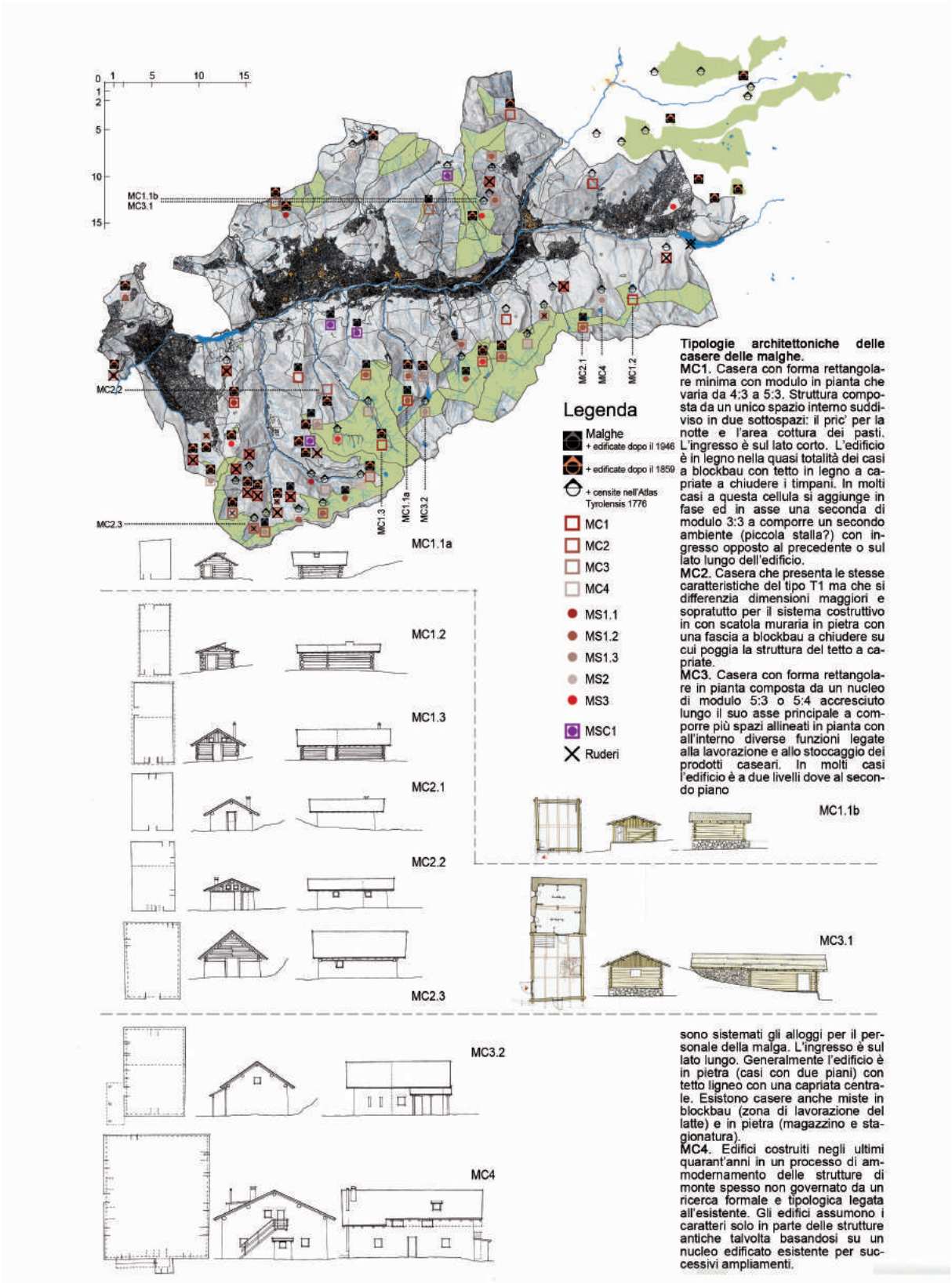

Fig. 3: The catalogue of "*malghe - casere*".

Connecting traditional landscapes with the reconstruction of traditional living and working environments able to produce goods and services, creating opportunities for marketing and selling local products. In this context, the ecomuseum can represent "... a dynamic process with which communities conserve, interpret and valorise their heritage as a function of sustainable development, through a combination of itineraries designed to put visitors in contact with local nature, traditions and history, but above all with the active involvement of the communities, cultural organisations, schools and local associations which are the decisive and determining factor in a participated process which, through a pact (in other words, a dimension of shared values with extensive involvement of citizens in a consensual process), helps form the sentiment of identity which promotes positive social dynamics and improves the quality of life of residents. …".

4. Definition of guidelines for the preservation, valorisation and innovation of upland landscapes

The general situation described shows sensitivity to the problem of preserving the material and immaterial testimony of the alpine landscape, a wide-area cultural asset of the alpine civilisation. In the context of the province of Trento, this entails identification of new design and planning instruments which make it possible to go beyond point interventions through the creation of a network [4] within which to develop and improve a multiplicity of functions, not just associated with tourist accommodation, but also of a productive, educational and cultural nature, or simply to provide shelter along established itineraries.

The problem is therefore to propose new methods and instruments to assess where, how and when to intervene on the basis of a hierarchization of the problems. sort of large-scale maintenance plan able to hold together and valorise the fragmentation of the unique alpine forestry and pastoral architectural heritage typical of the Trentino.

It is also evident that the role of legislation is not to promote valorisation and preservation. Laws cannot, in fact, consider the issues in their complex context, where natural and social-economic parameters collide.

The cogency of the regulatory tools certainly does not help. Quite the opposite, it ends up by determining unsurmountable obstacles which in many cases prevent the introduction of congruent and compatible strategies, functional to the characteristics of the architecture and the places.

The current state of the production buildings and pasture or meadow areas throughout the Trentino highlights a series of problems and criticalities which this vast body of regulations, from wide-area, landscape or local plans to municipal or sector schemes, has successfully resolved at sectorial level. However, it must be emphasised that interventions involving existing alpine buildings and structures have only rarely been coordinated and in the majority of cases involved point interventions on individual structures only.

The result has been a strong expansion of woodland, causing simplification of the landscape, with a loss of the wood-clearing-meadow mosaic structure formerly characteristic of the Trentino mountains and an overall reduction in the complexity of a series of environments to which a significant portion of the alpine biodiversity is linked.

It is evident that congruent conservation, valorisation and transformation requires an interdisciplinary operation based on overall knowledge of all the elements involved. This means that botanists, agronomists, geologists, urban planners, architects, economists etc. must work together with the same objective. An examination of the regulations and urban planning schemes existing to date seems, for example, to show an absence of guidelines on the immediate surroundings of the buildings as, for example, there are few regulations covering the arrangement and juxtaposition of the buildings, which limits the hypothesis of expansion. There is a need for provisions which provide incentives for construction, or for recovering existing structures, integrated with the typology of equivalent structures in the valley, without forgetting the material sustainability and energy self-sufficiency necessary in these outposts located in a difficult place which can be used for very brief periods only.

It is fundamental to create a network within which to develop the area's tourism potential, together with rural activities and crafts for maintenance of the mountains.

In this context, the stratification of buildings, seasonal farmsteads, alpine farms and huts ("malghe", "masi" and "baiti") in a limited area makes it necessary to differentiate their use in a pluralism of functions, not just productive, but also for accommodation, educational and cultural purposes and as simple shelters along a defined or definable itinerary which, through various stages, leads to the discovery and dissemination of local historical and social themes, while at the same time contributing to forming a sense of identity among the population.

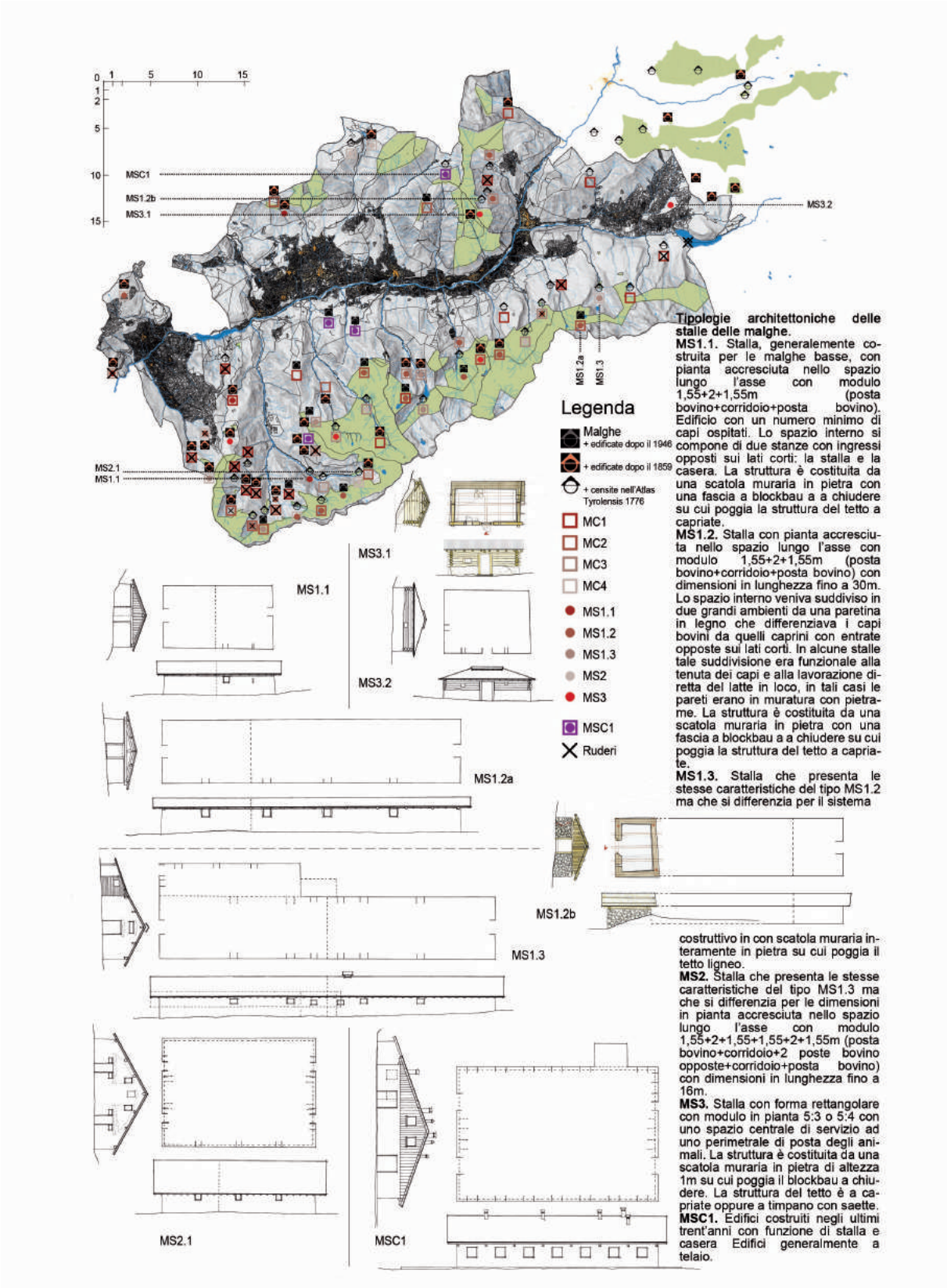

Fig. 4: The catalogue of "*malghe - stalla*".

The basis for this process is knowledge of the structure, taken as the starting point for a smart land project.

The possibilities for the territorial regeneration of these systems must therefore be studied, proposing various recovery and valorisation scenarios to reactivate their economic and socio-cultural roles, guaranteeing a new balance between natural evolution (action of time and climate, transformation of

plant and animal species etc.) and the anthropic action of land improvement and regulation. Guaranteeing the cultural heritage of these mountainous areas the maximum values of environmental sustainability implies an integrated dialogue between the issues involved in preservation of the built landscape and the requirements of energy self-sufficiency, between climate transformations and restoring the balance of forest environments and between the values of biodiversity and the need for ecosystem multifunctionality. If used appropriately, these unique and fragile resources can become the driving force behind new local economies through wide-area, inclusive and sustainable development. These objectives are, moreover, included in all Community planning programmes in the European Union (see the European Landscape Convention 2000 and European Policies for Tourism 2006, Development of the Alpine Space 2007-2013, and Rural Development 2013/2020, taken on board at provincial level in the new Provincial Planning Scheme 2006, the Strategic Plan for Rural Development in the Trentino 2013/2020 and the future Local Planning Schemes of the Valley Communities). It is more urgent to limit inventories, constraints or landscape or recovery schemes as far as possible, in favour of interdisciplinary knowledge of homogeneous parts of the landscape, going beyond the entity of the municipality to consider areas with uniform characteristics in terms of climate, geology, economy, culture, etc., determined by opposing economic and social prospects which interact and constantly transform the landscape, its significance and the values attributed to it and which represent the relationships between the constituent subjects and elements.
Preservation cannot be considered without land and architectural transformations as the landscape is the point of reference for achieving sustainable cultural, economic, ecological, environmental and social development.
The landscape must continue to be testimony of the past, but it must also look to the future. We must go back to the precepts and rules which have always regulated construction and transformation.
In this context, there is a need for strategic coordinated programmes, identified by the current body of legislation guiding recognition and characterisation of the various landscape identities to ensure the real value of each homogeneous portion of territory can be “exploited” by defining specific management actions. Actions aimed at proposing a guiding vision for the entire area, drawn up through consultation between the collectivity, technical experts and administrators, using diverse instruments able to adapt to the various situations, scales and contexts and aimed at diversification and integration.

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Pre-industrial built heritage: mills of Lomellina

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Abstract
In Italy remained a mainly agricultural country until mid-20th century, thus rural heritage has a primary interest. Rural architecture has a close relationship with agricultural landscape; both are the result of the work of man and together they give life to landscapes of labour. Within these landscapes, mills and hydraulic artefacts related to milling are particularly important. The paper will focus on artefacts of Lomellina (northern Italy).
Since Middle Ages in this region a heterogeneous irrigation system was created by large landowners or religious orders, allowing the spread of cereal agriculture. In 18th century land management system evolved to capitalism, with investments in land reclamation and canals. Since the advent of agricultural industrialization in 1950s the disposal of mills and other plants began and it led to their abandonment and decay.
The interest in material evidences of rural life is growing as their state of preservation is progressively getting worse; thus their conservation and valorisation is now extremely topical. The paper analyzes risks for preservation of these buildings resulting from abandonment but also from rehabilitation, as well as appropriate strategies for protection and reuse.

Keywords: Pre-industrial heritage, Preservation of rural architecture, waterways, Lomellina, protection and reuse strategies.

1. Introduction: Italian rural landscape
To carry out a research on an aspect of the landscape of a specific territory, we must first clarify the general meaning given to the term “landscape”. Landscape is defined as a «portion of territory considered from the prospective and descriptive points of view», but also – in geographic studies – as «the complex of characteristic features of a given area» [1]. More specifically, the expression “agricultural landscape” identifies «the form that man, in the course and for the purpose of its agricultural production, consciously and systematically imprints in the natural landscape» [2].
Although the oldest traces of agriculture in Italy date back to Neolithic times, for a long agricultural areas were quite poor and the more widespread agricultural system was the grassy meadow, with the practice of “slash-and-burn”; with the Greek and Etruscan colonization – but in many areas only in a later period – agriculture became instead the main activity and such it remained until the 1950s [2] – as demonstrated also by the great ideological importance attributed to agricultural issues during the Fascist period [3] – causing the transformation of natural landscape in a landscape “of labour”: in technical literature references are made to «human landscapes» [4] and «signs of labour» [5]. For this reason, rural architecture – closely linked to the agricultural world – has a great significance in Italian landscape.

2. The heritage of preindustrial mills in Lomellina
Within the complex of rural architecture and agricultural landscape, pre-industrial factories and hydraulic structures associated to cereal milling are especially important; watermills are in fact, probably the oldest example of association of a machine to a building and the prototype for future factories [6]. They are testimonies of a specific phase of agricultural processes and are characterized by specific building types, techniques and construction materials; the close relationship of mills with

canals (designed to ensure the necessary energy for their operation) connects them to territory and landscape even more than other rural buildings. Like for all other buildings with special technologies (in this case mechanical technique for milling) technical evolution has led to their rapid obsolescence and therefore abandonment that causes high risks for their conservation. The article will specifically deal with watermills in Lomellina a fertile flat region in Lombardy (northern Italy).

2.1 The development of the canal network

In history, every time man began to settle in a land and cultivate it, he has also started to intervene on its hydrographic regime to change it in favour of his own activities: in moist soil, the organization of agriculture required water drainage with suitable drainage canals; in those where water for irrigation and productive purposes was scarce, it was instead necessary to create canals to conduct water from other areas in which it was more abundant.

In Lomellina, oldest canals – predominantly made in medieval times – had originally drainage function of marshy ground and collected spring or superficial water, but at the same time served to redistribute refluent water in drier areas, the first significant evidence of a systematic and organized intervention date back to 11th-12th centuries, a time when some monastic orders (especially the Benedictines and Cistercians) created a series of settlements from which promoted land reclamation in Lomellina [7]. These canals were typically devoid of masonry artefacts and often exploited in whole or in part beds or paleo-beds of natural rivers [8]; over centuries they have therefore acquired a high natural character and landscape value. The rebirth of agriculture in late Middle Ages required the creation of numerous canals, but the fragmentation of land management and the complex existing system of rights of water exploitation gave rise to a composite and articulated system, largely disorganized and messy [8, 9]. As well as for drainage and irrigation, ditches and canals were used also to operate watermills – for grinding wheat or other cereals and for processing rice – isolated in the countryside, inserted within the farmsteads or located in towns.

In this territory – almost entirely reclaimed – from 18th century on, canals were dug mainly to improve the distribution of water and to conduct it where specific production needs (agricultural, craft or industrial) required it. A systematic plan for restructuring irrigation of Vercelli, Novara and Lomellina territories (the three areas, now placed on the border between Piedmont and Lombardy, at the time were all located in the Kingdom of Sardinia) was promoted since the middle of the 19th century and began to take shape with the construction of the Cavour Canal (started in 1863 and ended in 1866) to derive a large amount of water – maximum flow rate at the origin is 110 m³/s – from the Po near Chivasso; in subsequent decades to it the realization of a series of secondary canals followed in order to diffusely distribute water on territory. The canals made in this period typically have more markedly artificial features: straights riverbeds with regular section, often lined with materials which diminish water loss by filtration; presences of side roads for the maintenance of the canal; presence of masonry artefacts for the regulation of water height and flow rate. Also in this case canals were exploited for energy production, but small and medium factories prevailed over mills (already widespread on the territory).

Fig. 1: Maze of natural and artificial waterways from different ages near Vigevano (Bing maps).

At present in Lomellina the whole of canals appears as a highly articulated and complex system, with a very strong differentiation in size and a widespread distribution, characterized by a marked historical multi-stratification clearly perceptible in the morphological variety of the tracks – partly with sinuous and erratic layout, partly with rectilinear river bed – and in the strong diversification of the materials and building techniques used in the construction of banks and of artefacts for regulation and intersection.

2.2 Buildings and hydraulic artefacts linked to milling

The invention of mechanisms dedicated to grind cereals activated by hydropower probably dates back to 1st century B.C. and the place of invention is probably eastern Mediterranean; in the 1st century A.D. Pliny testify to their presence in Italy, from where they would have spread to the rest of Roman Empire, but probably remaining isolated examples due to the great abundance of slave labour [10], it is also probable that the technical decline following Roman Empire collapse had further reduced their diffusion. With regard to Po Valley, sporadic documents date back to the 8th century A.D., however, until 10th century mills were probably built only in places where the abundance of grain was associated with people concentration, making it convenient to establish complex and expensive machinery [11].

However, since 11th century watermills gradually spread in parallel to investments of monastic orders in colonization and reclamation of wetlands and to a great population growth [12]; in this same period in various parts of Europe the exploitation of hydropower by means of waterwheels spread to various areas of production, sometimes coexisting in one building [13]: extracting oil from olives, nuts, and poppy seeds [14]; beating oak bark for tanning leather [14]; processing malt for beer production and fibres used for the production of fabrics and paper [15]; metal working [16]; wood sawing [17].

No documents are known for this period describing specific types of mechanisms (especially waterwheels) used in mills of the Po Valley [11]; however, given the small height of available hydraulic jumps, we can most likely assumed that even at that time mills had waterwheels rotating about a horizontal axle – which require more complex mechanisms for driving grinders, but that are already described by Vitruvius – inferiorly immersed in the water current of a small canal (an irrigation canal or one specially derived from a greater water course). Surely this is the type attested in documents (such as those that prove the contribution of Leonardo da Vinci to the design of the Mill of Mora Bassa near Vigevano) and buildings still existing from the late 15th century and at least until the end of 19th century, when larger plants powered by hydraulic turbines or steam engines began to spread [6].

Up to the mid-19th century, wheels usually were made of wood and had radially arranged paddles because it was the simplest way to built them; in the second half of the century – in particular after 1868 when a law which imposed a tax on ground cereals was promulgated – the iron Poncelet wheel (conceived by Jean-Victor Poncelet in the early 1820s) began to spread in Lomellina, when technicians tried to make mills more efficient [18].

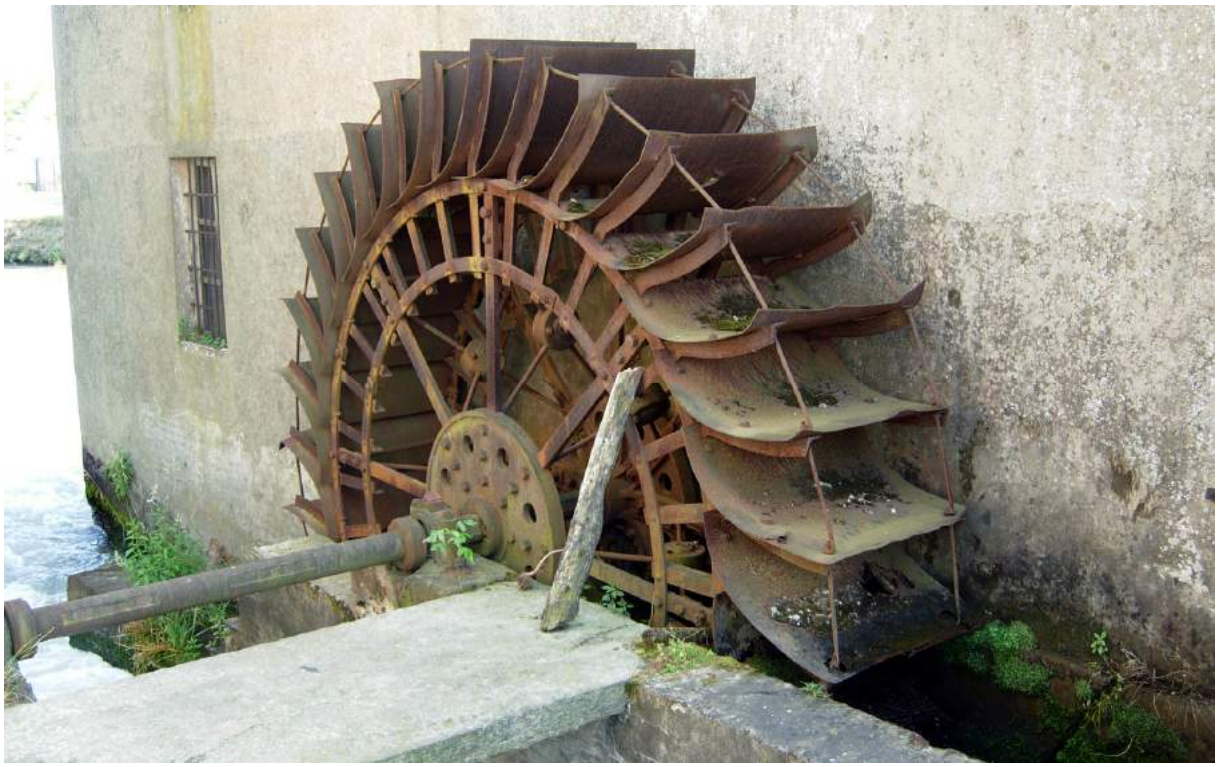

Fig. 2: Iron Poncelet wheel of the Sant'Angelo Mill in Lomellina, whose activity ceased in 1980s (E. Zamperini).

In modern age mills with millstones for grain grinding were joined by those with machines to husk and polish rice, a cereal for the first time extensively cultivated in Europe probably right in Lomellina in late 15th century during Galeazzo Maria Sforza's rule.

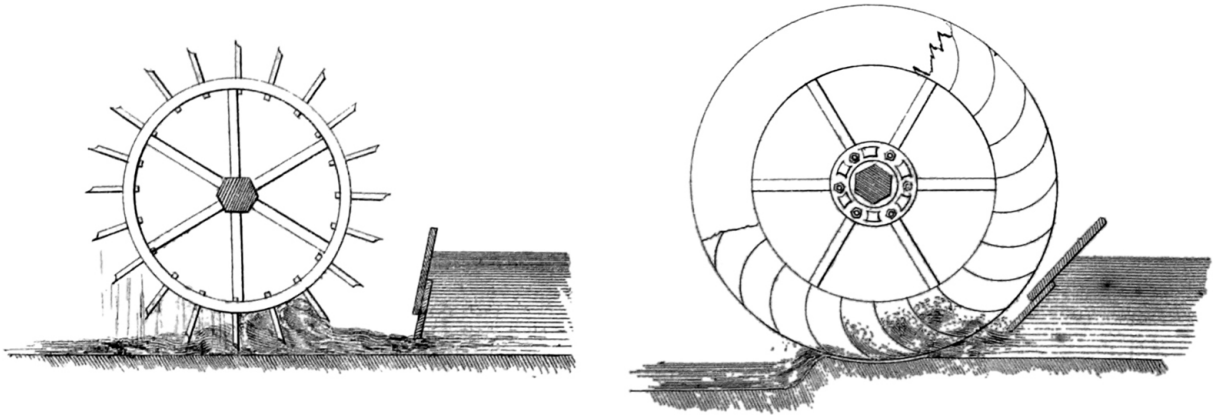

Fig. 3: Schemes of hydraulic wheels used in Lomellina: on the left traditional timber wheel with paddles (flat blades); on the right iron Poncelet wheel with curved blades that increase the efficiency of the conversion of hydraulic into mechanical energy [19].

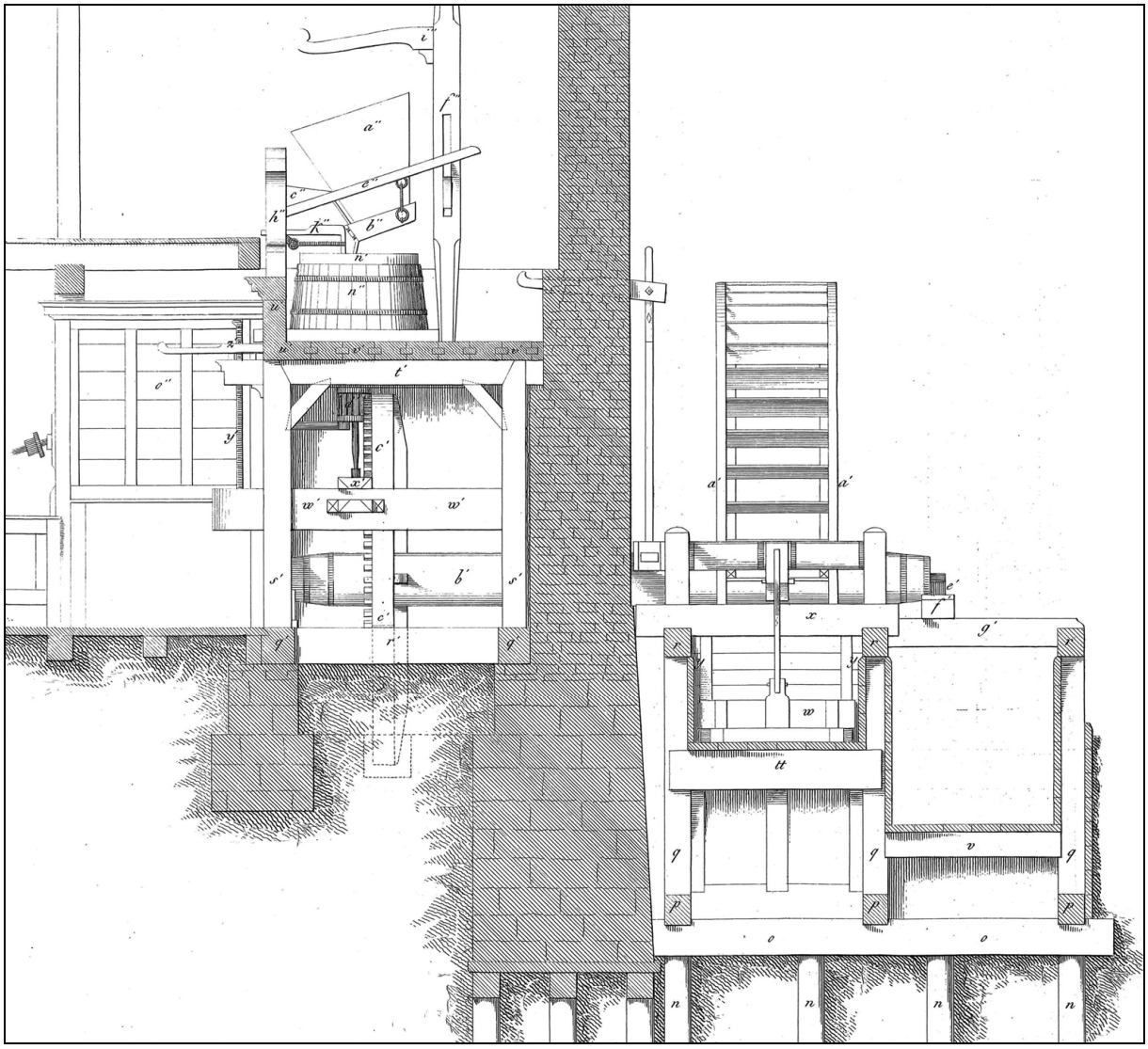

Fig. 4: Cross section of a 19th century mill for cereals [20]. On the right: the canal and the water wheel. On the left: the mill with the machineries for cereal grinding.

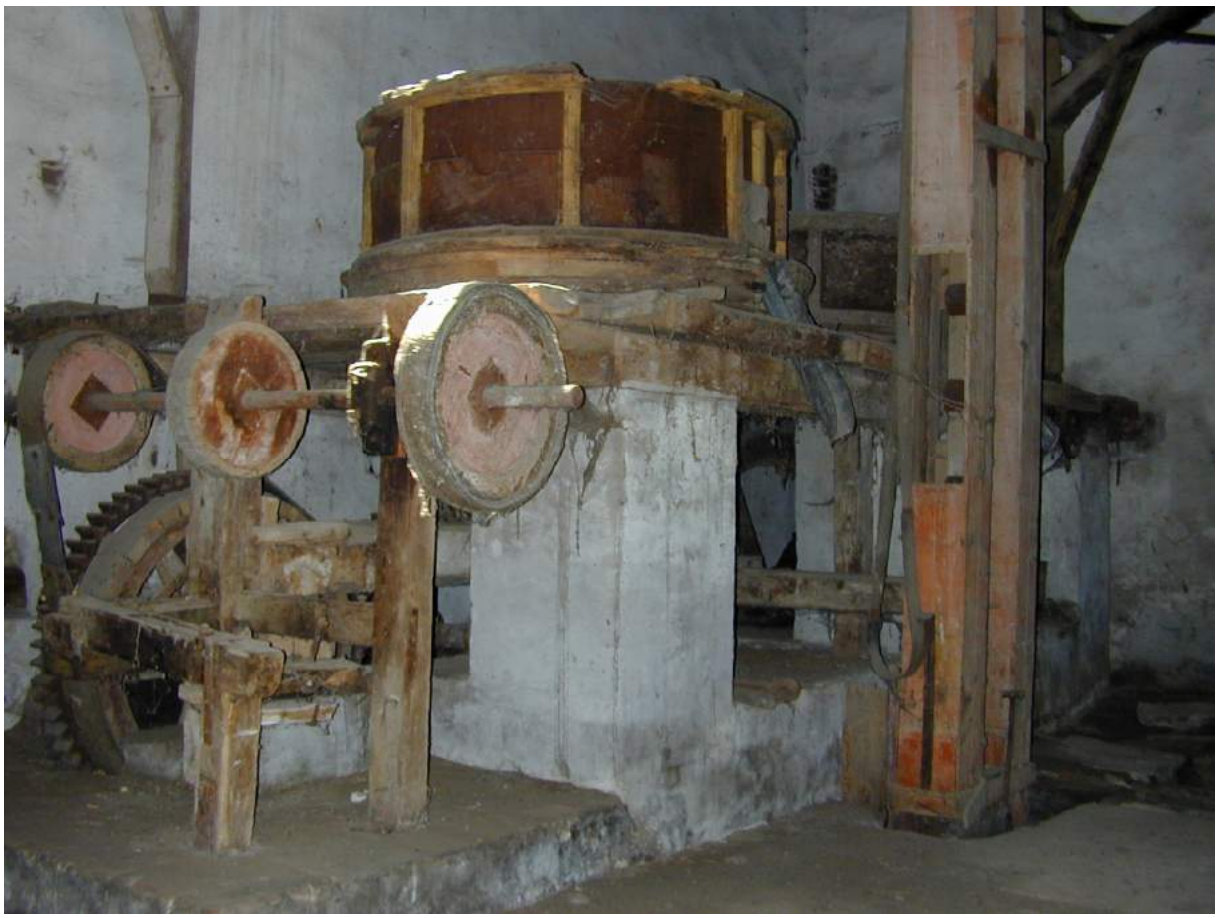

Fig. 5: Grinding machineries of the Sant'Angelo Mill in Lomellina, whose activity ceased in 1980s (F. Turri).

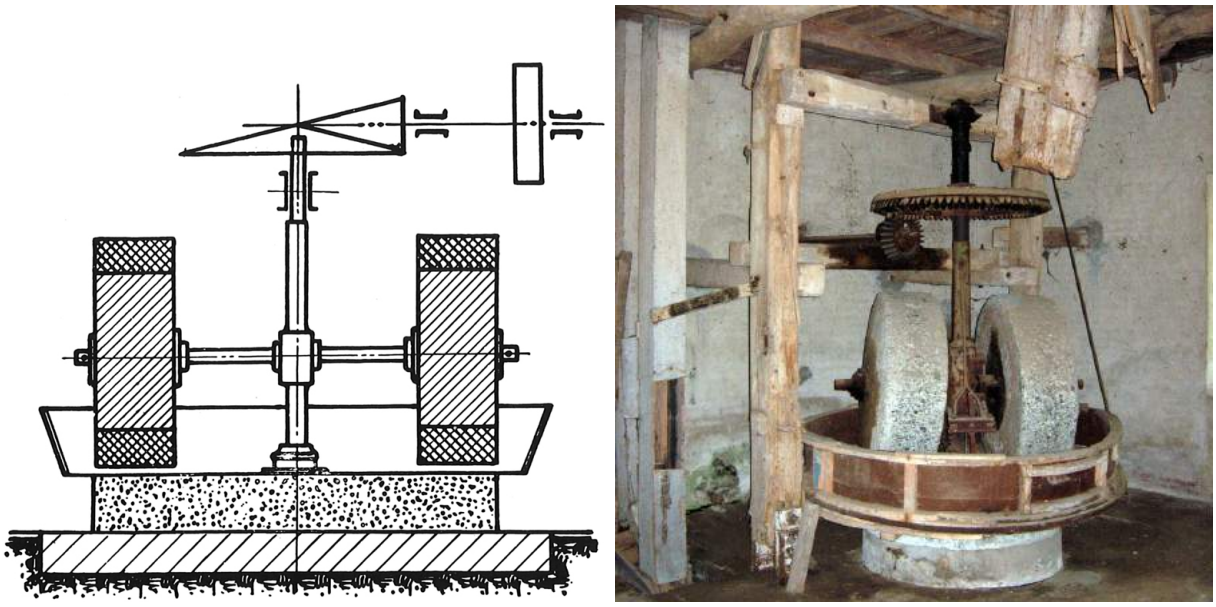

Fig. 6: Machineries used to polish rice. On the left of drawing of the machinery [21]; on the right the machinery in Sant'Angelo Mill in Lomellina (E. Zamperini).

While substantially ceasing to build new traditional mills, throughout the first half of 20th century existing mills continued to be maintained by replacing some equipment with differently conceived machines also used in most modern and larger plants [21, 22].
Social evolution that followed 2nd world war caused historic mills to be progressively abandoned, however many plants continued to be in use for a few decades, undergoing only routine maintenance; for example the mill in Sant'Angelo Lomellina that ceased its activity in 1980s [23].

Almost all the still existing mills have metal wheels (that spread from the last decades of the nineteenth century), because the few wooden wheels not replaced over time – exposed to weather and immersed in canals – decayed over time.
The situation of machineries is different, those still preserved are often – especially in the main parts, that are more durable and more expensive to be replaced – entirely wooden or wooden with metal parts. It's important to note that flour mills sites in rural areas are preserved at a higher percentage and in better condition than other mills and factories to them contemporaneous or subsequent site in urban areas; this is justified by the fact that buildings located in towns underwent the most active production and building urban dynamics, which ensured that plants were constantly renewed in order to maximize their productivity and buildings were replaced with more profitable ones, as the city expanded gradually embedding them in more central fabrics [6].

2.3 From rural building to widespread heritage

As already highlighted, the system of the mills of Lomellina strongly manifests the integration between territory and built heritage, a key theme for the evolution of heritage protection from the "emerging monument" to "widespread heritage".
Going out of use and being gradually abandoned, historic mills underwent a progressive deterioration of their state of preservation; many of them – completely abandoned – have fallen into disrepair and are now in ruins, others – mostly deprived of machinery – have been converted to other uses (e.g. warehouses, houses).
The theme of conservation and valorisation of the material evidence of traditional milling technique is relevant, because hardly any of the surviving building is in fair condition and because there is an ongoing phenomenon of cultural reappropriation of rural areas, that on the one hand creates the conditions for possible funding for preservation, on the other is likely to encourage further serious tampering of buildings and – even more – of remaining plants.
The importance of this heritage become a strategic part of the process of valorisation of agricultural land for recreational, food and cultural tourism, also favoured by Milan EXPO2015; these buildings are in fact among the last material evidence of a now extinct food production chain, closely linked to a territory and to its landscape.

Fig. 7: Sant'Angelo Mill in Lomellina. The mill is made of two buildings – located on the two banks of the canal – one for cereal grinding, the other for the husking and polishing of rice (E. Zamperini).

3. Conservation: criticalities and strategies

The phenomenon of re-colonization of rural areas – ongoing in recent decades after a long phase of depopulation in postwar period – carries risks for the conservation of rural building in general and of the mills in particular. Indeed, there is a contrast between traditional building features and new ways of living, from which a situation of anthropic risk originates, threatening the preservation of the character of rural buildings. However, it's crucial to emphasize that risks of non-reusing may be even higher, and – as demonstrated by many examples of ruined rural buildings – the lack of use can induce abandonment and absence of maintenance, and finally to a state of decay that can quickly lead to total loss of the building. Considering anthropic risks threatening the conservation of rural architecture, it is possible to identify three levels: *territorial level*, *functional level* and *technological level* [24].

From the point of view of *territorial level risks*, the re-occupation of rural areas – particularly peri-urban ones – led to the creation of new often incongruous settlements. New industrial or commercial settlements, as well as new residential areas are built in the territory, with architectures unrelated to surrounding landscape, or to the fabric of existing settlements. In particular, it is frequent the case of small municipalities located along major routes of extra-urban traffic that establish new settlements: shopping centres to intercept people in transit, or housing as districts dormitory quarters in the service of major cities. On the one hand the creation of these new districts can bring to municipalities funds necessary for the restoration and valorisation of mills, but on the other they are often larger than historical centres: they profoundly alter rural landscape and create an imbalance between existing population and that of new settlement, often uninterested in history and culture of the place.

From the point of view of *functional level risks*, the will to recover cultural roots – often implicit in the phenomenon of re-colonization – does not reflect a capacity/availability to readapt to traditional lifestyles. The way of living is mutated and therefore needs related to it have changed. This involves a non-acceptance of the perceived "uncomfort" of traditional houses, from which comes the request to adapt old houses to the current needs (e.g. improving of environmental comfort, insertion of modern sanitary facilities and vertical connections). The aesthetic modification of rural buildings is also frequent; they are altered to suit the tastes of new residents: new often disfiguring gates and fences are erected, modern railings and shutters are added; the insertion of systems does not take into account historical characters and does not try to integrate with the existing structure, thus altering its material consistency and its appearance. The appearance of the building is often distorted with new coatings or with the addition or subtraction of elements to recreate an idealized "rustic" look (e.g. suspended ceilings in plastered reed matting are usually and uncritically removed to bring timber beams in view, plasters are removed to expose masonry texture). Original stairs – generally tightly boxed between walls or closed by wooden boards, considered unsafe or simply uncomfortable – are often replaced by wider and less steep stairs, which completely alter the perception of interiors. Elements considered to be irregular are "corrected": wall surfaces are regularized, size and shape of openings are standardized, traces of historic building techniques are deleted because not understood (particularly after the removal of machinery). Furthermore often new accessory structures are built completely out of the constructive context (swimming pools, garages, etc.).

To the above, in the case of mills we can add a frequent "functional forcing" that aims to transform them into houses adequate to life present standards, considering these buildings as mere building containers alterable at will, with denaturing additions or subtractions of significant parts, to adapt to new functions incompatible with original internal morphology. Among the frequent interventions: demolition of machines, unevenness in flooring, and drainage channels; demolition and translation of vaults and floors to change rooms shape and height between floors; raising of existing roofs in order to obtain a greater number of storeys or to exploit attic rooms, making them habitable.

Moreover the imposition – due to local regulations – of rules out of the morphological and constructive context of rural architecture produced harm to conservation. A typical case is that of the retreat of the entrances to agricultural properties, in the past placed alongside country roads, this is an operation that causes the disruption of the building-road relationship.

Dealing with *technological level risks*, we must highlight that usually interventions of functional rehabilitation and maintenance aren't accompanied by a simultaneous recovery of the traditional know-how related to original materials and construction magisteria [25]. Therefore refurbishment interventions, unfit to relate to and understand the constructive nature of historical artefacts, often involve the demolition or radical distortion of building elements. In this context the role of unprepared and uninformed technicians is twofold: firstly, they are not able to plan and direct operations that are compatible with the pre-existence, therefore to cover their lack of preparation, they rely on uncritical and *a priori* judgements, secondarily they inculcate them in population, creating misinformation and miseducation. The theme of conservation and restoration of mills machinery – usually no longer functional, although in fairly good condition – connects to this level of risk. There is a problem of incapability to relate material and immaterial components; in more updated academic and professional circles, the current trend is to realize restoration interventions aimed at preservation of materials

testimonies, but without investigating and recovering technical and constructive magisteria which are at their basis, in this case the ways to use and “operate” mills; thus technicians do not reach a real understanding of mill as machine-building. This is due to the fact that architects and building engineers are used to deal with and keep in use material testimonies of the past, while usually mechanical engineers – the technicians with the most suitable professional training for the recovery of machinery – neither are interested in historical machines nor they are involved in recovery interventions. The possible restarting of mill machinery for food production – an especially powerful instrument for valorisation, as it’s integrated in the broader trend of recovery and valorisation of local food traditions – collides with technical problems that could be overcome with the involvement of mechanical engineers experienced in historical machines, however, the resumption of food production also clashes with very restrictive food hygiene regulations.

Fig. 8: Confienza Mill in Lomellina is an example of the risks both of abandonment and of reuse: the part of the building on the left – abandoned –is being invaded by climbing plants that will move roofing tiles creating a way of access to rainwater, and therefore to degradation; in the part on the right – reused as house – roof and plasters have been radically renovated completely changing the image and the character of the building (E. Zamperini).

In the absence of specific regulations or guidelines that govern intervention on these artefacts, current strategies for their protection and valorisation can be based almost solely on the declaration of cultural interest (Italian Legislative Decree no. 42/2004), but in practice it can be applied only to distinguished heritage buildings and not to widespread heritage. However we can’t think to reproduce in urban planning the same constraint system, just because it will reproduce the same defects, without even providing the benefits (e.g. tax relief, government funding, etc.) granted by national legislation. Even the method of direct funding of restoration work (by local authorities, foundations, sponsors, etc.) can’t be considered the optimal tool for the preservation of widespread heritage, primarily because – for obvious economical reasons – it might be addressed only to a small number of properties, and in addition because it doesn’t require the owner to have an economically sustainable plan for management of the building over time [26].
Instead it’s necessary that each good is capable of financing at least part of its own maintenance, the first objective to be pursued is therefore to the create at the local level the economic and productive conditions appropriate for achieving autonomously sustainable private initiatives. In this context the protection of this built heritage requires the education of population and technicians and the raise of

the awareness of local authorities on the one hand to ensure that they will promote the draft of guidelines and put in place incentives and tax breaks to encourage more preservation oriented refurbishment projects, on the other hand to create at the local level the conditions for the valorisation of buildings. Local authorities should therefore put in place strategies for the promotion of rural areas, publicizing food excellences and implementing tools for promoting cultural and recreation tourism, for example realizing WebGIS portals that provide online information of channels and paths (eligible to become a system cycle routes local) and on the attraction poles of the territory [27]. Public authorities should also take responsibility for a series of cultural activities: raising awareness of users and professionals about values of agricultural artefacts and importance of their conservation; promoting technical education of professionals with regard to building refurbishment; organizing provincial or regional guidelines for the creation of municipal planning instruments that – through a detailed interpretation existing building technology of compatible intervention techniques – should lead to interventions more oriented to the preservation of constructional character and material consistency of built heritage. These tools should help to overcome constraints of objectual legislation (window-to-floor area ratio, room height, etc.) through a performance-based approach, thus minimizing the risk of alteration of the typological and construction character of buildings and to provide indices for quality assessment of projects, through which determine classes for tax relief [28].
Mills – along with the other buildings most at risk (stables, dryers, etc.) – should be subject to a policy of special protection that guarantees the integral preservation of their value as testimony of material culture. For stables compatible uses may be provided, even if at the cost of a reduction in the area usable; the case of the mills that still have their historic machinery is even more critical, because their presence generally does leave very few space for other functions. The protection of these type of structure shouldn't be carried out only applying restrictions: if owners carry out conservation work and are committed to maintaining the building for a given period of time, a system of compensation and tax relief can be added to the system of restrictions. In particular, the compensation system should allow owners to build – in derogation to floor area ratio – new volumes compatible with built context from the points of view of morphology and landscape. The implementation of this intervention strategy should be based on an economic plan not including the funding of individual refurbishment projects – which would grant only relief linked to quality and conservation level guaranteed by the project – but invests locally in organizing tools for territorial valorisation, in cultural and technical training, and in developing regulations to guide and support design.

4. Conclusions

Mills have a relevant historical-technological interest and are a characterizing part of human landscape of Lomellina, but they are also productively obsolete goods, and the conservation of machineries inside them make them unsuitable for other uses and expensive to be restored. Their preservation is therefore possible only planning to incorporate them into a system of assets belonging to a local infrastructural and landscape network, that can be valorised only with the intervention of local authorities, in particular with the drafting of appropriate guidelines and urban planning tools and with the exploitation of information technology and WebGIS portals.

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Deleting of rising damp in the archaeological site of Piazza Armerina through the application of the technology by neutralising electrical charge T.N.C.

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Abstract
The phenomenon of moisture by rising damp is among the major causes of deterioration of masonry and for it the technical literature sets out different types of consolidation among which the engineer evaluates the best approach to resolve the particular problem.
The choice for each building comes from the analysis of the condition of the sites, the system building - environmental conditions and materials that compose the wall texture. The definition of the intervention is then strongly influenced by the historical and artistic value of the building on which you operate: in the event of buildings with historical and artistic value and decorated surfaces it would be unthinkable operate using conventional mechanical work, chemical or evaporative that are incompatibly invasive.
In these conditions the scientific research is testing innovative approaches by application of the "Technology by neutralizing electrical charge " (T.N.C) that offers two benefits: it preserves precious surfaces and, unlike traditional methods, eliminates the phenomenon at the origin regardless of the variables related to the characteristics of materials. The T.N.C., in fact, acts only on the water introducing an electromagnetic field able to neutralize the electrical potential of the flow inside the masonry, eliminating the action of rising damp.
The article analyzes the application case concerning the adoption of the T.N.C. in the archaeological site of Piazza Armerina in Enna, Sicily.

Keywords: Historical Heritage – Rising Damp – Capillary action - Restoration – Charge Neutralization

1. The phenomenon of rising dump moisture
In the context of interventions on the existing buildings with bearing walls structure, it is frequent to find pathologies of degradation related to the phenomenon of rising dump, which is produced by the interaction between the quantity of water present in the foundation soils, or however in contact with the masonry, and the porosity of the stone elements that compose the masonry textures.
The porosity represents the physical characteristic of the stones which is expressed as the ratio between the volume of voids and the total volume and determine their ability to absorb water from the subsoil and to transport it inside the voids by capillary action. It is known that a higher porosity of the stone improves the characteristics of thermal and acoustic insulation thanks to the low heat conductivity of air with values equal to about 0,026W / MK; however, when as a result of capillary water occupies the voids of the stone elements increasing the degree of saturation, there is a significant loss of these characteristics as well as mechanical strength of the blocks masonry.

The rising dump phenomenon is determined, according to the law of Jurin, by the surface tension and size of the stone pores that allow the water, rich in salts, to penetrate into the stone and to be traced back to molecular attraction effect.
After reaching the maximum ascent height, which is a function of the forces of attraction carried out on the fluid by surface tension of the pores, the water migrates outwards for evaporation and depositing

salts contained in it inside the pores. The crystallization of the salts following the evaporation occurs with an increase in volume that produces a stress state inside the blocks masonry with detachment of the protective layers and loss of strength characteristics.

Fig. 1: Deposit of salts in the pores

2. Types of intervention

In order to determine the most valid restoration methods of masonry affected by rising dump is necessary to make the characterization of the building by acquiring a high knowledge of materials, use of building, interaction with the external environment and of more or less important degradation phenomena: the diagnosis phase is the most delicate because a bad analysis of the primary factors can lead to the wrong choice of intervention methods thus worsening rather than solving degradation.
Taking a quick glance between traditional interventions suggested from common practice, we can identify:

Mechanical interventions which provide a mechanical cutting and sometimes the removal of material from the wall structure to reduce the contact with the soil or to interpose a layer of waterproof material. Among the best known are the "Koch Method", the " unstitch and stitch" and the mechanical cutting with introduction of stone, metallic or waterproof elements to stop the capillary rise.

Chemical interventions by which we put inside the masonry chemical substances with hydrophobic effect able to occlude the pores and reduce the surface tension of the stone providing a barrier to water ski. The chemical interventions are distinguished, depending on the technique of execution, in "impregnation at slow infusion" and "low injection pressure".

Evaporative interventions that are based on dehumidification of masonry structures due to the increase of the evaporating surface. This type of intervention may be realized through the use of siphons and drains carefully arranged inside the masonry or of macro-porous plasters that improve the volumetric capacity of the porous system by increasing the evaporation surface and delaying the formation of internal stresses following the crystallization of the salts.

Electric interventions that act on the natural electric fields which are activated as a result of the potential difference between the construction materials and the ground. The first interventions of the electric type are based on the principle of electro osmosis: a conductive fluid (water) moves in a porous vehicle under the action of an electric field, from the positive pole (anode) to the negative (cathode). The methods of intervention are therefore been devised in order to cancel the potential difference which determines the water ski or to introduce an external electric field that could reverse the trend. This category includes the active and passive electro-osmosis, the phoresis electro-osmosis and the most modern technology of **Neutralization Charge T.N.C.**

The most suitable choice of restoration depends, as already said, by the specific conditions of the case. However, there are some thoughts that have helped overcome some of the exposed methods.

The intervention with Koch's method, for example, is based on the assumption that the absorption of a masonry is directly proportional to the contact surface between it and the water table and therefore suggests to act by reducing the continuous section of the masonry and replacing with arched structures. The application of the method, however, has shown that the intervention does not affect the quantity of water that is absorbed by the masonry but only on the speed of ascent: the specimens tested in fact have all reached the same level of ascent, although at different times.

The mechanical cutting methods with introduction of waterproof elements don't eliminate the causes of the rise but are aimed only to the realization of a barrier that doesn't allow the water to ascend the layers above but sacrifices those below, determining the consequent reduction of the strength characteristics. Moreover, the realization of a continuous cut at the base of the masonry has a negative effect on dynamic behavior of buildings in seismic zones.

The chemical interventions realize a barrier which unlike the mechanical cutting doesn't affect the static of masonry but similarly to the previous method produces an accumulation of water in the layers below.

Even the evaporative interventions don't act on the absorption of water from the soil, but substantially favor the exchange to the outside, probably also fueling the rise. Furthermore the efficacy of the method depends on the correct placing of the macro-porous plasters and thermo-hygrometric environmental regime, and therefore don't constitute universal methods of intervention.

The limit of the electrical work instead lies in the variability of the factors related to the masonry, the characteristics of the materials that compose the wall structure, the concentration of salts in the water and the degree of humidity, which alter the value of the natural electric potential. Furthermore, the operation is greatly influenced by stray currents in the subsoil. However electrical work paved the way for the development of techniques that intervene on the cause of rising damp from the soil in order to effectively promote a recovery intervention of damp walls. Scientific research has developed an innovative system called "TNC" that intervenes exclusively on the behavior of the water molecule in the natural electric field, excluding the dependence on other factors and establishing the efficacy of intervention, influenced only by chemical and electrical characteristics of water.

3. Intervention on architectonic heritage

The correct choice of the recovery method is even more important when we are working on historical buildings restrictions because it is strongly conditioned by the artistic value of the structures.

In case of decorated surfaces, finishes and masonry with high documentary value, we may rightly exclude all the mechanical interventions involving the removal of material and, in the case of insertion of waterproof barriers, the use of new elements that are incompatible with the original structures.
In the chemical interventions similarly we introduce new materials that interact with the natural stone in order to create a barrier to water rise. In this case the impregnation or injection of the chemical products, which penetrates moving within the capillaries of the stone, determine two unknowns on the result of the intervention: the first relating to the composition of the compound and its interaction with the original materials (stones, mortars and finishes); the other related to the porous structure of the masonry that could lead to accidental impregnation of decorative surfaces, altering the aesthetic and formal characteristics.

Furthermore, after what has been observed, it is clear that both the mechanical and chemical methods don't possess the characteristics of reversibility, recognizability and minimum intervention required to the restoration and therefore cannot be considered in these particular conditions.
The evaporative interventions, however, involve the replacement of entire portions of finishes with macro-porous material. The application of the method is not plausible, because the good practices of restoration of buildings with historical and architectural interest require in each case, the maintenance of the originating materials providing, wherever possible, the consolidation of the existing plaster in place of remaking.

It is evident that the only rehabilitation methods we can apply in these cases are electrical one and among them the innovative "technology of charge neutralization" (TNC), which, as shown by the large experimental campaigns, provides a high level of performance and eliminates the interference with the wall structure, preserving the valuable surfaces and, unlike traditional methods, eliminating the phenomenon at the origin regardless of the variables related to the characteristics of the materials.

4. The technology of charge neutralization T.N.C.

This technology is aimed to eliminate causes of rising damp phenomenon by an intervention that doesn't depend from the type of material, the wall structure, the thermo-hygrometric conditions and the amount of water and salts in the masonry.
The scientific study in support of this method is based on the analysis of the movement of water inside ducts of the wall capillaries and of the factors that influence it: in addition to the action carried out by the surface tension and evaporation the moving of water is strictly influenced by the negative

electrostatic potential that is established, in a natural way, on the inner walls of the capillaries, called "Helmholtz double layer".

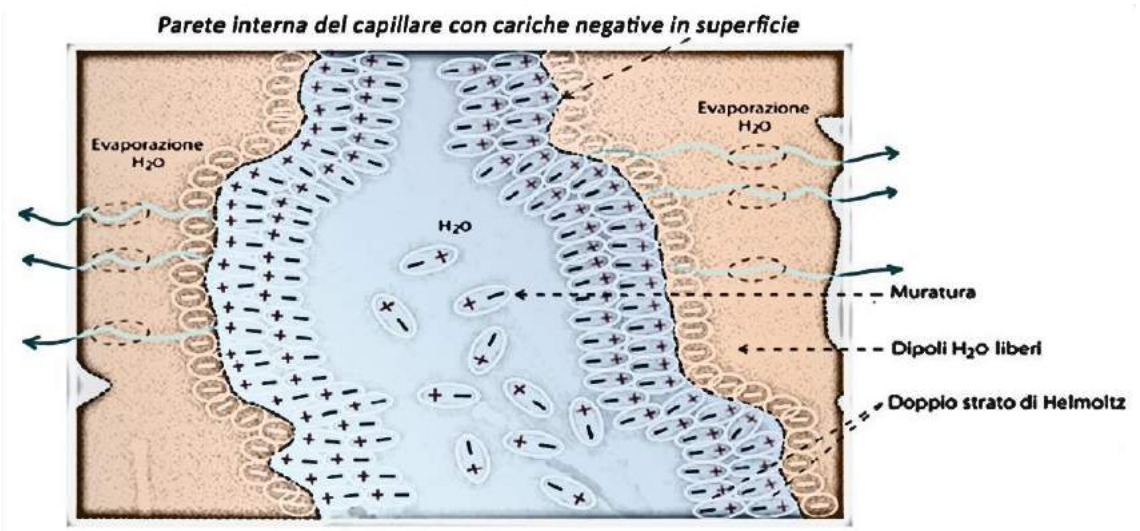

Fig. 2: Schematic representation of the "Helmholtz double layer"

To better understand the mentioned effect we must observe the structure of the materials that compose the masonry to the microscopic scale: most of building materials are characterized by a structure containing silica, a component with a negative electric potential which confers to the inner surfaces of the capillaries the property of attracting water molecules (dipoles): through the electrostatic action carried out dipoles orient themselves with the positive side toward the inner surface of the capillary, configuring a "double layer" defined “Helmholtz double layer”.
The capillary phenomenon of the rise and the evaporation of the water in correspondence of the wall surface of produce a movement of Helmholtz layer from which it generates a weak electrical differential potential between the soil and the wall with values that vary depending on the rise intensity by 10 □20 mV (in the case of weak or absent rise) up to 300 □500 mV (very strong rise).
This evidence shows that the capillary phenomenon is governed by the action of tiny forces of electrical nature.

The technology of charge neutralization T.N.C., therefore, aims to intervene directly on the electrical forces at the origin of the ascent. Such system, having to fight only tiny forces, has much less expensive, in terms of energy, compared to any other traditional system.

The scientific principle behind the method, which aims to eliminate the phenomenon of capillary rise, is based on the application of electro-capillary physical phenomena analyzed in the context of experimental studies of nano-technologies performed by Universities and international Research Institutes since the early 2000s.

In accordance with such experimental studies it is possible to apply an external electromagnetic field to induce changes in the distribution of electric charges at the interface between a conductive liquid (for example a saline solution) and a solid surface (for example an internal wall of a micro capillary).
From the physical point of view this effect offers the opportunity to change the flow of the liquid inside the capillary.

The described technology can be easily applied using the devices T.N.C. Domodry□ of Leonardo Solutions that represent the weak electromagnetic waves pulse generators capable of neutralizing the electrical potential differential of the capillary flow inside the masonry. The waves produced are suitably modulated in order to be harmless to the human organism.

In simple way we can therefore assert that the T.N.C. can neutralize the water molecules canceling the attraction that the capillaries of the masonry exert because of difference in charge.

The Domodry□ device consists of a unit of 28x17x6cm size that is placed inside the building and connected to an electrical outlet. Once in operation it inhibits the capillarity phenomenon, interrupting the ascent of water and neutralizing the water content already present in the masonry which is

gradually kicked out through spontaneous evaporation with variable speed depending on the construction characteristics of the wall, the amount of water initially present and the climatic conditions of the place. At the end of the dehumidification will be enough continue to operate the T.N.C. installation to ensure the maintenance permanently of the equilibrium state (natural hygroscopic damp) reached from the masonry.

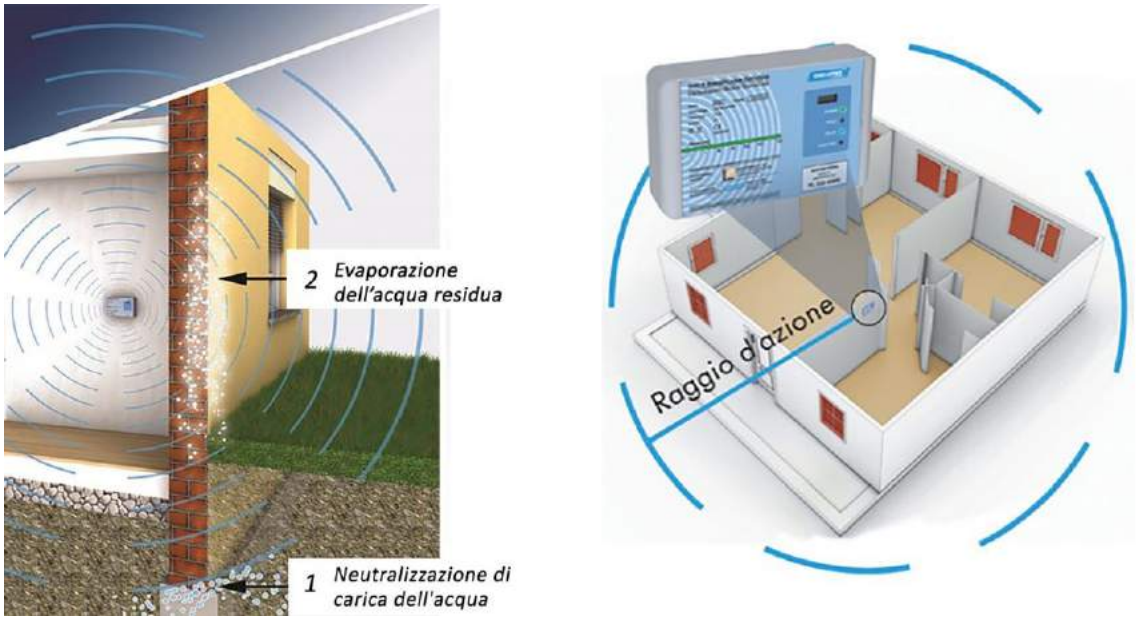

Fig. 3: Working principle of T.N.C. Domodry

The Domodry devices act in a spherical action field with variable radius - in relation to the device model - from a minimum of 6m up to a maximum of 15m, ensuring the dehumidification of all the structures (walls, partitions, floors, etc.).
The pulses generated from the device are far less than those with a normal household appliance and therefore are totally harmless to people and animals. This characteristic has allowed to obtain for the device the certification of "bio-built".

The charge neutralization system Domodry stands for maximum versatility, thanks to the possibility to adapt to buildings of any type and size, and for minimal invasiveness that make it an optimal method of intervention in the conservation of historical and artistic heritage.

5. The case of archaeological site of Piazza Armerina

In order to determine the efficiency of the charge-neutralization technology, Leonardo Solutions has implemented various installations, in collaboration with University and other institutions, for the collection of experimental data that have been evaluated by analyzing the changes of the water content in the masonry in the course of time in different areas subject to the action of the system.

The experiments were conducted in buildings very different both for materials and construction techniques both for the historical and architectural value.

To verify the efficacy of the innovative technology and the complete lack of invasiveness of the method in the context of the architectural heritage, an experiment was carried out by the installation of charge-neutralizing devices in the ruins of the “Villa Romana del Casale” Piazza Armerina (Enna, Sicily).

The Villa, considered an example of representation mansion of the Roman period, became part of the World Heritage Site of Unesco since 1997.
According to some experts, the structure was built in the late imperial period by the will of a Roman governor or probably commissioned by the Emperor himself. To increase the value of the building there are polychrome mosaics whose construction is attributed to African mosaic workers and the rich collection of wall paintings that decorated the exterior and the interior of the residence environments.
The architecture is developed with three main bodies that are oriented each according to its own axis around the large rectangular room with peristyle and the central basin.

Fig. 4: Photo from the archive of the Regional Museum of the Villa Romana del Casale in Piazza Armerina. Author: Mario Noto

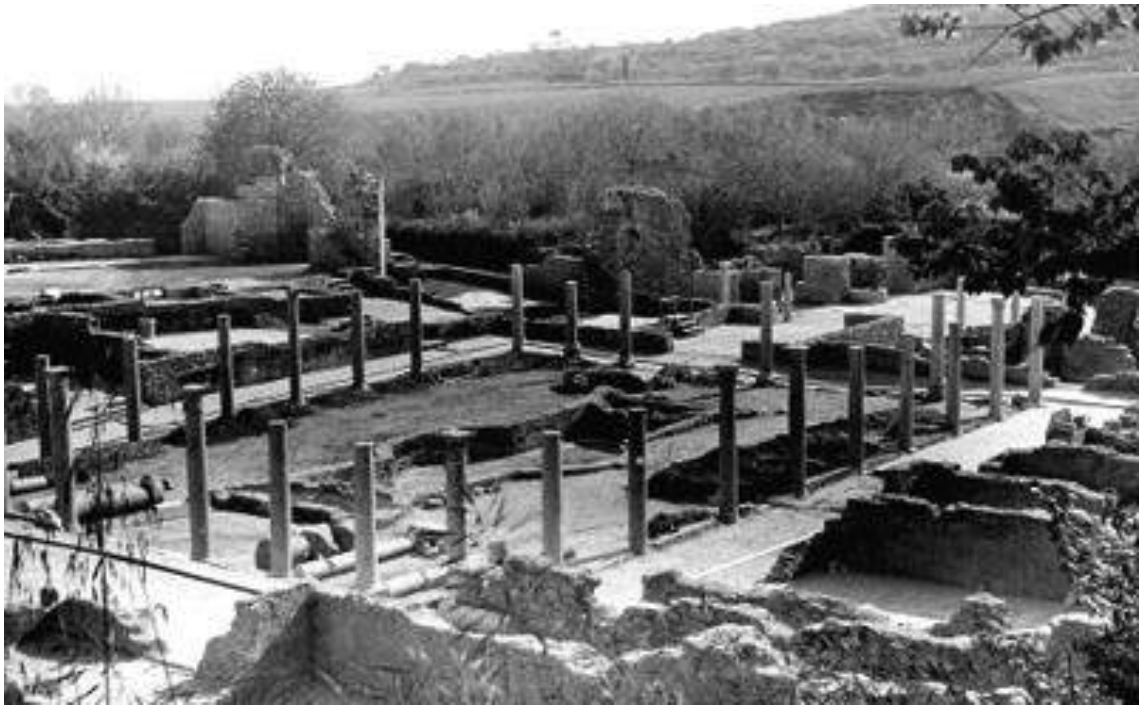

Fig. 5: Central peristyle discovered with the excavations led in the '50s

Archaeological excavations of the Villa were performed since the 30s of the twentieth century, on the basis of the survey conducted at the beginning of the previous century that had led to light part of the ruins and mosaic floors.

After World War II, thanks to the actions financed by the Sicilian Region and the “Cassa del Mezzogiorno”, almost all archaeological works have been completed.

The great discoveries led under the direction of Gino Vinicio Gentili were followed by the competition for the design of the new covers. The winning project, by the architect Franco Minissi, involved the construction of steel structures with closings in plastic slabs. This solution caused an alteration of temperature and humidity conditions on the wall faces helping create of rising damp phenomena that have caused a serious deterioration of the mosaic carpet.

During the modern excavations promoted by the University La Sapienza of Rome, the Museum of the Villa del Casale and the Commission for the Architectural and Landscape Heritage of Enna, have been found more remains of an ancient village of the Middle Ages in the south of the archaeological site area.

View to achieving the consolidation of masonry structures the Villa has been subject to a testing campaign Domodry installed in December 2012.

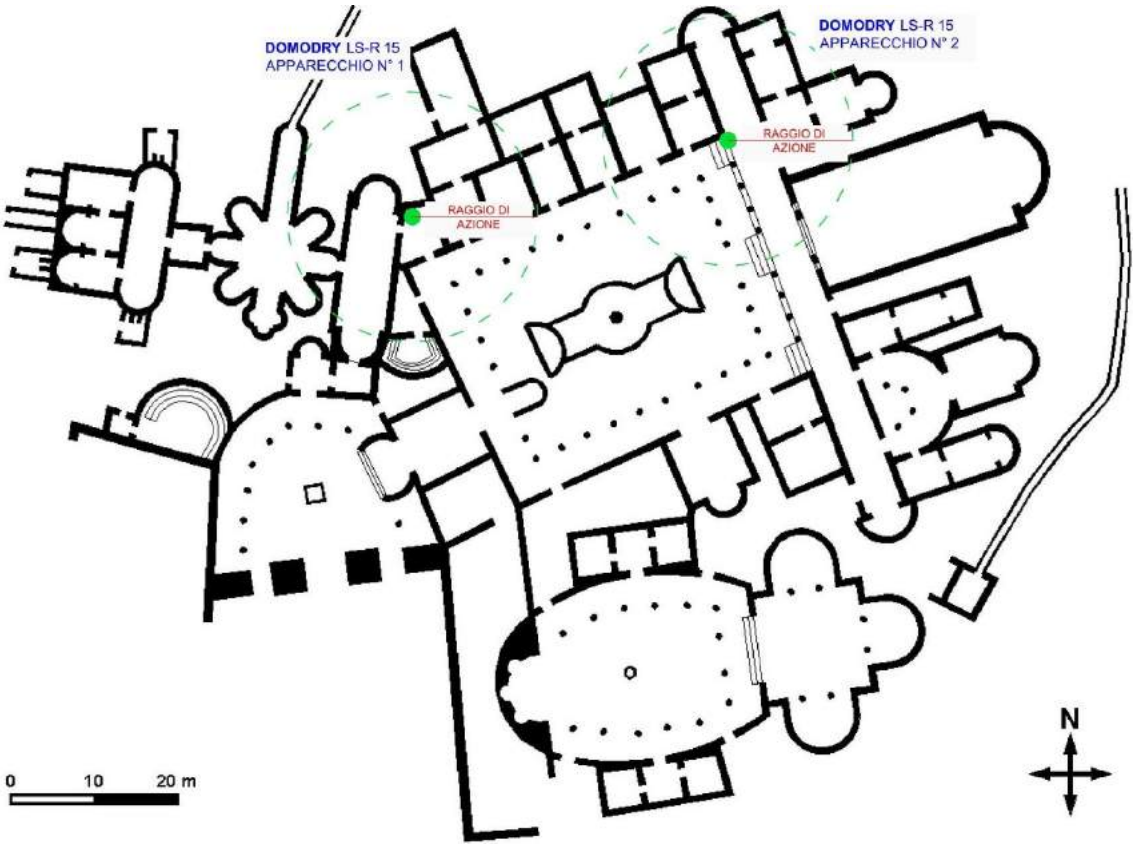

Fig. 6: Installation diagram of the devices

The evaluation of the results was performed using the following survey methodology:

- Measuring of water content in the walls, carried out with the method given by the UNI 11085;
- IR thermographic mapping of the internal surfaces of the building

Measurements were repeated in three sessions for each installation:

1. The first during the installation of the system;
2. The second during the drying step;
3. The third at the end of it

The first device was installed at the Circus Salon or Gymnasium.

Fig. 7: Installation of the first device

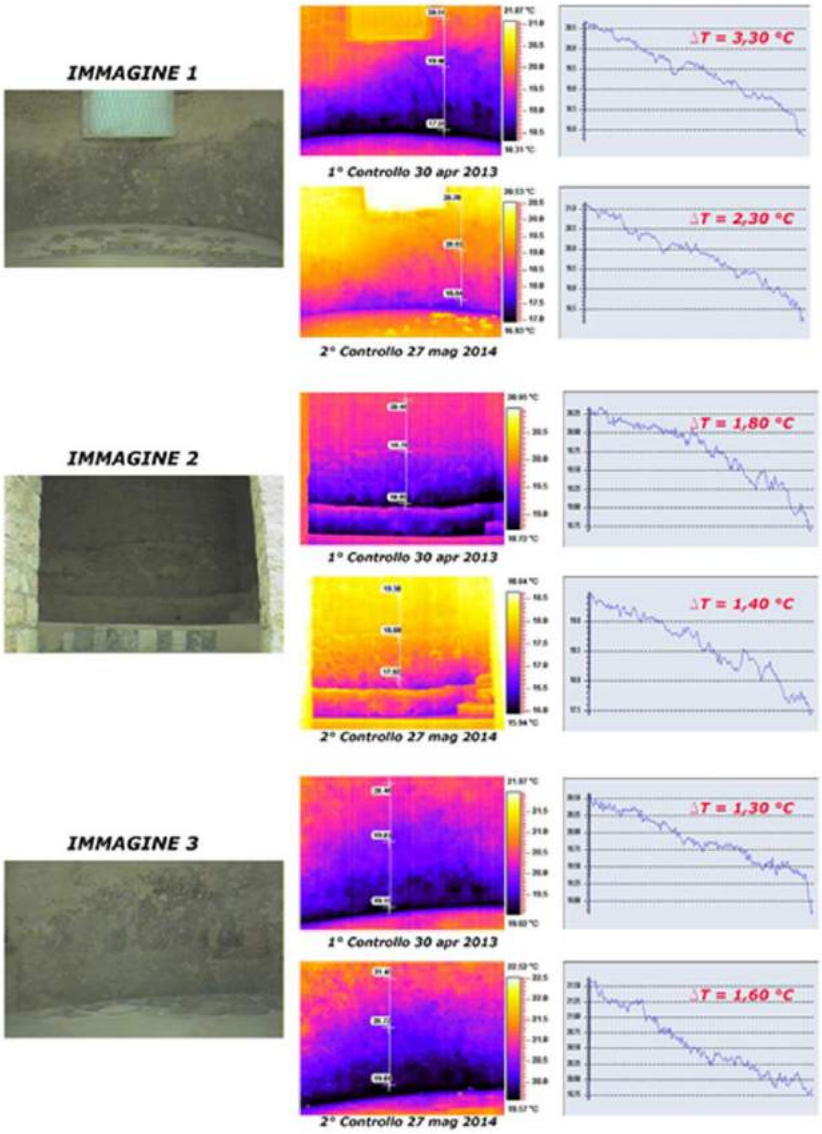

Fig. 8: Measurements repeated in three sessions

The second device was installed at the rooms in the north of the large rectangular peristyle.

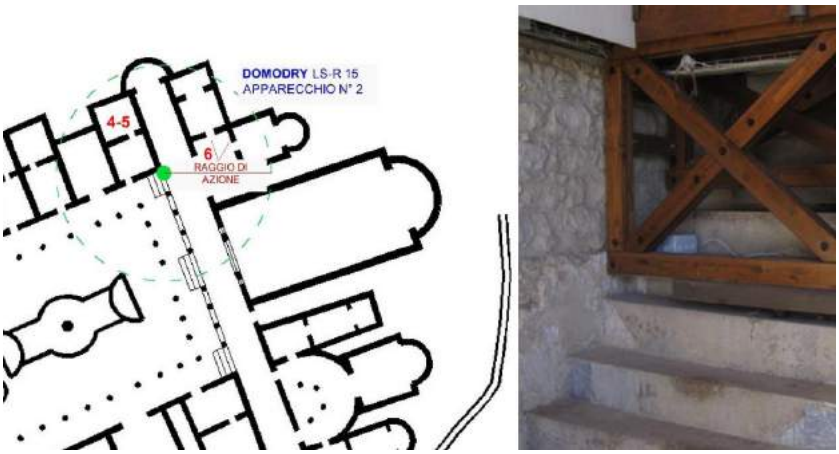

Fig. 9: Installation of the second device

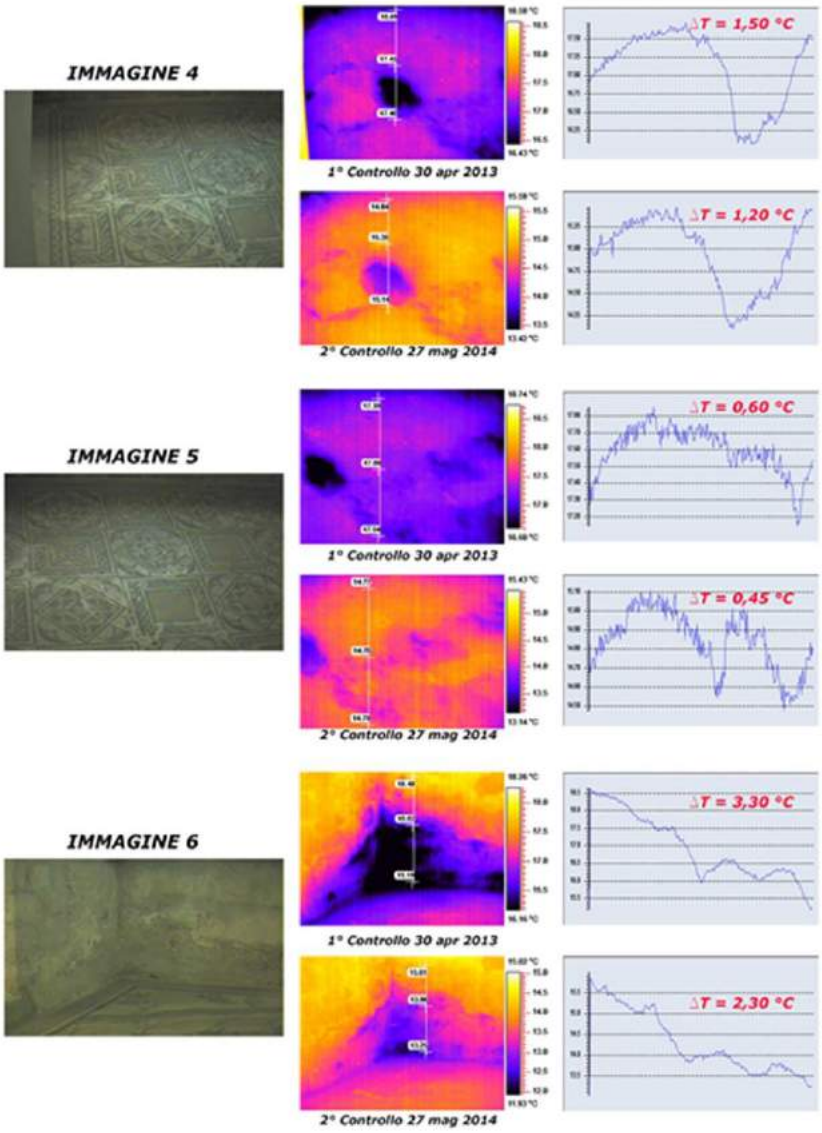

Fig. 10: Measurements repeated in three sessions

Through the comparison of the data provided by measuring of water content with thermographic images of the masonry section, it has been possible define the parameters to extrapolate a good approximation of the value of water content in portions of masonry not directly investigated, comparing the relative thermal images, so as to appropriately limit the number of invasive samples.
In addition on some of the samples taken in the first measurement session, it was determined the content of soluble salts by ionic chromatography, in order to evaluate the extent and the status of the masonry degradation.

The Architect Rosa Oliva, Director of the Regional Museum of the Villa Romana del Casale in Piazza Armerina, has checked that the surveys carried out on site during the first two years after activation of dry out damp masonry indicate positive results in terms of reduction of the initial content of water in the masonry.
The thermographic analysis of last May 2015, made about two and half years after the Domodry□ system installation of , confirmed that the capillary phenomenon was shut down in all areas covered by the action of devices, and also revealed a drastic reduction of the pre-existing masonry damp, both at the level of the floor mosaics, both mainly of masonry walls.

Thanks to the excellent results obtained the Museum Management is determined to extend the installation of devices in total archaeological monument area.

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The application of the integrated M.E.T.A system in the study of the Masseria Ferrara in San Leucio.

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Abstract
In the 18th century the policy implemented by the Bourbon monarchs in the "Terra di Lavoro" led to the formation of a new environmental context, where the agricultural landscape made concrete its organisation through the "Masserie", structures acting as companies for the exploitation of agricultural resources. From the 20th century onwards, there has been a gradual decline of these companies, which are losing, from an architectural point of view, their distinctive features.
Today the protection of these structures, worthy of attention for both constructive techniques and for the high level of integration with the sorrounding landscape, it is of primary interest. Hence the need to use M.E.T.A. software able to support, in the initial phase of the preliminary design, the appropriate technological choices and at the same time, to respond to the energetic and environmental efficiency and to the preservation of typical, architectural and constructive features, in order to evaluate, in advance, the feasibility of an energetically efficient and an historically compatible intervention.
The Masseria Ferrara, inserted into the system of exploitation of the land resources of the Royal site of San Leucio, was chosen as subject of study for the application of the integrated M.E.T.A. system described in the article.

Keywords: history, memory, energy saving.

1. Introduction by C. Giuliano
Today, the technological innovation of historic buildings is a subject matter of fundamental significance since in our country there are 13.7 million buildings, of which 12.1 Million are designated for residential use and the remaining 1.6 Million for a non-residential use. The 70 of these buildings was achieved before the introduction of the law about the energy saving (the first law is the L. 376 issued in 1976) and a quarter of these buildings has never been subjected to requalification or maintenance interventions [1]. This leads to an excessive consumption of energy and resources whereas in Italy the 35 of energy consumptions are due to civil buildings and the 48 concerns the overheating.
All of these parameters may decrease by making incisive interventions on the buildings to improve the energy efficiency of the existing building heritage, trying at the same time to protect the historic heritage in danger of being lost as inadequate to the needs of today.

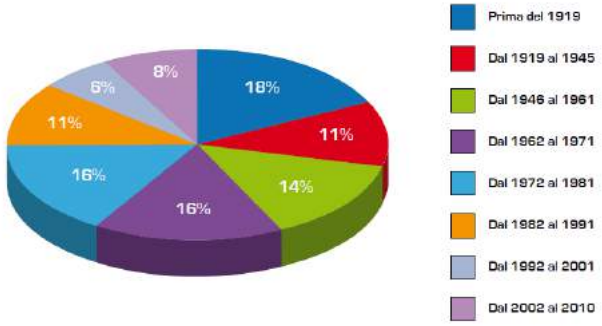


Fig. 1: Subdivision of the buildings by the year of construction (Sources: Istat, Agenzia del Territorio).

This article will present the results of a research project obtained thanks to the possibility of a direct link with the world of industry and services: we had the opportunity to select a business partner, the "Adavanced Systems s.r.l." in Casalnuovo di Napoli (NA), involved in the realization of directional software products and administrative software for great users. Together with this company has been produced an expert system able to support, at least in the initial phase of the meta-project and the preliminary draft, the appropriate technological choices viable able to simultaneously respond to energy and environmental efficiency and to the preservation of typological and architectural features.
This instrument is called M.E.T.A. - that is Metadesign for Energetic and Technological Assessment, is useful to assess, as a precautionary measure, the feasibility of an efficient and historically compatible intervention. The M.E.T.A. system suggests interventions which concern in particular the housing system in order to make it efficient.
The software, according to the Directive 2002/91/UE (D.Lvo 311/06, DM 59/09 and *Linee Guida Nazionali*) is specifically designed for the cataloguing of data collected during the observation of the building and it primarily acts as a container of the measured values for the various components of the structure. It is thus possible, for each component, to set up a detailed list of their elements and to evaluate them.
Each element is associated with the measured values which can then be compared with the inner database of standard reference values.
This procedure will provide, thanks to visual markers, a first feedback about the placement of the measured values.
Once you have entered all the recorded values, for each part of each component, we will observe the situation to figure out where to actually intervene to obtain an overview as concrete as possible. You can integrate this operation with the choice of focused interventions, for each component, reflecting the technological and architectural compatibility of the single parts.
The software will provide a visual assistance, through appropriate indicators, about the possibility, or not, to carry out the interventions.
Once you have achieved an optimal balance between values, results and actions it will be possible to produce a summary illustrating the values inserted in the system for a clarifying overview [2].
The application of the software was carried out on Masseria Ferrara, conveniently contextualized from a historical point of view within the territory of San Leucio to which it belongs. The study documents its current state of decay and neglect. For a potential energetic-environmental recovery of the structure, the planning procedure started from the identification of technological features of the building and from the possible actions to be made to improve performances even respecting the historic and architectural character of the asset.

2. Description of buildings by C. Di Falco

Masseria Ferrara is part of the ample context of the territorial system of Caserta during the Bourbon period, when the attention of the sovereign moved on extended estates in *Terra Laboris*, the Royal Sites used for hunting, for cultivation or cattle farming. In particular, the Royal Sites of Carditello, Calvi and San Leucio, were intended to agricultural and livestock experimentations thanks to the presence of system of villas and farmhouses [3].
The Hill of San Leucio, where there is *Masseria Ferrara*, situated on the slopes of *Monte della Rocca*, was acquired in 1750 by the Bourbons and was part of the territorial organization plan to connect the site to the "new Realm" and to the preexisting Belvedere palace.
The typology of the farm, as a particular form of rural settlement and as a business model, arises from the link of several factors due to the characteristics of the territory, the agrarian landscape, the

settlement dynamics and the organization of the work that inevitably configures the architectural structures [4].
The construction of *Masseria Ferrara* dates back to the last two decades of the 18th century, as stated in the inscription placed outside that recalls the constitution of the annexed chapel by Antonio Ferrara and Giovanna Supino in 1797.
In the "Platea dello Stato di Caserta", drawn up by Antonio Sancio, administrator of the Royal Site of Caserta, there are sources which help for the historical reconstruction of the building, documenting the purchase by the Royal administration in 1808 [5].
At the time of sale, the estate was not in perfect conditions but still enjoyed of many hectares of land planted with vineyards, olive trees and orchards. In 1836, after the cholera plague that hit the territory, the *Masseria Ferrara* was used as hospital.
In 1858 the Masseria was still owned by the Royal family, then it was sold to Nicola Giordano and Teodanna Fortuna.
Today the farm has a structure made of tuff, entirely made of masonry and it mostly corresponds to the nineteenth century report by Sancio, who described it as a courtyard building, consisting of an L-shaped building on two levels, with the short side to the West and the long side to the North.
The lower floor has four arched compartments to the North, plus one under the porch, while to the West side there are four slums with four compartments behind.
An exposed staircase allows the access to the upper floor, where there is a loggia, and the arrangement of the rooms corresponds to the lower floor. Moreover, there is a recently built inner staircase. There is a pitched roof.
In front of the structure there is a courtyard, enclosed by walls, at the intersection of which is placed a family Chapel, typical of big farms.

Fig. 2: Masseria Ferrara.

3. Methodology by C. Giuliano

After the analysis of the territorial context of the Masseria, including the physical features of the land and the local climatic conditions, there has been the check of the walls from a structural point of view. To this has followed the check of the energy potentiality of the roof, the reinterpretation of the thermo-hygrometric features and the behaviors of perimeter walls (opaque and transparent ones).

We have verified, by using the software *Termus* and *Tempest*, the properties of the components of the structure, and for each of them were assessed the performance of the layers of the structure in order to verify the compliance with current law parameters. We analyzed not only the thermal transmittance but also the thermal wave attenuation and phase shift coefficients of the opaque elements [6].
All data were inserted into the M.E.T.A. software. It allowed us to choose the right type of intervention, as, depending on the type of action to be implemented, the intended use of the building and the climate zone (the case study falls within the zone C), minimum requirements are determined.
Since this is an historic manor farm we clicked on "EXISTING BUILDINGS REQUALIFICATION".

Fig. 3-4: Software M.E.T.A. Choosing of the type of intervention.

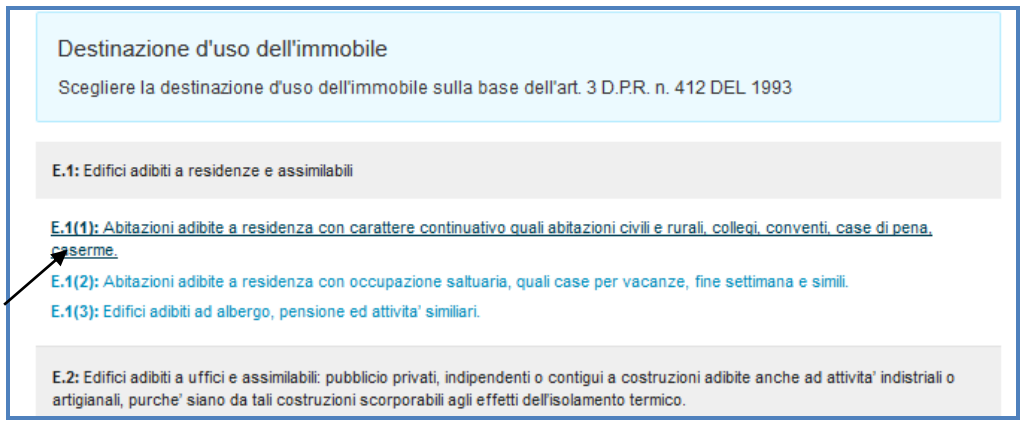


Fig. 5: Software M.E.T.A. Choice of destination of use.

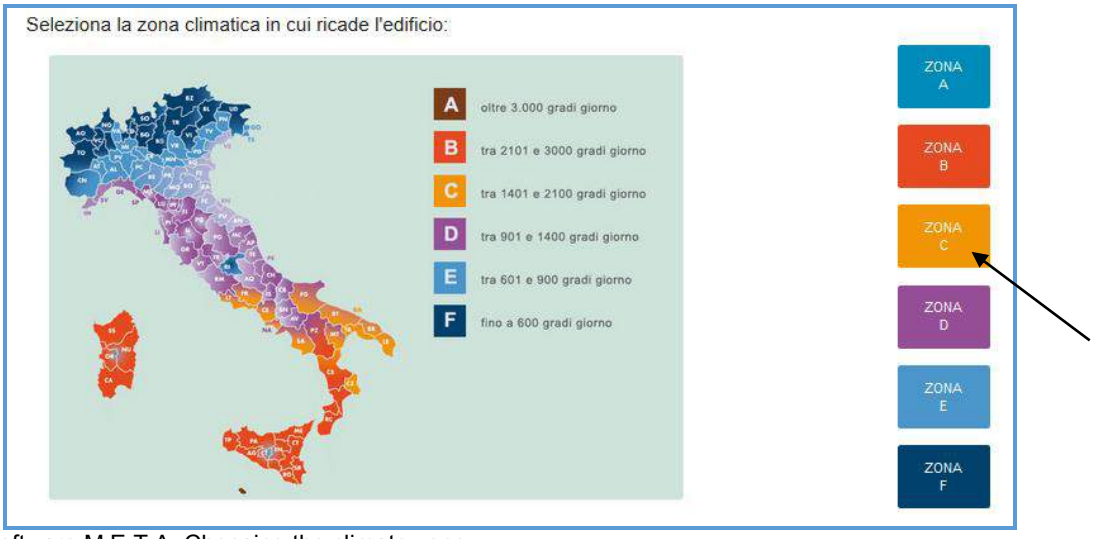


Fig. 6: Software M.E.T.A. Choosing the climate zone.

Then, was made the insertion of the data for the different parts of the building in order to verify the compliance with the parameters of the law.
The software provided us the hypothetical interventions for any disparities, up to produce an illustrative summary with all the values entered into the system with their interventions to create a clarifying overview.

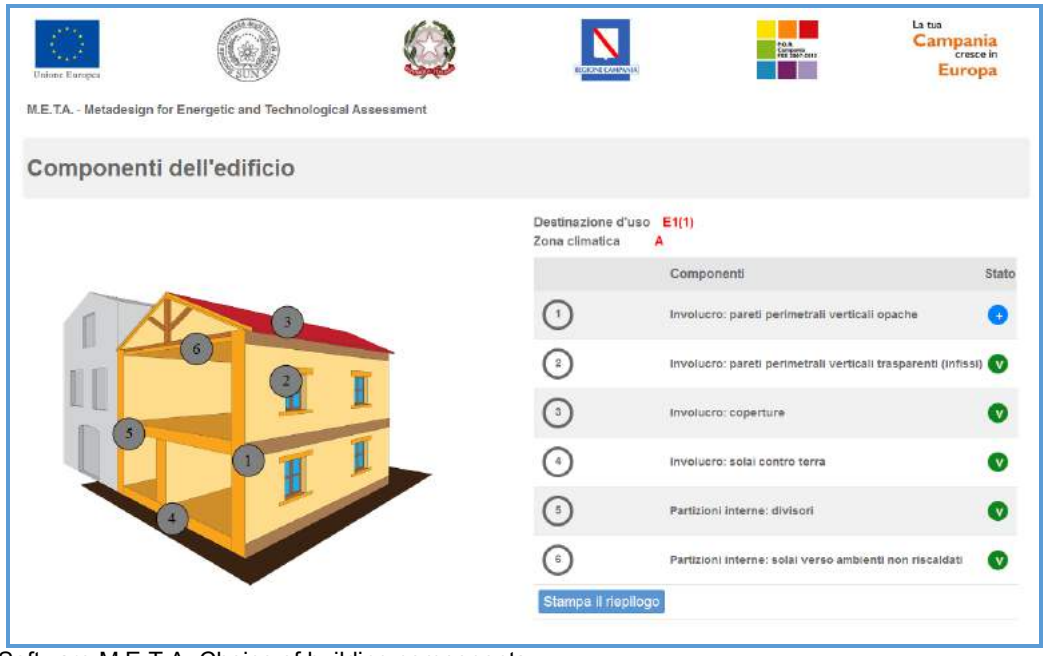
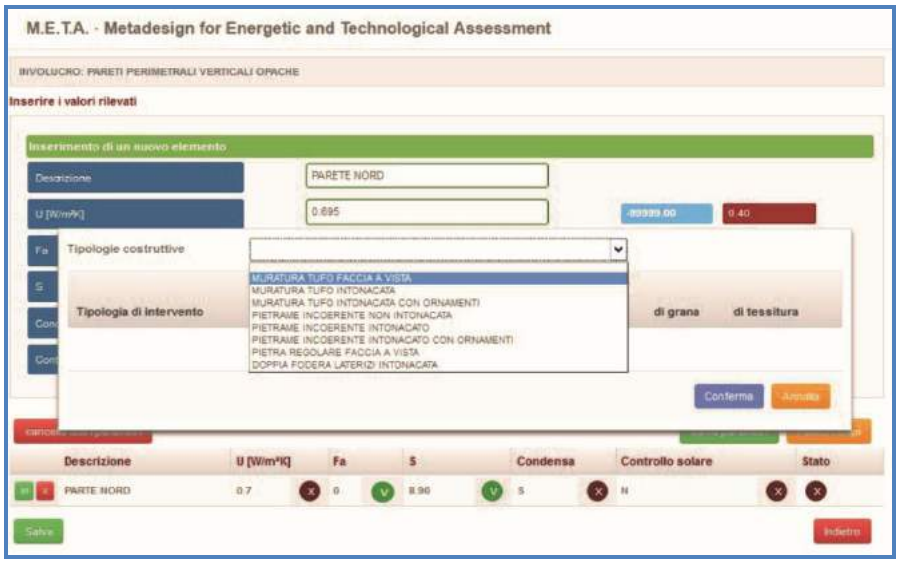


Fig. 7: Software M.E.T.A. Choice of building components.



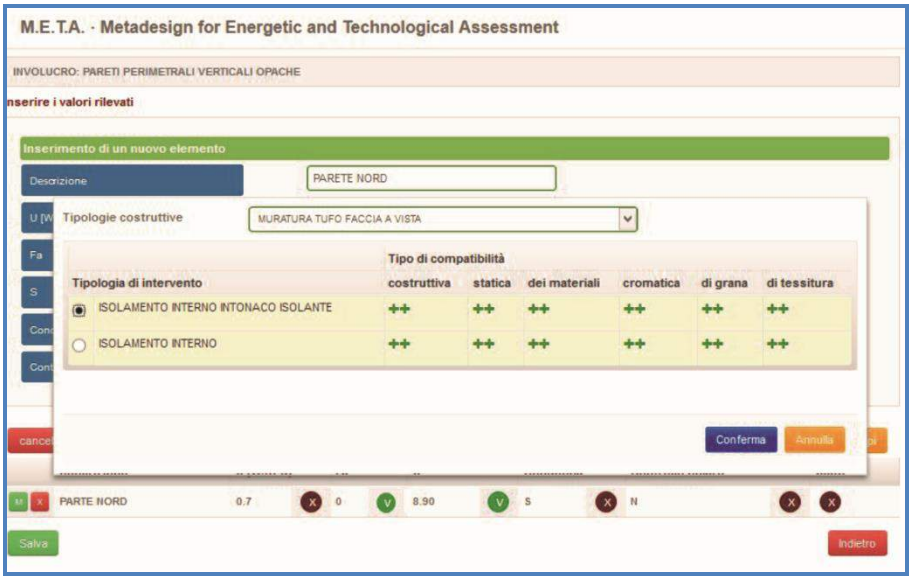


Fig. 8: Software M.E.T.A. This is a screen where is possible to insert the recorded values of the building components and to check them with the parameters of the law.

Tabella riassuntiva delle componenti dell'edificio

Involucro: pareti perimetrali verticali opache

IDENTIFICATIVO	DESCRIZIONE	U [W/m²K]	Fa	S	CONDENSA	CONTROLLO SOLARE	STATO
10	PARTE NORD	0.695	0.00	8.90	S	N	

Interventi proposti

IDENTIFICATIVO	CC	CCR	CG	CM	CODTIPOLOGIE	CS	CT	EL	INTERVENTI	TIPO	TIPOLOGIE
10	++	++	++	++	A	++	++	1	ISOLAMENTO INTERNO	4	MURATURA TUFO FACCIA A VISTA

Involucro: pareti perimetrali verticali trasparenti (infissi)

IDENTIFICATIVO	DESCRIZIONE	U [W/m²K]	Ug [W/m²K]	CONTROLLO SOLARE	STATO
11	INFISSO	2.805	2.105	N	

Interventi proposti

IDENTIFICATIVO	CC	CCR	CG	CM	CODTIPOLOGIE	CS	CT	EL	INTERVENTI	TIPO	TIPOLOGIE
11	++	++		++	AAAA	++		2	INFISSO A TAGLIO TERMICO CON VETROCAMERA A CONTROLLO SOLARE	8	INFISSO SOSTITUIBILE

Involucro: coperture

Identificativo	Descrizione	U [W/m²K]	Fa	S	Condensa	Controllo solare	Stato
12	COPERTURE	4.00	0.00	0.00	N	N	

Interventi proposti

IDENTIFICATIVO	CC	CCR	CG	CM	CODTIPOLOGIE	C S	CT	EL	INTERVENTI	TIPO	TIPOLOGIE
12	+	+	+	+	AA	+	+	3	TETTO VENTILATO	13	COPERTURA PIANA A FALDE INCLINATE CON STRUTTURA IN LEGNO

Involucro: solai contro terra

Identificativo	Descrizione	U [W/m²K]	Fa	Condensa	Stato
13	SOLAIO A TERRA	4.2657	0.8868	S	

Interventi proposti

IDENTIFICATIVO	CC	CCR	CG	CM	CODTIPOLOGIE	C S	CT	EL	INTERVENTI	TIPO	TIPOLOGIE
13	++	++		+	CCCCC	++		4	ISOLAMENTO	16	SOLAIO A TERRA

Partizioni interne: divisori

Identificativo	Descrizione	U [W/m²K]	Stato

Partizioni interne: solai verso ambienti non riscaldati

Identificativo	Descrizione	U [W/m²K]	Fa	Condensa	Stato
14	SOLAIO VER SO SOTTOTETTO	2.858	0.88	N	

Interventi proposti

IDENTIFICATIVO	CC	CCR	CG	CM	CODTIPOLOGIE	C S	CT	EL	INTERVENTI	TIPO	TIPOLOGIE
14	++	++	++	++	BBB	++	++	6	ISOLAMENTO ESTERNO	19	TRAVI A VISTA

Fig. 9: Software M.E.T.A. Summary table of the building components and interventions to be made.

The results of the test showed that the building has very poor performance as far as concerns the thermal insulation with a transmittance higher than the values prescribed by law.
However, the strength of the building is the high thermal inertia of the walls due to their considerable mass.
This helps to considerably reduce the high thermal oscillation of the external environment guaranteeing adequate levels of comfort especially in summer.
Therefore, as provided by the software M.E.T.A., the interventions to be carried out on the structure are aimed at reducing the value of the thermal transmittance of the vertical walls and floors on the ground though an internal insulation and of the floor towards the attic with an outer insulation; these are the only suitable solutions which respect the historic and architectural character of the structure.
We have chosen to use environmentally friendly materials in most of the interventions, as these are materials that have the following requirements:

- They do not emit toxic substances (dust, radiation, gas ...) both during the production phase and at the time of use;
- They allow the constant ecological conservation of the product at every stage of use and processing, avoiding to damage the environment and the operators;
- They have not undergone transformations in the change of the structure and its chemical composition, so they are not polluting;
- A little energy is used for their production, transportation, use and must possibly be found on site, thereby reducing the costs and the pollution due to transport;
- Once their function is over, they must return to nature, or be reused in other processes or in other fields. Material recycling is also required as a function of energy saving;
- They show durability and maintainability in order to avoid energy and economic waste;
- They are good protector of energy [7].

The interventions about the structure evaluated during the design phase considered the addition of a new layer of thermal insulation for the dispersing walls, realized by the installation of an insulating plaster; while the thermal insulation regarding the floors against the ground and those towards unheated rooms are designed with insulating panels of hemp fiber and Kenaf placed on the inner surface, in the first case, and on the outer surface in the second case.
Since this is an old abandoned farm it shows discontinuity at various places and different problems. The software suggests performing an internal or external insulation or a ventilated roof. In the case of the Masseria should be performed a complete remake of the roof, after having obtained a positive opinion by the Superintendence of Architectural and Artistic heritage, thus creating a ventilated roof to solve all the problems.

Another problem is the absence of the frames in the structure and then, at the design stage it was assumed (as suggested by the software) to introduce doorframes with thermal insulation with double glazing to ensure a good thermal comfort and to avoid problems of disturbances, or solar control glazing with thermal break doors where sunshine problems arise due to increased sun exposure.

4. Conclusions by C. Di Falco

To carry out interventions on a historic building placed in its context, it means to rethink at it as a structure suitable for a current use, in which is important to guarantee adequate energy performances in combination with the lowest consumption of resources. The interventions suggested by the M.E.T.A. software would allow obtaining optimal solutions to consciously manage consumptions, improving the structure's performance, trying not to transform its conformation, in accordance with the architectural and cultural heritage of our territory.

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Evaluating impacts of Cultural Heritage Valorization - or Historic Preservation- : a comparative overview Italy – USA

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Abstract
The article deals with the issue of the evaluation of the impacts resulting from Cultural Heritage Valorization - or Historic Preservation -. If the Cultural Heritage is indeed a "lever for economic and social development", then advanced evaluation methodologies are needed to assess the outputs of the valorization activities on the local economy (cultural, economic, and social effects such as employment, tourism, property values, tax system, etc.).
Starting from an overview of the actual studies and reports in Italy, and specifically, in Campania Region, the article explores the efficacy and the relevance of the Preservation Economic Impact Model ("PEIM")*, created by the Rutgers University Center for Urban Policy and implemented in about 15 USA states. Despite the different availability and quality of the data in the Italian statistical system, an effort to better understand the relationship between valorization/historic preservation and economics should be made in in the perspective of the "multiplier effect".

Keywords: Cultural Heritage, Valorization, Historic Preservation, evaluation of the impacts

1. Introduction[1]

Before considering the issue of the evaluation of the impacts connected with the valorization of Cultural Heritage, some brief considerations about the two different approaches (USA-Italy) in the protection, conservation and enhancement of the Cultural Heritage need to be discussed.
Historic preservation is a term used only in the United States and it indicates a movement emerged during the decades preceding the Civil War, with efforts to preserve resources associated with significant figures and events in American history. Public concern over the possible loss of historic sites and buildings prompted Congress to adopt the *Anti□uities Act of 1906*, offering protection to prehistoric and historic sites located on Federal lands. The 1906 Act prohibits the excavation or destruction of antiquities from public lands without a permit from the Secretary of Interior and authorizes the President to declare lands owned or controlled by the federal government as "national monuments," thereby preserving them for future generations.
A national policy of preserving historic resources of national significance for public use was established by the *□istoric Sites Act of 19□□*, which established the National Historic Landmark Program. This legislation further empowered the Secretary of the Interior, acting through the National Park Service, to use the Historic American Buildings Survey to survey, document, evaluate, acquire and hopefully preserve archaeological and historic sites.

[1] The opportunity to deepen the subject take the cue from the collaboration in the International Course "Development and Preservation in Large cities: an International Perspective" instituted, since 2012, by the Department of Architecture and Industrial Design "Luigi Vanvitelli", the Benecon Competence Center, and the Edward J. Bloustein School of Planning and Public policy at Rutgers, the State University of NJ, USA. Fabiana Forte is author of the paragraphs 1 and 2, David Listokin is author of the paragraph 3.

In the 1950s and 1960s «national federal programs ranging from urban renewal to the interstate highway system, fueled the demolition of many historical buildings. Partly in reaction to the widespread loss of historic places and growing social environmental sensitivity, a preservation system developed by the 1960s»[1].
The National Historic Preservation Act of 1966 (NHPA), is considered «the key federal law that establishes a federal policy for the preservation of cultural and historic resources in the United States» [2] introducing the National Register of Historic Places (NRHP).
There are multiple criteria for being listed on the National Register (e.g., historical, architectural and/or arachaeological significance) and once listed in the National Register, properties are afforded some procedural protection from adverse governmental action and may also become eligible for federal historic tax credits.
The NHPA also created the federal *Advisor Council on istoric Preservation*, with similar functions to the Italian Soprintendenza. State governments participate in the federal preservation effort in the USA (e.g., they are active in the National Register process, participate in the review of adverse governmental actions and some have state-level historic tax credits). Local governments sometimes implement similar listing, regulatory, and tax-helpful preservation programs. Table 1 overviews major American federal preservation legislation over time.

Year	Legislation	Activity (Partial)
1906	Antiquities Act	Designates and protects historic "monuments"; regulates excavations
1916	National Park Service (NPS) established	NPS "houses" federal preservation activities (e.g., National Register)
1935	Historic Sites Act (HSA)	Basis for National Historic Landmarks
1966	National Historic Preservation Act (NHPA)	Key federal preservation law; establishes: National Register of Historic Places; Section 106 review of federal actions threatening Register properties; Advisory Council on Historic Preservation (ACHP)
1966	Department of Transportation Act	Section 4(f)—transportation projects shouldn't use historic or park resources unless there is "no feasible or prudent alternative"
1969	National Environmental Policy Act (NEPA)	Prepare environmental impact report on "major federal actions significantly affecting environment," including historic resources
1974	Archaeological and Historic Preservation Act (AHPA)	Extends archeological protection and recovery
1979	Archaeologic Resources Protection Act (ARPA)	Protects archaeological resources on federal/Native American lands; permit system for archaeological excavation on federal lands
1980	NHPA Amendments	Requires owner consent for National Register listing, establishes certified local governments (CLGs)
1981	Economic Recovery Tax Act (ERTA)	Establishes tax credits (25%) for historic preservation
1986	Tax Reform Act (TRA)	Reduces historic tax credit to 20%
1991	Intermodal Service Transportation Efficiency Act (ISTEA)	Encourages "intermodalism"; Transportation Enhancement Activity (TEA) funds can be used for historic preservation improvements
1992	NHPA Amendments	Penalizes "anticipatory demolition" by federal agencies; mandates greater federal agency stewardship of their historic properties
2012	Moving Ahead for Progress in the 21st Century	Modifies TEA funds for preservation (originally authorized by ISTEA)

Table 1: an overview of selected USA federal legislation: source Listokin [1]

In any case it is important to underline two main aspects which substantively differentiate the USA preservation approach from the Italian framework. First of all, the non-invasive policy of the central USA government which leaves large margins of operation to private initiatives, strongly stimulated by financial tax deduction (Historic Tax Credit); then, a legislative framework (at federal, state and local levels) more oriented towards the *valorization* rather than the *preservation* of cultural goods [3].
At the European Union level, the term "Cultural Heritage" is used to speak about preservation; it includes natural, built and archaeological sites; museums; monuments, artworks; historic cities; literary, musical, and audiovisual works, and the knowledge, practices and traditions of European citizens. While the Member States are principally responsible for their own cultural heritage policy, European cultural heritage benefits from a range of supportive measures (policies, programs and funding) aimed at preserving and promoting it [4].
Currently, Horizon 2020 is the biggest EU Research and Innovation programme, with 79 billion euros of funding available over 7 years (2014 to 2020). In the period 2014/2015, about 71 M € will be dedicated to the protection, conservation and enhancement of tangible and intangible cultural assets. The European Commission has published on 14 October 2015 a new set of calls for proposals within the framework of its Horizon 2020 research programme; this new set of calls allocates a substantial budget for cultural heritage which confirms the growing European support to the sector.

However, with the current recession, in Italy, as in other European countries, the involvement of private subjects in the preservation of Cultural Heritage has become a relevant issue, that depends on several factors, above all, the scarcity of public resources.
In recent years, in fact, the Italian government is strenuously promoting a more direct involvement of the private sector, being significantly cut its cultural budget (which represents only 0,10 of the GDP). With it not being a case that Italy, among the other European Union state members, is one of the states which spends less on culture [5], despite its extraordinary Heritage.
As several studies and reports in the field of Cultural Economics have highlighted for a long time, the traditional approach that considered this Heritage as "immutable" has been overcome by an approach that recognizes its vitality, or productivity [6], as well as, its preservation, is understood as a "productive" activity carried out for "social use" [7]. This obviously represents the economic gain and the social benefit yielded through the conservation, which – as it obtains a greater value – may be also understood as valorization.
And, it is in this perspective that the notion of *valorization* should be interpreted. In Italy, this notion is particularly debated because there is a "culture of conservation" that prevails and it enforces a very ancient legislative tradition which must be "proudly" defended (started from the period that precedes the unification of Italy, passing from the 1939 legislation), but there was not a "culture of valorization". In other words, the country has little invested in its cultural heritage, little providing to management efficiency and secure funding.
As set out in the *Italian Code of the Cultural and Landscape eritage* (Legislative Decree n. 42/2004), *valorization* (or enhancement) consists of the exercise of the functions and regulation of the activities aimed at promoting knowledge of the cultural heritage as well as ensuring the best conditions for the use and public enjoyment of the heritage. A private subject may concur, co-operate or participate in such activities.
Then, in a purely economic interpretation (concerning the *mise in valeur*), it is possible to consider valorization as a way for an "entrepreneurial" management of the cultural heritage, able to producing revenues for its preservation. It is important to underline that this interpretation does not aim to increase the market value attributable to the cultural asset, but rather to attract resources for financing its conservation and accessibility [8], providing it with the "social plus value"[9].
This obviously represents the economic gain and the social benefit yielded through the conservation, which – as it obtains a greater value – may be also understood as valorization. In this perspective, valorization nowadays refers not only to the cultural dimension of Heritage, but also to the economic one, in terms of impacts on employment, increasing of entrepreneurial activities, territorial regeneration and development.

2. Evaluating the impacts of valorization

In the last decade Cultural Heritage policies at European level (Council of Europe) evolved from a "conservation-oriented approach" towards a "value-oriented one". This new approach emerges, first of all, in the *Framewor Convention on the Value of Cultural eritage for Societ in 00*, which recognizes Europe's cultural heritage «an irreplaceable repository of knowledge and a valuable resource for economic growth, employment and social cohesion » [10].
More recently, in May 2014, the Council of the European Union adopted *Conclusions on cultural heritage as a strategic resource for a sustainable Europe* where cultural heritage is recognized as a major asset for Europe. It plays an important role in creating and enhancing social capital and has an important economic impact, including as an integral part of the cultural and creative sectors.
This because, among other things, cultural heritage: « constitutes a powerful driving force of inclusive local and regional development and creates considerable *e ternalities*, in particular through the enhancement of sustainable cultural tourism. Cultural heritage additionally supports sustainable rural and urban development and regeneration and generates diverse types of employment. Further, cultural heritage plays a specific role in achieving the Europe 2020 strategy goals for a "smart, sustainable and inclusive growth" because it *has social and economic impact* and contributes to environmental sustainability.
Cultural heritage cuts across several public policies, beyond the cultural, which have a *direct or indirect impact* on cultural heritage and, at the same time, cultural heritage offers a strong potential for the achievement of their objectives. Therefore, this potential should be fully recognized and developed» [11] and then, a rigorous evaluating process occurs.
Following the EU Council, the European Commission adopted in July 2014 the communication *Towards an integrated approach to cultural heritage in Europe*, where is underlined (point 1.2) that «the economic value of heritage has recently come into research focus, but only partial estimates of its importance are available… To increase understanding of the actual and potential role of heritage in policy development, it is important to improve systematic data on its economic and social impacts»[12].

In this direction is ranked the project *Cultural □eritage Counts for Europe: Towards an European Inde□ for Valuing Cultural □eritage*, the EU culture programme launched in 2013 [13].
It is clear that the issue of the evaluation of the impacts connected with the valorization of Cultural Heritage has become relevant in the policy agendas, both at European level and at national level.
The Italian semester of presidency of the Council of the European Union (from 1 July to 31 December 2014), placed Cultural heritage and Tourism in the core of the Community policies choices. It is meaningful that the conference, organized by the General Direction for the valorization of the Cultural Heritage (MiBACT - Ministero per i beni e le attività culturali e il Turismo) during the Italian presidency, was titled: *Measuring impacts of cultural heritage valorization. Tool for evidence based policies* (Rome, October 13-14, 2014).
A specific session of the conference was dedicated to "Measuring impact: metrics for policies". In accordance to the program, «in order to avoid a rhetorical approach to cultural heritage values, it is preeminent to provide reliable and suitable indicators to be put in place for calculating the instrumental benefits - economic, cultural and social ones – of cultural heritage valorization.
Quantitative data must highline not only economic-financial impacts but they must also capture multidimensional, long term effects such as increasing cultural capital, strengthening social cohesion, reducing unemployment and enhancing better quality of life, etc. An increasing awareness of the potential instrumental short term – long term outputs on local communities is really the starting point to define innovative policies of cultural heritage valorization; these policies must be communicated and shared with public, stakeholders and local communities»[14].
In Italy, the theme of the conservation and valorization of the cultural built heritage is traditionally important to the disciplines of appraisal and evaluation. Since the 1970s the approach to Economic Conservation by the Neapolitan School of Monument Restoration [15] has identified several values for the historical and cultural heritage, thus, further refining the study of components and different categories of users: from the 'social surplus value' to the 'complex social value'.
On the basis of these different values, several evaluation methods are put forward: some of them refer to the "wiliness to pay" concept (under both the conditions of existences or not of a market); others refer to the single attributes of the asset.
Since then, we have assisted to a meaningful development of methodological frameworks and innovative approaches. But, in the last decade, despite the growing relationships among culture, creativeness and economic development being analyzed in several studies and reports, it is not yet the case in Italy that a real methodological debate on the evaluation of the impacts has been developed.
The main studies are in the touristic sector or in the sportive events (as that for Torino Olimpic Game 2006) but very few in the cultural heritage sector. This scarcity of analysis, could be explained by several factors as, in accordance with Guerzoni [16] the methodological backwardness in this field, the rudimentary of the accounting system of the cultural institutions, the scarce availability of data.
But these reasons don't justify a methodological delay because, for at least twenty years, at international level, the *economic impact anal□sis* has become a fundamental tool in cultural policies.
It has become increasingly important in cultural policies to demonstrate the many benefits that intervention of valorization provide to surroundings communities and their region. In order to measure the impact of the preservation/valorization, several economic impacts models are available.
The most known and implemented is the *input-output model*s. In general terms, these models estimate the way in which money spent on cultural heritage may stimulate actions and flows of financial resources in other areas or sectors bringing additional income or development to a given place: the *multiplier effect*. [17].
In Italy, only in the last years have some efforts for understanding the multiplier effect of Cultural and Creative Industries been made, as in the Fondazione Symbola reports [18], but, at regional level only few regions are producing impacts analysis reports [19].
With specific reference to Campania region, despite the production of sectorial studies in the field of cultural heritage, cultural tourism and creative industries [20], largely absent is the specific analysis of the multiplier effect in the valorization of cultural heritage.
In this perspective, the efficacy and the relevance of the Preservation Economic Impact Model ("PEIM")*, implemented in about 15 USA states, with all the necessary adaptation, could be a useful evaluation approach for assessing and understanding the outputs of the valorization activities on the local economy in the Campania region (cultural, economic, and social ones such as employment, tourism, property values, tax, system, etc.)

3. The PEIM model

The Preservation Economic Impact Model ("PEIM") was produced by the Rutgers University Center for Urban Policy. It was developed by Rutgers regional economist, Professor Michael Lahr and Professors Lahr and Listokin have implemented PEIM in both large and small states in the USA (e.g.,

Texas, Florida, New Jersey Oklahoma and South Dakota). PEIM employs a multiplier methodology that calculates job and wealth creation, employee wages, economic output and federal, state and local tax benefits generated from a historic rehabilitation investment based on key project characteristics, such as location, total development cost, and type of real estate project (e.g., commercial or residential property). PEIM measures economic impacts up to construction completion but not after the building is placed in service. PEIM calculates the following economic indicators:

- Direct Impact Components – labor and material purchases made specifically for the preservation activity.
- Indirect Impact Components – spending on goods and services by industries that produce the items purchased for the historic preservation activity.
- Induced Impact Components – expenditures made by the households of workers involved either directly or indirectly with the activity.

When applied, the PEIM generates the following critical information:

• JOBS: Employment, both part- and full-time, by place of work, estimated using the typical job characteristics of each industry.
• INCOME: "Earned" or labor income; specifically, wages, salaries, and proprietor income.
• WEALTH: Value-added—the sub-national equivalent of gross domestic product (GDP). At the state level, this is called gross state product (GSP).
• OUTPUT: The value of shipments, as reported in the Economic Census.
• TAXES: Tax revenues generated by the activity, which include taxes to the federal government and to state and local governments.

To illustrate the application of the PEIM, the following summarizes the impacts of the federal (USA) historic tax credit(HTC) in inflation-adjusted 2014 dollars for each of these economic measures for the cumulative period fiscal years(F□) 1978-2014 :

National Economic Impacts

Federal HTC-assisted Rehabilitation

□117.6 billion CUMULATIVE (F□ 1978-2014) historic rehabilitation expenditures results in:

Jobs (person-years, in thousands)	2,493.0
Income (□billion)	98.6
Output (□billion)	271.4
GDP (□billion)	134.1
Taxes (□billion)	39.3
• Federal (□billion)	28.6
• State (□billion)	5.4
• Local (□billion)	5.3

The benefits of investment in HTC-related historic rehabilitation projects were documented by the PEIM to be quite extensive, increasing payrolls and production in nearly all sectors of the nation's economy. During the F□ 1978-2014 period, □117.6 billion in HTC-related rehabilitation investment created 2,493,000 jobs and □134.1 billion in GDP, nearly 30 percent of which (738,000 jobs and □38.0 billion in GDP) was in the construction sector.

This is as one would expect, given the share of such projects that require the employment of building contractors and trades. Other major beneficiaries were the service sector (443,000 jobs, □17.7 billion in GDP), the manufacturing sector (510,000 jobs, □34.5 billion in GDP), and the retail trade sector (364,000 jobs, □10.0 billion in GDP).

As a result of both direct and multiplier effects, and due to the interconnectedness of the national economy, sectors not immediately associated with historic rehabilitation, such as agriculture, mining, transportation, and public utilities, benefited as well. These PEIM data help support the continued provision of the federal HTCs.

In short, the PEIM and similar models are essential tools for quantifying the economic consequences of historic preservation. An ongoing collaboration between Rutgers University and the Second University if Naples and BENECON will foster continued research and application of such models in Italy and the European Union.

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The installation of sonic architectures: a simulation of the visiting experience

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In the last decade, with the widespread of interactive systems, a large number of multimedia contents have been added to the traditional fruition systems (e.g. information panels, audio guides) of museums and archaeological areas to enrich the experience of the cultural assets. Among the most attractive there is the use of: projection screens, virtual interaction systems or acoustic informative materials. The installation of acoustic informative materials in archaeological areas should aim to improve the soundscape quality in order to increase the visiting pleasantness by the tourists. Nevertheless, their use might help to enhance archaeological areas by properly managing the visitor flows (avoiding congested noisy areas and unattractive quiet areas). An example is the installation of sonic architectures, that are speaker systems hidden within sound design objects harmoniously blended in the environment.
This work aims to verify the possibility to use sonic architectures to manage visitors' flows. The investigation has been conducted in an immersive virtual reality environment, where it was recreated a site of the ancient Pompeii, the Quadriporticus.

Keywords: Archaeological sites, immersive virtual reality, multisensory visiting; sonic architectures

1. Introduction

Valorising tourist attractions, as museums or archaeological sites, represents a key challenge for institutions and curators, in order to keep flourishing museum's budget and to ensure tourists' satisfaction. According to Hu et al. [1], a tourist attraction is "a permanent resource, either natural or human-made, which is developed and managed for the primary purpose of attracting visitors". Nevertheless, nowadays the ways through which visitors should be attracted go more and more over the cultural asset itself: the widespread of interactive technologies (i.e. projection screens, virtual interaction systems, acoustic informative materials) is leading cultural site's managers to integrate the traditional supply with new fruition systems [2,3].
Among the different innovative fruition's systems, the installation of sonic elements for indoor or outdoor environments should represents an interesting solution to tackle different issues [4]. First, by means of these elements it is possible to combine the demand of transferring information contents to the tourists and of improving the *soundscape* quality as well as the global pleasantness judgement of the visitors. Moreover, this strategy may also contribute to manage the tourist flows. According to Sthromaier et al. [5], receiving information about the preferences of visitors monitoring visitor paths and trends is crucial to improve the visitor experience of museum or cultural site. Having the chance to lead unknowingly the tourists towards an area rather than another one, could allow an improved distribution of tourists in a site, avoiding too much crowded or too neglected areas. Finally, sonic elements also allow masking the inappropriate emissions produced by nearby infrastructures.

This paper aims to assess the effects of sonic elements' installation in an archaeological area through a simulation in an immersive virtual reality environment. The experiment evaluates the tourist behaviour with and without sonic elements during a visiting experience to the Quadriporticus of the Theatres in the archaeological site of Pompeii. This site is characterized by wide dimensions and homogeneous geometries, in order to avoid that visual features affect the tourist behaviour.

2. Brief description of the site

The Quadriporticus was built in the early years of the first century. However, its original use is still unclear. Historical reconstructions suggest two possible uses: 1) as foyer for the close Great and Little Theatres [6]; 2) as a gymnasium for athletes [7]. Furthermore, after the earthquake of 62 A.D., the Quadriporticus was completely renovated and expanded, becoming a school for gladiators. With the violent eruption of Mount Vesuvius in 79 A.D., it was covered under a layer of lava and ash. Only after the archaeological excavations, it was unearthed along with the nearby theatres.
The structure's access is characterized by a main entrance on the north side, with three columns in Ionic order. Inside, the structure shows a large central courtyard, bordered by a portico with 74 columns of tufa, in Doric order with the bottom grooved (Fig.1).

Fig. 1: Views of the *Quadriporticus of the Theatres* (actual state)

3. Methods

3.1. Experimental design

The experiment aimed to assess the tourist behaviour at an archaeological site during a visitor experience characterized by the presence of sonic elements. Sonic elements are loudspeakers hidden inside items coherently integrated with the rest of the environment.
Two different sonic elements were used during the simulation:

- Descriptive Sonic Element (DSE): it reproduces a short historical description when the visitors reach its position (within 2m);
- Attractive-Descriptive Sonic Element (ADSE): as the previous one, but in addiction it plays an attractive sound in order to attract the tourist's attention.

Two different test sessions were performed. The dependent variable in the experiment was the time spent by the participants to reach the sonic element; the independent variables were two different degree of Visibility of the sonic element (High-Low) and two types of sonic element (DSE-ADSE).

3.2. Materials

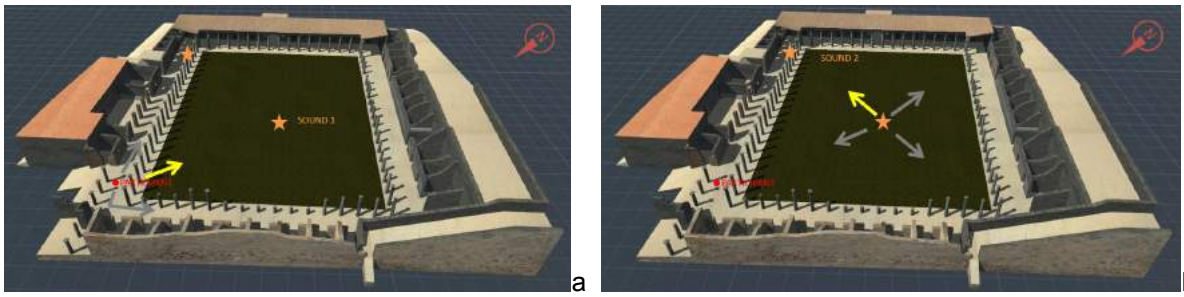
A 3D reconstruction of the site was carried out starting from the plans retrieved in literature and finished with information collected during an inspection on site. Thanks to a detailed photographic documentation, the entire model has been mapped with textures as they appear at present. Therefore, using the 3ds Max software, the whole modeling phase has been realized. Sonic elements were added to the scene; they were physically the same, whilst different in terms of emitting sounds.
For the condition "High Visibility" (HV), the sonic element was located at the centre of the Quadriporticus. In this case, the DSE provided a description about the activities carried out in the site when it was a foyer (ante 62 A.D.), while the ADSE attractive sound consisted of an environmental sound characterized by the presence of people, evocating the ancient use as foyer.
For the condition "Low Visibility" (LV), the sonic element was located in a corner of the Quadriporticus. The DSE described the activities in the age of the Gladiators' Barrack (post 62 A.D.), while the ADSE attractive sound reproduced the sound of a battle between gladiators.

The narrative descriptions were collected from historical literature, and then recorded in an anechoic environment. Attractive sounds were chosen from IT database. Afterwards, each sound track was adjusted according to the expected sound levels and appended to the sonic elements. Finally, the model was implemented inside the software Wordlviz Vizard for the management of the visual and acoustic information, as well as of the virtual exploration hardware.
The whole test session was carried out in the anechoic chamber of Department of Architecture of Second University of Naples, where a specific workstation was arranged. The virtual scenarios were shown by means of an immersive virtual reality system using an Oculus Rift Visor. The visor showed stereoscopic images with a 1920x1080 resolution, updated at 75 Hz. The system was managed by a WorldViz 5.1 software. The head's movement were tracked through a Positional Tracker Camera with 3 d.o.f. As far as the orientation, an accelerometer inside the visor allowed the detection of gaze's orientation. The sound tracks were reproduced through Sennheiser HD 201 headphones.
To explore the environment the participants were provided with a PPT Wand joystick.

Fig. 2: Photo of a tester during the virtual visiting.

4. Experiment

During the visiting experience, the participants were projected in a virtual environment. Each subject was at the actual Quadriporticus' entry (north area). He initially was free to explore the virtual environment.
Once he took confidence with the environment, the test session started with the HV condition. The first sonic element appeared at the centre of the court and the participant explored the environment till to he decided to reach the sonic element (Fig 3a). Once within a 2m area from the sonic element position, the task was completed and its last was stored.
Then, the participant started his task in the LV condition: the second sonic element was in a corner of the Quadriporticus, and as before, the subject completed his task when he reached the sonic element (Fig 3b).
The described experiment was carried out in two different test sessions: the first with Descriptive Sonic Elements (DSEs), the second with Attractive-Descriptive Sonic Elements (ADSEs).
Two different groups participated to the test sessions, 9 for each test sessions. Participants were chosen among University's students (mean ages 22, 5 males for the group 1; mean ages 23, 6 males for the group 2).



a b

Fig. 3: Experimental design: sonic element n.1 (a); sonic element n.2 (b).

5. Results

A preliminary analysis of the paths carried out by the participants in the virtual environment shows a high variability between subjects. In particular, some participants seemed to be effectively attracted by the proposed elements. On the contrary, some other subjects carried out their task just after having completed an exhaustive tour of the archaeological site.
Secondarily, the times spent to reach the sonic elements has been analyzed.

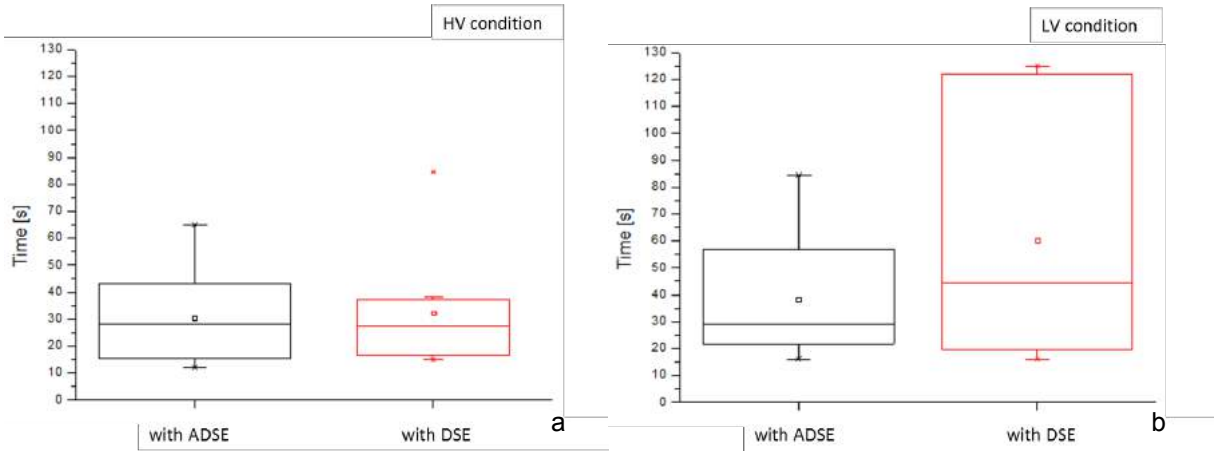


Fig. 4: Box plots of time (s) spent by the participants in both the experimental conditions: a) High Visibility; b) Low Visibility.

As shown in Figure 4, the results highlight that for the HV session the mean value for the DSE test session is slightly higher than in ADSE session (32,4 s instead of 30,4 s), and this happens for the standard deviation too (20,1 s for DSE and 16,7 for ADSE). This difference increases when the degree of visibility decreases. Indeed, for LV condition, the ratio between the mean time spent by subjects to reach the sonic elements with DSE and with ADSE is higher than 1,5 (60,4 s instead of 38,2 s), and the standard deviations are respectively equal to 45,6 and 22,5 s.
Therefore, it is possible to observe that:

- even if the DSE test session did not provide the reproduction of attractive sounds, participants tended to reach the element's positions both in the HV and LV conditions, because visually attracted;
- nevertheless, in the LV condition the effect of the attractive sounds is very significant and participants spent less time to reach the sonic elements.

6. Conclusions

In order to promote a cultural site and make it more attractive for inexpert users, multisensory visits may be implemented in several ways, for both museums and archaeological areas. Using sonic elements may contribute to improve the quality of sonic environment in a specific area and to distribute more efficiently the visitors' flows.
The visit's simulation carried out in this study highlighted that tourists reach the sonic element's positions more quickly with attractive-descriptive sonic elements (ADSEs) than with descriptive sonic elements (DSEs). The lower is the degree of visibility, the higher is the time spent by the participants when they may not rely on the help of attractive sounds.
The installation of sonic elements emitting attractive sounds may represent a valid solution to lead people towards established areas. Nevertheless, in the flow management design, some considerations are important. First, the larger is the exploration area, the higher is the sound dispersion, and this leads to a more difficult recognition and localization of sound source. Increasing the number of sonic elements through a path and decreasing the relative distance among them could help tourists to carry out better their task. Moreover, defining the correct sound pressure level of the sound sources, as well as choosing the better auditory stimulus in terms of spectral content, represent a significant challenge to design flow management strategies optimizing the sonic environment simultaneously.

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Architecture of Conversion. Space and power in the early Christian Basilicas

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Architecture of Conversion

Space and power in the early Christian Basilicas

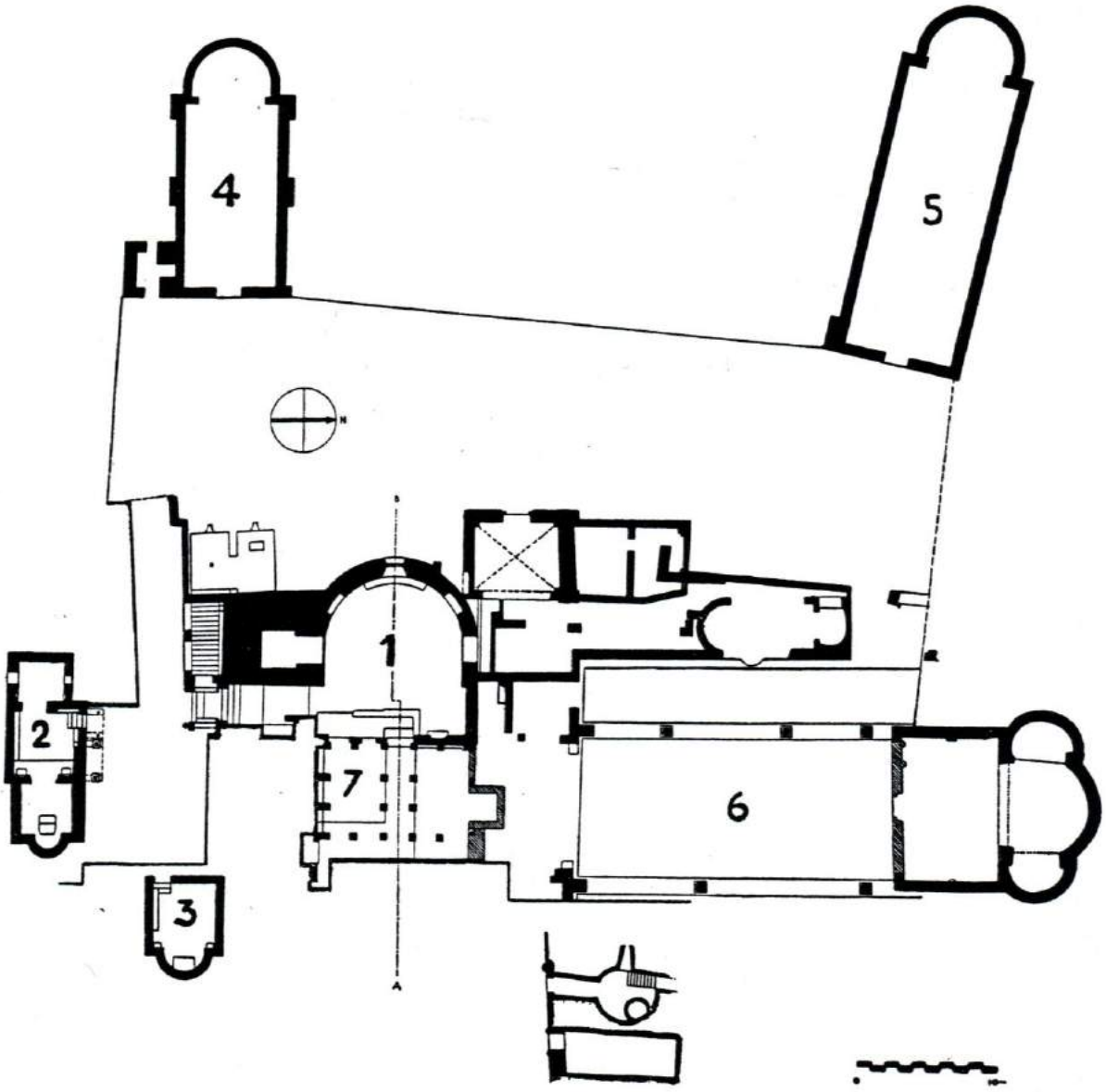
This research proposes a social analysis of the Early Christian basilicas and argues that church construction played an important role in the process of religions change in Late Antiquity. The study of Christian ritual and architecture shows that the Early Christian churches depended upon and reacted to existing phenomena that served to promote hierarchy and shape power structures in Late Roman society.
The primary purpose is to integrate the study of ritual, architecture and social history and to demonstrate how Early Christian architecture played an important role in affecting social change.
The architectural space of the Early Christian context manifests itself in three overlapping and inclusive ways: it was sacred and social space and combined this double nature continually. In doing this, it created a third kind of space, a space of mediation and ambiguity that allowed for the profane to transcend human reality and the sacred to manifest itself in human form. Christian space depended upon the language of the traditional aristocracy and ensured that it both persisted and was subsumed within a Christianizing discourse. Thus, Christian space was Christianizing space, actively and continuously replaying the act of appropriation that implied a social and religious aspect to the messages it communicated.
For the Early Christian period, Christian architecture as mediating or Christianizing architecture actively generated a cultural reality. To characterize the Christian space as exclusively sacred space or social space, or even both at different times, misrepresents the complexity of Christian architecture.

Keywords: Late Antiquity architecture; Christian architecture, Christian space.

1. Architecture of Conversion. Space and power in the early Christian Basilicas

The scholars releve that the spread of Christian influence on society and culture in the ancient world is best understood as a long-term process rather than as a discrete event in the life of a community or individual.

Furthermore, the emergence of Christianity should not be interpreted as a teleological process with a definite end representing "total" or "thorough" Christianization.
The expression of religious ideas reflects the tension between conservative and eternal cosmological principles and the dynamism of social relationships and social logic. Buildings, especially churches, represent one of the ways that the eternal and sacred is made manifest and exerts an influence over social and cultural experience.
The lack of textual sources, difficult chronological issues, and our fragmentary knowledge of the archaeology of pagan cult during the fifth and sixth centuries for Greece, has left the relationship between Christians and pagans almost impossible to understand, even in the rare instances of the



1. G. Chierici, *Cimitile. Architectural floor plan*.

conversion of a temple to a church. Furthermore, the general tendency to discuss the rise of Christianity at the expense of a public or institutional paganism, characterized by monumental architecture, has occasionally obscured the far more complex nature of pagan practice during antiquity. The hazy relationship between “Christianity” and “paganism” is most apparent in the various aspects of Christian iconography that have pagan roots, and in the aspects of Christian practice that reflect the continuation of certain pagan rituals and practices, such as magic or local festivals, couched in Christian terms.

Numerous other scholars have elaborated upon this idea of cultural Christianization and the structure of power in Late Antiquity and many have emphasized the changes brought about by the interpenetration of Christianity and traditional forms of elite expression.

The views advanced by those researchers who adhered to a similar perspective on the expansion of Christianity as a cultural system are important in that they provide a description of the changes that occurred in the Late Antique world. Early Christian architecture can provide evidence for how ‘the mechanics’ of Christianization, as a cultural process, actually occorre and explain how cultural and social changes took place through the manipulation and negotiation of social and cultural symbols and space. Thus, churches represent both a medium for Christianization and mode of its expression.

This dual role of churches, however, has not been fully appreciated in previous studies of Late Antique church construction. Scholars have often considered the presence of churches as evidence for

2. Cimitile. Basilica complex (photo by S. Carillo)

Christianization, but both in the text and on the ground the relationship between Christianization and churches is a complex one. The construction of churches was likely related to the projection of imperial or episcopal power in some communities, such as in the churches surrounding Rome or Milan. Other reasons for church construction include the production of a Christian sacred landscape characterized by the churches that marked martyr's tombs, the locations of miraculous events, places associated with the Passion and spots long held as having certain intangible sacredness.

Traditional studies of church construction in antiquity have followed three approaches. The most familiar approach to early Christian architecture is the traditional art historical approach. Scholars working this tradition emphasized the evolution of early Christian art and architecture. It has tended to be quite formalistic and interested primarily in creating chronological typologies which are presented in various catalogues, handbooks, and surveys. The result of this has been a number of studies by historians and art historians alike which bring art historical and architectural evidence to the fore as a source for understanding the ancient world.

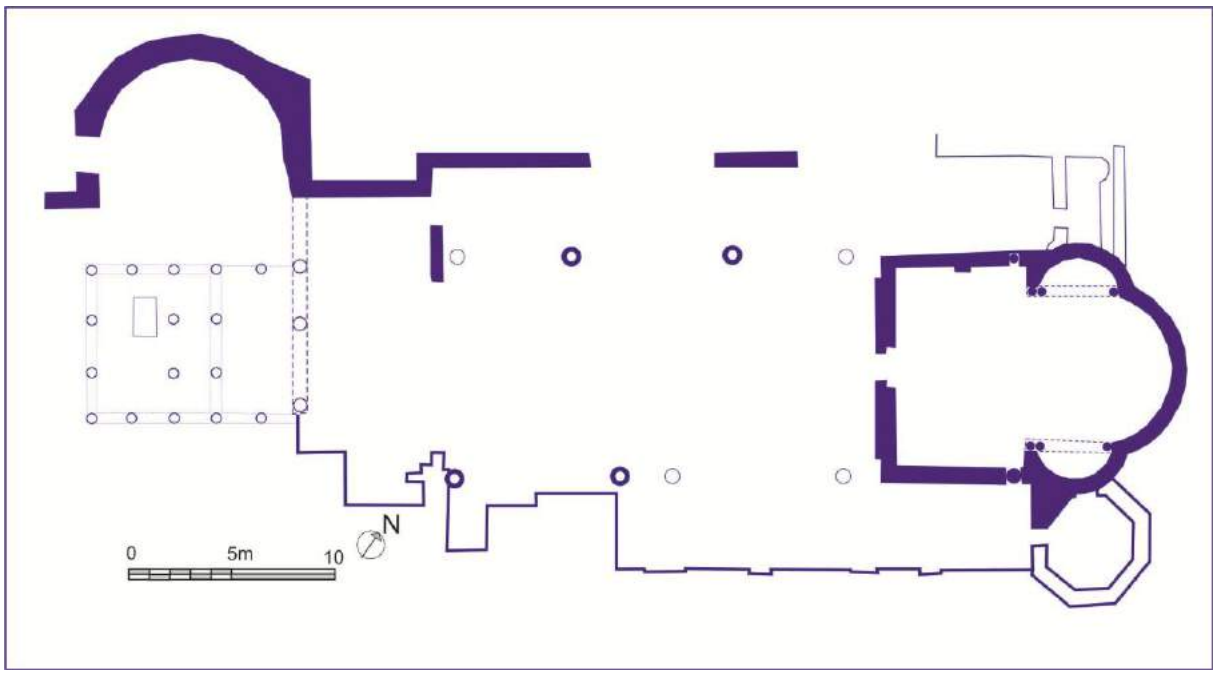
The approach to ancient religion and religious architecture taken by scholars such as Trombley, Spieser, and Gregory has sought to demonstrate that church building can best be understood in the context of ancient religion, because they have especially focused on the construction of churches in or around pagan sanctuaries.

Although this dissertation will not propose a universal way of reconciling the historical method and efforts to determine the nature of ancient conversion or ancient Christianity, it will operate under a compromise position that might ultimately present a framework for approaching important matters of belief with the tools and evidence available for historical analysis. Architecture often served to present a set of values and expectations through creating an often highly biased setting. In this capacity domestic architecture, in particular, has been seen as a reliable guide and an important component of the "structuring structures" that support social organization.

Sacred architecture endeavored to promote a particular response or set of responses from those who experienced it – whether it be the clergy, the formal participants in the Christian ritual, or members of society who experience it without such a well-defined connection to Christianity. Churches were places that presented an individual with a group of architectural, ritual, and iconographic stimuli that

3. Cimitile. Basilica nova, trychora (photo by S. Carillo)

served to communicate ideas of cosmology, social order, and morality. When people were exposed to the experience of Christianity, particularly the powerful and basic experience of Christian architecture, they actively produced “conversion” or “Christianization” as they negotiated the tension between the concrete architectural form, ritual, and preconceived notions regarding religious experiences.
The cosmological aspect of early Christian architecture –which itself derived from notions of a religious experience rooted deeply in the Mediterranean tradition– ensured that experiences produced within its walls and rituals did not remain local, but had far-reaching implications.
While pious motivations accounted for numerous donations to churches, it is likewise clear that the traditional motivations for donations, such as self-promotion appear in the inscriptional record as well. The diversity of motives for donating mosaic floors, church furnishings, or pieces of architecture to churches likely reflects –for example- the diversity of the groups making these various donations. Traditional elites transferred their ambitions and language from the secular or civic hierarchy to the ecclesiastical hierarchy. By their side, however, a new class of donor emerged perhaps from among the Christianized artisan class, whose relatively modest means and status would have excluded them from acts of civic munificence in the ancient polis. In the Early Christian world, however, they made important contributions to the decoration and upkeep of the Christian buildings which stood at the center of their community’s sacred and ritual identity.
It is likely, in fact, that their donations played an important role in facilitating the building boom which took place during the fifth and sixth centuries and led to the proliferation of Christian sacred architecture in the Mediterranean area.
Thus, the evidence from Early Christian inscriptions in churches both highlights a change in the way monumental architecture was financed and provides important insights into the nature of the change itself. According to the epigraphy, donations to churches worked to facilitate access to various divine rewards for the individual donors, such as salvation, safety, and protection. This stands in contrast to the "classical" form of civic munificence limited to an intensely competitive curial class. This group by Late Antiquity appears to have been increasingly poor, ineffectual, and both unwilling and unable to lead the way in the financing of monumental architecture.
The resources available to the church through the willingness of a larger percentage of the population to support church construction and decoration led to the proliferation of Early Christian architecture in urban and rural areas. Christian architecture, often the most visible architecture in a Late Roman city, projected Christian ritual space to the community.



4. Cimitile. Basilica nova. Floor plan (by S. Carillo)

1.2 Paulinus of Nola and Cimitile's trychora

This happens all over the Mediterranean area: it is the emblematic case of Cimitile, near Nola. Here at the end of the fourth century Paulinus of Nola (355-431 a.C.) builds a basilica with part of the family property.

The relationship between the physical upkeep and construction of the Church buildings and the liturgy followed a trend evident elsewhere in Late Roman society. As the influence of Christian liturgy expanded to involve Christian culture more and more deeply with "secular" or traditional Late Roman culture, the financial arrangements required to support the expansion and elaboration of liturgical space itself gained expression in liturgical terms.

As Bowden and others have argued, the financial mechanisms for the expansion of Christianity – namely the growing pool of resources made available through the encouragement of pious donations from all members of the congregation– depended on the community's acceptance of the efficaciousness of the liturgy. The articulation of liturgical space through iconography, ritual, and language embedded in Late Roman culture bound liturgical theology, particularly the role of Christian ritual in mediating between God and humanity in Late Antiquity, to a long tradition of elite display and religious expression ensuring a smooth transition from the ancient world to the Byzantine.

In this sense, the corpus of Paolinus offers a unique opportunity to follow along the birth of the Christian center of Cimitile and motivation of its development.

The choice of *tr□chora*, as explained in the past, could be a function of this: Christianization as a cultural process is closely tied to the idea and practice of mediation. The idea of mediation, as a central aspect to the process of Christianization, in the religious space of Early Christian Greece is not a simple matter, however. At its most visible the practice of mediation appears in the role of the clergy as they brought humanity into contact with the divine through the ritual of Christian liturgy. Clerical privilege in the sacramental aspects of Christian religious life is homologous with their access to the growing economic, political and cultural capital accorded to the institutional church and inaccessible to the laity except through clerical intercession.

Paolino of Nola in 402 a.C. transfers the trinitarian symbol in architectural forms by retrieving a domestic type to express the faith of the Council of Constantinople (381) and confer liturgical force.

Finally, Christianization mediated between the religious traditions associated not only with the temples, priesthoods and cult celebrations essential to civic life and the civic elite but also with the simple, but efficacious religious practices present throughout Mediterranean culture and common to everyday life. Christianization as a process both melded public and private religious practices and inscribed both rituals in the exclusive, but permeable Christian liturgy.

Early Christian space as space of mediation between two different ideas, times, social structures, and, ultimately natures (the human and the divine), presents a way of understanding Early Christian church architecture that includes different fields of meaning.

The context of the Christian liturgy and the cosmological meaning it imparted in Christian sacred space, however, brought these prayers into concert with Christian thought and probably contributed to their continued use into the Byzantine period and beyond.

5. Cimitile. St. Stefano basilica (photo by S. Carillo)

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Technological design for the energy efficiency of the minor architectural heritage

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Abstract
Physiological and pathological degradation, physical and functional obsolescence are the most important reasons that motivate and in some cases require design actions on traditional buildings. However, when the demand for rehabilitation is linked to needs of heritage reuse, community economic development, cultural offerings exploitation and preservation of historical memory, we are in the presence of another category of actions, attributable to the broader field of the "government" of the built heritage. In these cases, the first purpose is the improvement of the technological and environmental performance for the use, whether material (physical) and intangible (knowledge).
In addition, the so-called 'minor architectural heritage' has another intrinsic form of degradation, which is the energy one, due to construction practices with poor energy performance that today inevitably have to deal with both the increased demands of quality of life (well-being) that the European objectives of energy and environmental sustainability and high legal standards.
In this context, research has pointed to the identification of passive technological solutions that favor the maximization of the performance envelope, compared to the use of plant systems, in order to ensure comfort conditions of the internal environments.

Keywords: Energy Efficiency, Nearly Zero Energy Building, Passive Solar Systems, Energy Decay

1. Introduction by A. Violano

Most traditional buildings were designed and built before the development of requirements about energy efficiency of construction sector. While law protects the majority of historic buildings and for them it is a priority to preserve the historical, artistic and architectural character, there are many thousands of buildings that are not legally guarantee. This category includes nearly all buildings constructed in the last century, until the 80s. We are in the presence of a minor architectural heritage that has no constructive value of traditional architecture, because it is made with materials and components with lower performance and it is therefore characterized by a strong energy and environmental degradation. In fact, it is not able to satisfy the conditions of comfort required by the modern needs of life and by applicable legal requirements.
Physiological and pathological degradation, physical and functional obsolescence are the most important reasons that motivate and in some cases require design actions on these traditional buildings. However, when the demand for rehabilitation is linked to needs of heritage reuse, community economic development, cultural offerings exploitation and preservation of historical memory, we are in the presence of another category of actions, attributable to the broader field of the "government" of the built heritage.
In these cases, the first purpose is the improvement of the technological and environmental

performance for the use, whether material (physical) and intangible (knowledge).
It is important to consider that the rehabilitation and transformation works, made in order to improve the energy efficiency of these buildings, should take into account traditional technology and characteristic behavior of the construction, otherwise very real damage can be caused.
This paper present the results of a work in progress research that has pointed to the identification of passive technological solutions that favor the maximization of the performance envelope, compared to the use of plant systems, in order to ensure comfort conditions of the internal environments, according to specific characteristics of traditional buildings.

2. New energy requirements for rehabilitation of existing buildings by M.Cannaviello

The rehabilitation of the so called “minor housing stock” decay has necessarily to do in the one hand with the increased needs of the quality of life, so comfort, and on the other hand with the European target of energetic and environmental sustainability, and so with the law standards in effect at present.
To deal with actually the reduction of energy consumption in the building industry, it is not enough to define standards for the new constructions (that represents a bit more than 1 of the housing stock), but it is necessary to recover the existing buildings [2].
In Italy, about 60 of the housing stock, that correspond to 7.161.861 buildings, are more than 40 years old (that’s to say built before 1971) and show important performance deficiency and evident decay problems.
From a strictly energetic point of view, these buildings were built before 1976 when the law 373 entered into force (that is the first national law to establish the minimum values of thermal isolation), as a result they have a very high energy needs. In particular, the worst buildings’ conditions concern buildings built after the Second World War (1945-1970), with low quality construction techniques and have heat loss problems, condensation humidity and so on.
The existing buildings have a decisive role in the energy policy in our country and in EU. For this reason, the 2002/91/CE Directive (Energy Performance of Building Directive) that is the first to introduce a Common European Framework for Energy Performance of Buildings, considers not only new buildings, but also the existing ones exposed to important restoration interventions, exceeding 1000 m2.
The 2010/31/EU Directive entered current in Italy with the 90/2013 law and other decrees (as the three Decrees 2015/06/26) imposing to the member states new rules. In particular, the D.M. 2015/06/26 – “Minimum Requirements” is about the redeveloping interventions of the existing house stock with a new approach and structure.
The most important news in comparison with the previous laws is about new requirements that concern all the redevelopment interventions, irrespectively of the building surface on plant. Intervention categories and the specific energy standards depends exclusively on the types and the incisiveness of the intervention. The last one is in relation to the dispersing surface (considering all the opaque and transparent building elements that define the volume at a controlled temperature from the external space and from the adjacent non-air conditioned rooms), as a percentage ratio between the surface of the intervention and the total gross surface.
The intervention categories are:
- First Level Restoration
- Second Level Restoration
- Energy Redevelopment

The First Level Restoration consists of both interventions on the building envelope with an incidence more than 50 on the dispersing gross surface of the building envelope and the restoration of the thermal installation for the winter and/or summer air conditioning.
In these cases, the energy performance requirements refer to the whole building and to the performance of the energy service.
This intervention can be compared to the new construction: the First Level Restoration shall respect the energy standards expected for the new buildings. This means that existing buildings have to become Nearly Zero Energy Buildings, if the interventions belong to that category.
The Second Level Restoration concerns the building envelope with an incidence between 25 and 50 of the dispersing gross surface and can (not necessarily) interest also the thermal installation for winter and/or summer air conditioning.
In this case, the energy performance requirements concern thermal-physical features of elements and components of the involved building envelope.
For the proportion of opaque building envelope of the intervention, it is necessary to verify that the values of thermal transmittance and of the total solar transmission factor of the window elements are less than or equal to the limit values shown in the tables of the Appendix B. Moreover, the global coefficient of thermal exchange-by-transmission that is the result for the whole part of the building

envelope where intervened, has to result less than the limit value.
The last category is about the energy redevelopment of buildings. This category regards the actions that have nothing to do with the previous categories and have a role in the energy performance of the building. These are interventions that involve a less than or equal to 25□ of the total dispersing gross surface and/or consist of new installations, restorations of a thermal installation or of any other partial intervention, including the generator substitution. In these cases, the energy performance requirements are only applied to the building and installation elements and referred to their thermal-physical and efficiency features.
Even for the intervention of "energy redevelopment", as well as of the "Second Level Restoration", the energy standards are in the Appendix B of the DM 2015/06/26 – "Minimum Requirements" and differ from the characteristic parameters of the reference building (Appendix A – DM 2015/06/26 – "Minimum Requirements"), and they can be used for the new building and for the "First Level Restoration".
The basic principles of this approach can be shared. It aims to solve any difficulties to redevelop the existing housing stock that results characterized by poor quality energy performance as previously explained to the standards established for new buildings.
Unfortunately, comparing (Table 1) the standards for the new housing and for the First Level Restoration (and so the values of the characteristic parameters of the building) with the standards for the Second Level Restoration and the Energy Redevelopment Interventions, it is clear a quite low percent difference, less than 10□.
The exceptions are very limited. They deal with the ordinary maintenance intervention on the existing thermal installation and the building envelope interventions that involve painting restoring or just a small part of plaster that involves only 10□ of the total dispersing gross surface of the building.
The new energy standards aim to rehabilitation the existing housing stock considering a high-energy quality, but considering how much they cost and the payback time, perhaps they are too ambitious and difficult to carry out.

3. Advanced control systems to improve energy performance of the building envelope □by L. Melchiorre□

Because of the recent national and European rules on buildings energy performance, more and more restrictive about the comfort conditions to satisfy, scientific research has focused its interest in building envelope, conceived not only as passive frontier between the confined space and the environmental context, but as an active system able to exchange and produce energy.
The next-generation envelope is conceived as a dynamic interface, reactive skin and multi-purpose selective filter, characterized by increasingly higher performances, up to becoming, in the most recent developments, an *active*, *reactive* or *responsive* device.
Active building envelopes are those which are integrated with systems of energy production from renewable resources, re-active ones in which the border devices is wisely activated only under certain climatic conditions, and finally, responsive when they are actively used to transfer and/or store heat, light, water and air. Therefore, the building envelope technological model has evolved moving from characteristic massive configuration to complex systems, but above all always "lighter", "*e□periencing a form of dematerialization, losing of firmness*" (Frampton, 1995) [7]
The fear of lack "*firmitas*" conceptually tied to the mass (the norm sets the limit of 230 kg/m^2) is deleted from the technological control of new materials and components performance, arising from the overlap of specialized layers, that are diversified by type. Each one of these layers contributes to satisfy a specific performance (insulation, waterproofing, phase shift, or heat wave attenuation).
With reference to research carried out by the IEA (International Energy Agency) - Annex 44 concerning the responsive architecture, it is possible to identify several technological solutions of advanced integrated façades (responsive elements). Among the best-known and diffused are:
- Opaque Ventilated Façades
- Transparent Ventilated Façades
- Opaque façades with integrated photovoltaic
- Transparent façades with integrated photovoltaics
- Integrated solar collectors (with air or water)
- Façades made of transparent insulating materials.

But another objection has been previously made: *"in the new buildings the cost of the structure reduces its incidence from □0□ to □0□, the movable partitions rise up from □□ to □0□, but especiall□ the plants grow up to □□□"* (Frampton, 1995). [8]
In fact, there were been developed types of envelope in which the adaptive components are combined with mechanical and technological systems in order to further maximize the efficiency of the innovative building envelope, able to dynamically interact to changing outdoor climate conditions.
The sensors, conceived as real nerve endings of a building, play a key role. The data gathered from these sensors run through a network plant and lead to a reaction of the building by using a

computerized mechanism - similar to a central nervous system - able to process the collected data and activate suitably the envelope reaction.
These sensors, diversified according to the type and usage, commonly are classified in relation to the type of physical quantity, which they measure; among those most used, for instance, there are detection sensors of light, sound, temperature and humidity. Thanks to the use of these devices, it is possible to trigger the full interaction architecture-man and architecture-environment, thus making the architecture increasingly dynamic and responsive.
Therefore, innovation consists in the integration of management and monitoring mechanisms of internal environmental conditions, energy control with profiles designed to save energy, and regulation of air conditioning system, light, home appliances and security systems, with the main aim of reducing the negative impact of user behavior.
Home automation systems, consisting of groups and computerized control units, are able to adjust the orientation, the opening or the position of the façade elements in order to maximize energy efficiency of the building, but not only, the plant and technological integration aims to make the building a *living organism*, able to self-regulate to ensure the well-being of direct users, exclusively using energy from renewable sources.
However, the development of so-called "smart systems" and the introduction of sustainable technologies bring a significant increase of costs in the detection systems, climate controls, technical devices, materials and major maintenance costs because of the complexity of components and of their mutual position.
The benefits, however, can be traced to the positive contribution to the energy balance supplied by renewable energy and to the improvement of indoor comfort conditions.

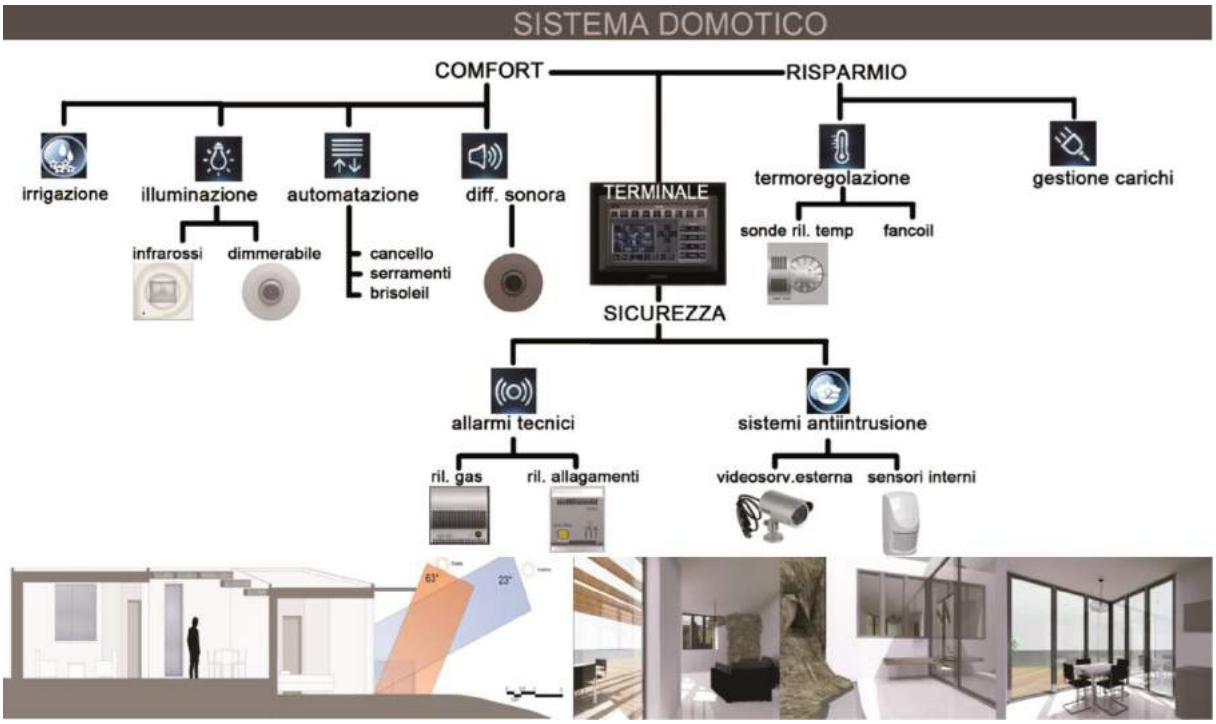

Fig. 1 - The automation system scheme, designed as part of the Indoor Sustainable Technologies Laboratory (CdL AIDA SUN) of the prof A. Violano with students Arcella and C. F. P. Marrazzo

4. Design methodology and feasible technological solutions by A. Della Cioppa

To define the possible passive technological solutions to redevelop an existing building, it is needed to start from an energetic-environmental evaluation of it.
This analysis has to follow some established steps that aim to examine, initially, the climatic-environmental parameters of the building and then to break up the building into its installation and its structural and technological elements to work where there is more criticality to benefit the environmental sustainability.
The first part is about the collection of climatic data as average temperature, rainfall, prevailing winds and so on to compare them with the specific environmental data of the building as orientation, exposure, the natural airflow, shades, shadows and so on.
The second part consists of obtaining the data concerning the structural elements, the building materials, how the installations work and the technological choices.
The correct elaboration of the collected data permits to define the best solutions to redevelop the

analysed building.
To examine and interpret the climatic/environmental data of a building according to the site where it is built there is the “site microclimate matrix” theorized by Brown and Dekay (2001) [1] and reconsidered by Grosso (2011) [5].
“The site microclimate matrix, in both its two-dimensional and 3-D applications, is one of the tools used to evaluate the environmental impact of the built environment on a specific building, with reference to two climate factors, such as sunlight and wind and their interactions with the shape, the orientation and the location of the building. The method suggested leads to the evaluation of the SEQ (Site Environmental Quality) for the whole building, or parts of it (e.g. apartments), according to classes of values, related to local climate conditions, destinations and time of use”[5].
To improve the technological and energetic performances of the buildings, there are several strategies to adopt such as shading systems, ventilated solar elements, solar greenhouses, ventilated solar walls (Trombe-Michel Walls) … the envelope has a very important role: on it is possible to intervene easily with good results.
Among the different passive technological solutions that favour to maximise the building performance, considering the installations to guarantee comfort conditions, a research concerns a solution to use opaque elements on the façade with an installation to produce energy from sustainable sources with a ventilated space of open air between walls managed with domotic systems.

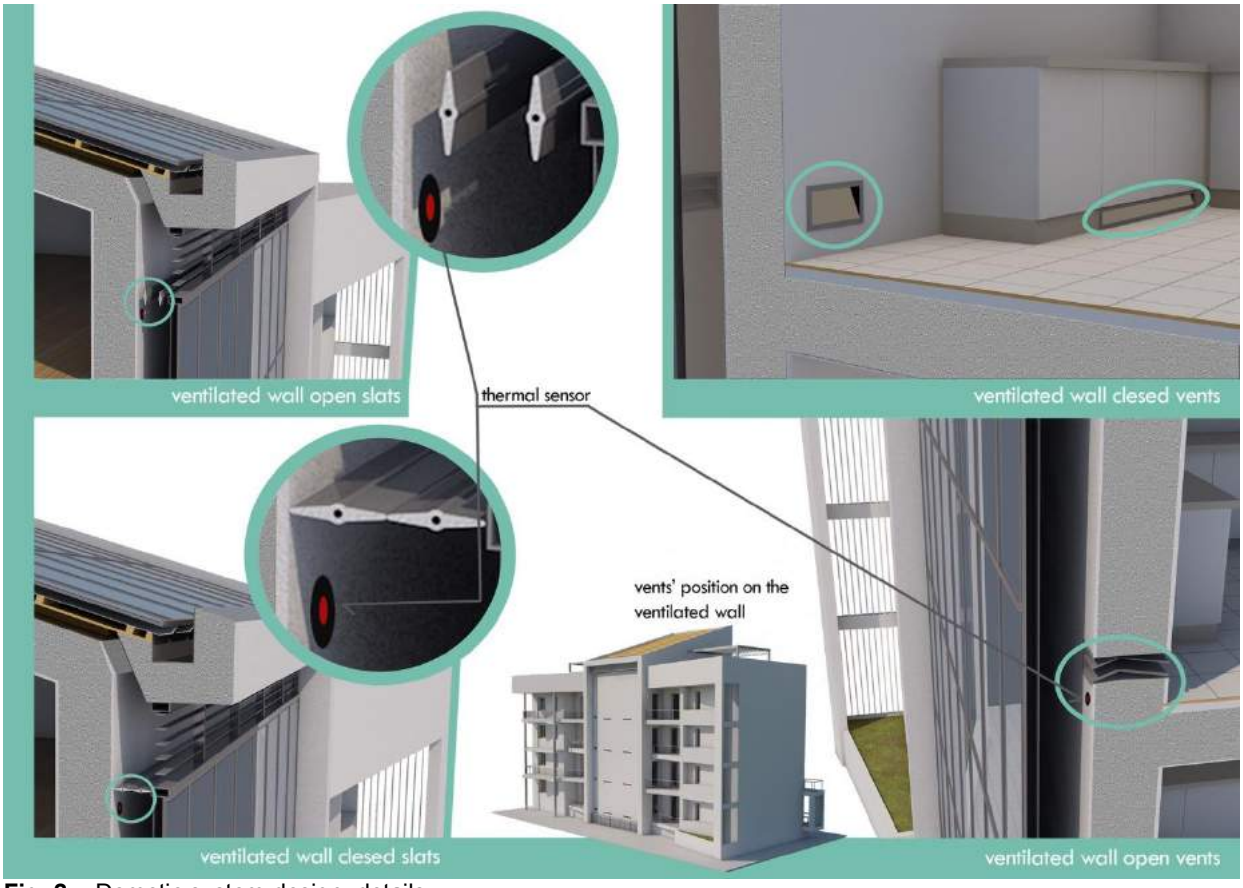

Fig. 2 - Domotic system design: details

This system is more suitable for buildings built in the A, B and C climate areas, that is to say in the areas where the climate is warmer with short and temperate winters and warm and long summers with a low rainfall level.
The climate characteristics influenced the building techniques, but today the traditional building systems have to deal with some requirements that are established thanks to recent laws about energetic saving paying attention to the primary energy consumption for summer cooling that is very important in these climatic areas.
The system uses the natural ventilation that, especially in warm climates and in summer, is a very good solution to guarantee the passive cooling of the buildings.
The air movement and renovation remove heat from the buildings because of the thermal convection, naturally, without the use of mechanical ventilation or energy consumption, and this is more plentiful proportionated to the differences of temperature and pressure between indoor and outdoor.
This ensures cooling advantages and permits to improve air quality, purity and how cool it is. To use

the ventilation wall and roof airing, a domotic system is designed and it works according to the temperatures recorded by thermal sensors.
The domotic system permits to diversify the natural ventilation of the building during the four seasons.
Thanks to this system, it is possible to give a new energetic quality to any blind wall or roof of a building through a technological element with high energetic performances that set the airflow according to the outdoor environmental conditions, reducing the energetic consumption and in the meanwhile contributing to fulfil the indoor comfort performances.

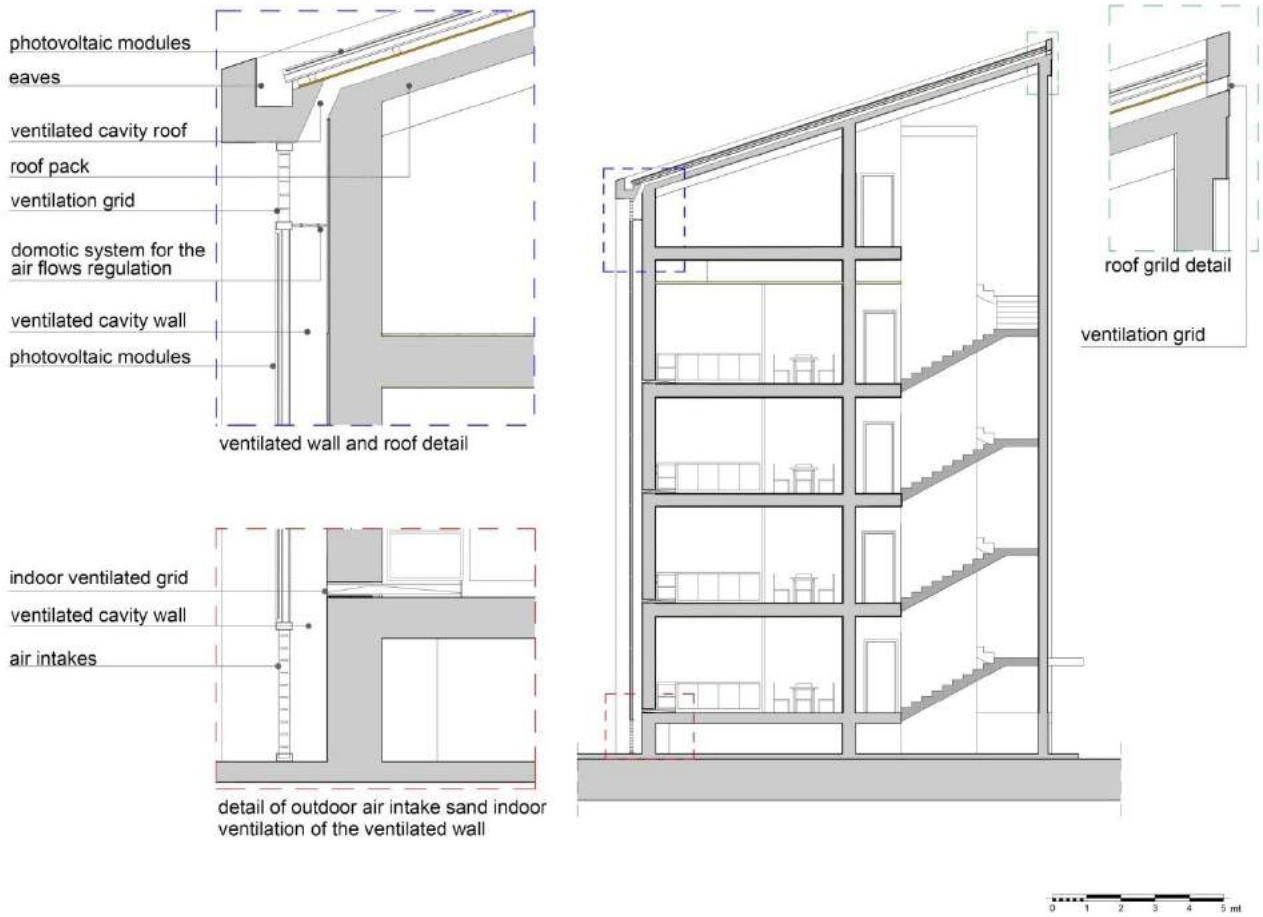

Fig. 3 - Ventilation system detail

5. Towards NZEB performances by AV

The MD 2015/06/26 – Minimum Requirements states "Nearly Zero Energy Buildings" are all the buildings, both just built and already existing, that respect all the requirements of the table below (established with the in force validity from the 1st January 2019 for the public buildings and from the 1st January 2021 for all the other buildings) and the integration commitment of the renewable sources (in accordance with the Legislative Decree 03/03/2011, n 28).
To do these tests, it is necessary to consider the methods preliminarily. The building collects or rejects material and energy flows coming from the environment through its components and the envelope has a decisive role for the flows management. To keep an indoor wellness and comfort condition of a building, the thermal load in two seasons (summer and winter) produced indoor spread through the envelope, and the air quality has to be checked in the heating, cooling and ventilation (and the act of humidifying and dehumidifying is related to them).
The analysis of the thermal loads of each location to condition is the starting point not only for the correct dimensioning shaping of the air conditioning installations, but above all for an efficient technological planning of the envelope that reduces the installations' use and consequently the energetic-environmental costs, working efficiently.
In winter, the building-installation system has to work to increase the indoor temperature, because in the A-B-C climatic areas the outdoor temperature is lower than demanded indoor.
Therefore, it optimizes the free solar contribution through the transparent envelope (the window is the best passive solar system) or using the heating installations [4].
The thermal load is analysed when designing: the outdoor conditions are established according to the

climatic area (Fig. 1); inside the building, it is considered an air temperature θa □ 20□C and a related humidity of 50□ (for every use purpose and irrespective of what the season is – UNI TS 11300:2014). To keep good comfort conditions, it is necessary to supply heat as much quantity as that dispersed by transmission/ventilation/infiltration, but less than outdoor and indoor free contribution. In summer, it is necessary to reduce the incoming heat by transmission and direct solar radiation on a transparent envelope, as well as heat spread by people and other external source (Qint).

H' T [W/ m^2K]	Average global heat transfer coefficient for transmission by unit of dispersing surface
A sol,est / A sup utile [-]	Summer equivalent solar area for usable area
EP H,nd [kWh/m^2]	Thermal Performance Index useful for Heating
H [-]	Seasonal average efficiency of the winter Heating
EP H [kWh/m^2]	Energy Performance Index for winter Heating. It is expressed in non-renewable ("NREN" index) or total ("tot" index) Primary Energy
EP W,nd [kWh/m^2]	Thermal Performance Index useful for the production of sanitary hot water
W [-]	Seasonal Average Efficiency of the domestic hot Water production
EP W [kWh/m^2]	Energy Performance Index for domestic hot Water production. It is expressed in non-renewable ("NREN" index) or total ("tot" index) Primary Energy
EP V [kWh/m^2]	Energy Performance Index for Ventilation. It is expressed in non-renewable ("NREN" index) or total ("tot" index) Primary Energy
EP C,nd [kWh/m^2]	Thermal Performance Index useful for Cooling
C [-]	Seasonal Average Efficiency of the air Conditioning in summer (Including humidity control)
EP C [kWh/m^2]	Energy Performance Index for summer air Conditioning (including the eventual moisture control). It is expressed in non-renewable ("NREN" index) or total ("tot" index) Primary Energy
EP L [kWh/m^2]	Energy Performance Index for artificial Lighting. This index is not calculated for E.1 category, except for boarding schools, convents, houses prisons, barracks and for category E.1 (3). It is expressed in non-renewable ("NREN" index) or total ("tot" index) Primary Energy
EP T [kWh/m^2]	Energy Performance rating of the service for the Transport of persons and goods (elevators systems, sidewalks and escalators). This index is not calculated for E.1 category, except for boarding schools, convents, houses prisons, barracks and for category E.1 (3).
EP gl □ EP H □ EP W □ EP V □ EP C □ EP L □ EP T [kWh/m^2]	Index of Global Energy Performance of the building. It is expressed in non-renewable ("NREN" index) or total ("tot" index) Primary Energy

Tab. 1. Efficiencies, parameters and energy performance indices (Source: MD 2015/06/26)

Therefore, according to UNI TS 11300:2014-I, the ideal need of Thermal Energy for Cooling (QC,nd) is given by the relation:

$$QC,nd \square Qgn - \eta C,ls \times QC,ht$$

otherwise

$$QC,nd \square (Qint \square Qsol,w) - \eta C,ls \times (QC,tr + QC,ve)$$

When designing, above all in case of new buildings, the first step is the reduction of Net Energy [3]. The Nearly Zero Energy Buildings (that are requested performance by the current laws, according to L.90/2013 and the Decree 2015/06/26) are buildings that reduce the Net Energy Need and at the same time reduce the winter dispersion and the summer thermal accumulation and fulfil the residual energy need with systems that produce energy through renewable source.
Nevertheless, it is possible that from a qualitative point of view, in winter the building guarantees very good performances, which are not so efficiently confirmed in summer.

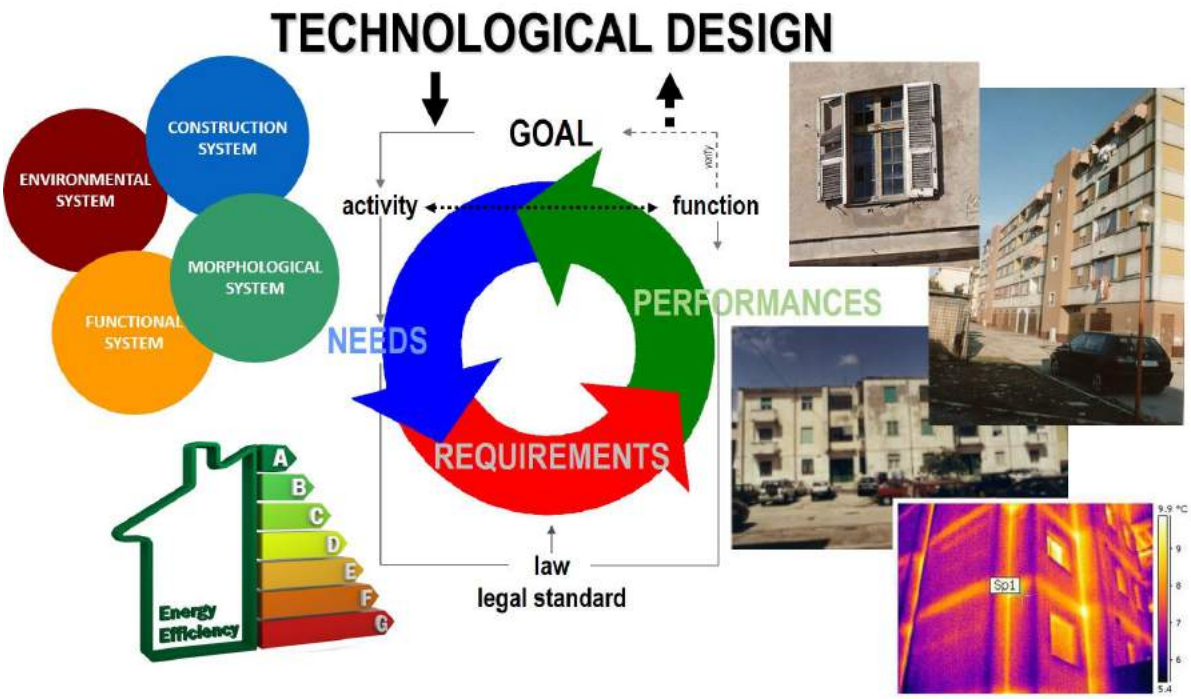

Fig. 4: Need-performance approach to reaching standard NZEB

The analysis is done comparing them and this gives very useful information about where operate when designing to ensure the expected performances.
Usually, the summer performances improvement can happen for instance improving the natural ventilation and shading, but this can worsen winter performances, because some parameters are trade-off. However, the design knowledge, with the employment of computing software tools, permits to be compliant to all the minimum requirements: the surface and interstitial condensation, the global average thermal by-transmission-exchange per aspersing surface unit (that gives the isolating systems efficiency applied to the envelope), as well as the equivalent summer solar area, that describes in detail the behaviour of the transparent envelope and gifts isolations in summer.
To sum up, the design is a knowledge tool, first, and a modification tool, then. The building restoration for a new use or to improve it needs a creative interpretation of potentialities (that are still in embryo from an architectural point of view), material and energy flows (denied or too generously granted) and a wise research to ensure an equilibrium among technological innovation, functional quality and conservation.

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Developments Italian regulations on additional services

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Abstract

The theme of managing services to the public in places of culture is not a subject which lacks in analysis, surveys, researches, debates and reflections. The so-called "law Ronchey" opened, in its time, the way to many opportunities for the development of the broadening of services to the public services, that from the initial and conventional definition of "additional" over the supply guaranteed by the public institution, qualifies now more and more increasing as an essential component which raises the quality of culture and promotes the satisfaction of the visitors needs.

In this long period of time, the cultural evolution of the concept of services to the public and the critical debate on the forms of delivery of services themselves were also accompanied by regulatory and organizational changes that constitute the framework within which the Central Administration and MiBACT device has operated in this matter.

In particular, these management systems have been the most obvious consequence to the so-called "discovery of the public", as theorized by Karsten Schubert, by institutions and places of culture, namely the opening to a wider audience, which is the result of the need to introduce in the organizational system of public cultural heritage management mechanisms to identify museums as centers of revenues and not only as cost centers, generating cultural heritage exploitation initiatives compatible to the public and free use of the assets.

Keywords: museology, museum management, additional services, “law Ronchey”

1. Pre Ronchey Era

The activation of the additional services provided by the law Ronchey of 1993 was preceded and accompanied by a lively debate that has described the entry of the privates now as a revolution of the economy of the museums, now as the emergence of a contradiction between the cultural mission of the museum and the economic dimension of the contracted services. "That of the additional services of the public museums is the story of an intuition that has had considerable difficulties to be translated into an appropriate management model and default by law, able to find the exact balance between conflicting requirements and to outline the respective roles of different actors involved in the sector. Just take into

account the different revisions of the relevant legislative framework or of the current level of contentiousness between museum authorities and entities managing or even modest economic successes achieved by some entrepreneurial activities undertaken for confirmation of what is said "[1]. This was an unique situation because at the time of their original forecast, the additional services were hailed as a "revolutionary new in the panorama of the immobile cultural heritage"[2]. In particular, these management systems have been the most obvious consequence to the so-called "discovery of the public"[3] by the museum institutions, i.e. the opening of places of culture to a wider audience, which is offered additional benefits to the traditional cultural offer. In addition, they are also the result of the need to introduce into the organizational system of the public cultural heritage management mechanisms that generate economic resources flows, focusing, in some cases, on the exploitation of cultural heritage initiatives, although consistent to a public and free use of the assets.

Actually the possibility of access to "ante litteram ancillary services" such as a cafe, drinking coffee at the museum bar, or relative to the bookshop, like buying a magazine at the library, already existed before the adoption of Law 4/1993 , although in different ways: for example in Pompeii "until the mid-seventies it worked the Mutual Aid Fund: it fed by selling postcards to visitors and with a share of the license fee from the restaurant which existed from the end of the war in Terme del Foro. The Fund, as well as interventions of assistance to the individual employees, shares to all staff of the Superintendent. It was a kind of 'profit-sharing': although the capital which provided them, that is the museum and the excavations, was not owned by those who perceive it"[4].

In the "pre-Ronchey era" the granting of commercial spaces within the state museum was regulated by the General Directorate of the Ministry of Finance, which fixed and collected a fee that was to flow into the state coffers. A first change came in 1987 with the signing of the agreement between the Ministry for Cultural and Environmental Heritage and the Government Printing Office and Mint State for the management of commercial spaces for the sale of books, postcards and other publishing products at the museum and the archaeological areas of the state. That convention provided that the Institute realized educational and informative publications but despite the new wave. introduced by the Convention, the Ministry of Cultural and Environmental Heritage did not benefit from higher revenues and remained effectively excluded from the performed activities [5]. The Institute developed a strategy with substantial investments in the infrastructures and a series of trade agreements with other publishers, in order to offer the widest range of products and embrace the public interest, and it decided to manage in a direct way the relations with the authorities, the selection and purchase of products and commercial and tax accounting, making handle, directly to the distribution companies, the mere sales activities in individual open points. The ministerial[6] bureaucracy slowed the start of the operations at least until the early 90s when 19 stores were opened and 14 more came to light the following year. The lack of additional services, unhappy locations or often inadequate ones united to the contingent crisis of the touristic sector and economy in general and to the public no habit and the "endemic" presence of the itinerant trade, often abusive, led to a turnover far below the initial estimates, removing any possibility of self-financing of the museums. "The road of expanding services to the public should be pursued to the bottom. It is a duty of civilization, before a relative bargain, to put coherently the richest cultural heritage of the world in acceptable terms of usability and readability, without excesses of commodification, but without depressing the demands of the public of every level or nationality"[7].

Also in 1990, at the Sixth Week of Cultural Heritage, it was approved the Final Document of the First National Conference of Museums[8]. In the Art. 6, the document anticipated the possibility to entrust to privates "support services such as ticketing, cloakroom, retail and dining options, tasks which promoted cultural initiatives from time to time identified and, in perspective, the custodial functions and guard, valuing the forces of volunteering through special forms of concessions".

2. "Ronchey Law"

On November 14, 1992, when the Minister for Cultural and Environmental Heritage Alberto Ronchey, in the office for only four months, proposed the Law Decree n. 433, entitled "Urgent measures for the operation of

public museums. Provisions on public libraries and public archives ", then converted in the law 14 January 1993, n. 4, now famous as "Law Ronchey" [9], the framework first outlined changes radically. The urgency of the measures was a clear hint of the deplorable state in which they poured the museums of our country at that time: inability to support themselves through their own efforts, with the consequent need to depend on the contributions of the Public Administration, total inadequacy of the structures, without those services deemed essential now as catalogs, guides, reproductions of works of art; to aggravate this situation helped the reduced opening hours and the long summer closures, to coincide with periods of increased tourist numbers. The law Ronchey restored full power to the Ministry of Cultural and Environmental Heritage, for the grant of commercial space within the public museums. The revolutionary impact of the measure lies essentially in two elements: for the first time, in a legislative level, the visitor becomes the subject of the anticipated visit and, as such, it is entitled to enjoy a service that is not limited to the simple enjoyment of the collections; the other great innovation introduced resided in the possible outsourcing of the management of the museum services, entrusted for the first time to private entities. The entry of private entities in the management was the biggest news and at the same time the greatest taboo in a country where the passive protection of cultural heritage had always prevailed on the enhancement.

The scenario of the Italian museums, unchanged for over a century, was modified, allowing for the first time the entry of private management of museum services, alongside to the Public Administration. They threw the foundations for a profound and radical change, although slow and suffered, that would soon generate new needs and further action. The discipline of additional services is undoubtedly the most interesting element of the Ronchey law. With this measure the museums were opened to the world of entrepreneurship, with positive consequences in terms of increased demand, after the enrichment if the museum offers, and an economic return, although the income expectations have been overestimated.

In this regard, Antonio Paolucci, then Superintendent of the Museum Pole of Florence and since 2008 director of the Vatican Museums, argued that they had to debunk the legend concerning the "fruitfulness of the museums". According to Paolucci, in fact, the measures implemented through the Ronchey law could not resolve the situation of the endemic term care of the museums, with the exception of some unique cases, such as the Louvre, where the revenues from additional services represent 18% of the revenue of the museum, compared to an average of no more than 15% [10]. To Paolucci's opinion it is added the voice of Luca Zan, professor of economics at the Alma Mater, who points out how the expression "professional managers" of the museum management, should certainly not mean an unlikely goal of economic self-sufficiency, but it means an economic empowerment and a consequent accountability, namely the duty of the museum managers to give transparent and timely reporting of the museum's expenses [11].

About a year after the approval of the Ronchey law, it was enacted the Regulations for the Implementation of additional services set up by art. 4 of the Act, with Ministerial Decree no. 171 of January 31, 1994 [12]. The Regulation establishes the criteria and procedures for the granting services, it provides information on the right use of the cultural assets and anticipates the preparation of a list Price, later published under the Ministerial Decree of 8 April 1994 [13]. Among other things, the bill provides the possibility to perform casts of works of art to create items for sale at the bookshop turned into museums. This last point has caused some controversy among scholars and publishers. The delay in the additional services, like three years after the approval of the law has been activated, is due to the complexity of rules and procedures set out in the Regulations, but also and perhaps most importantly the "passive resistance implemented by supervisors, powered , at best, by an absolute lack of interest in the matter, at worst, by a stubborn distrust of any form of outsourcing that contemplates, among his reasons, the growth of the economic profitability of assets" [14]. On the other hand, the measure provided for the supervisors the right, but not the obligation, to activate these services.

Further confirmation of this strong resistance to change is the reaction provoked by the Article 47c of the Decree Law of 23 February 1995, n. 41, converted into the Law of 22 March 1995 n. 85 [15]. The aim was to increase revenue from additional services in a time of national economic crisis, widening the range of providers of services also to non-profit organizations such as cultural and banking foundations, and extending also to activities such as supervision and discipline cleaning of the exhibition rooms, the reception, the guidance and teaching assistance, ticketing, management of record collections, of libraries, exhibitions

and other promotional activities. The innovations introduced by the measure were such as to require a second Regulation implementing, by Ministerial Decree of 24 March 1997, n. 139 [16], signed by the then Minister Walter Veltroni which provided that reliance on private additional services had to take place only if those services could not be delivered through the human and financial resources of the public administration or if the entrust to individuals proves convenient in economic terms to the administration (art. 2, paragraph 1); also, they consider financially convenient activities and services that, alone or in combination with others, produce an increase in income or decrease in costs for administration (art. 2, paragraph 2). This second regulation can be interpreted as the result of the criticisms of excessive liberalization initiated by Article 47c, which according to some would lead to a debasement of the cultural and educational value of the museum services. The new Regulation updates the types of services provided: a sales and service catalogs and cataloging aids, audiovisuals, computer, of any other informative material, of reproductions of cultural goods; a library loan service and supply of reproductions relative to library and archive assets; the management of record collections, and museum libraries; The bookshop of the management and commercial use of reproductions of works of art; reception services, information, guidance and educational assistance; cafeteria services, catering, wardrobe; cleaning services, security, ticket management; the organization of exhibitions and promotional activities.

The law 25 March 1997, n. 78 [17] introducing the entry ticket for the benefit of the Ministry of Culturak and Environmental Heritage, the presale and then the scheduling of visits, not only it has finally solved the problem of queues at the entrance of the most frequented museums in times of increased inflow , but with the abolition of entry tax the proceeds from ticket sales were finally returned to the competent Ministry, where previously it was for the benefit of the Ministry of Finance. With the entrance fee, the museum in relation to the public is configured as a service, and the payment of the ticket was not intended as a condition for admission to the use of the public good, but as a contribution to be paid for cover the costs of a public performance.

This goal, of obtaining control of the cultural institutes inspired by criteria of economy, including through the opening to private participation, finds its first formulation in legislation Legislative Decree 20 October 1998, n. 368 [18], establishing the Ministry of Heritage and Culture, where the paragraph 1 of Article 10 provides the possibility for the Ministry to exercise more effectively its functions and in particular the enhancement of cultural heritage, through the conclusion of agreements with public or private entities administrations, namely the creation or participation in foundations, associations or companies, according to the procedures and criteria which were later defined by the next Ministerial Decree implementing 27 November 2001, n.491.

3. Additional services in the Cultural Heritage Code

The low profitability generated in recent years by the services in question and the management problems mentioned above have prompted the legislature to intervene again on this matter. The first occasion was provided by the approval of the Cultural Heritage Code, Legislative Decree 22 January 2004 n. 42 [19],in which additional services have been anchored to the system of the promotion of cultural heritage, with the aim of strengthening the real function of the institute in question and to ensure a suitable use for the purpose of "promoting knowledge of cultural heritage and [to] ensure the best conditions of use and public access to the heritage in order to promote the development of culture". The special profile of the development of cultural heritage is relevant, because it can help ensure the best conditions of use and public enjoyment of the cultural heritage and because it has been and is the experience with the greater degree of outsourcing of the consolidation of the public activities in the cultural heritage sector [20]. In this perspective, the additional services are activities aimed not only at improving the enjoyment of the cultural heritage, but also to promote greater knowledge and, therefore, become a full appreciation of the important tools of the system, like the other public service initiatives this linked system.

The figure unquestionably revolutionary of the Municipal Code is precisely the plurality of instruments admitted by the legislature in the new cultural heritage management system, coming to anticipate that even where the administration has justifiably opted for a direct form or internal asset management, it keeps open

the possibility to use the instrument of the concession to third parties for the custody of the services referred to in Article 117. In addition, the Code allows, albeit abstractly, to operate according to the traditional logic of concession also segmented and even certain additional services: the choice between direct or indirect management of the additional service is entrusted by art. 115 to a comparative evaluation, having as parameters the cost and effectiveness visas to the objectives pursued. Please note, however, that the choice between one or the other management formula made with reference to a single additional service activity does not bind the acting administration with respect to the other, being able to have well-managed services in direct form and others to on which is more convenient further outsourcing. However, when chosen the form of the indirect management it becomes necessary to proceed to the entrust of the concession to private third parties selected by means of public procedures, not being able to admit direct contracts, as also mentioned by the Administrative Court. In the organization of additional services there is the ability to manage the cultural assistance and hospitality in an integrated form with cleaning services, surveillance and ticketing, provided for in paragraph 3 of art. 115 [21]. Integrated management is an organizational option that can be very beneficial for the public administrations concerned, since, greatly simplifies contractual relations, to focus in a single pole of imputation responsibilities and, therefore, to more easily govern an externalization process that otherwise would present a multiplicity of dynamics.

The management indirectly is implemented through: a) direct award to institutions, foundations, associations, consortia, joint stock companies and other entities, consisting of, or participated, the predominant part , by the public which pertain goods; b) concessions to third parties, according to the criteria specified in paragraphs 4 and 5. Paragraph 4. The state and the regions resort to management in an indirect form in order to ensure an adequate level of development of cultural heritage. The choice between the two forms of handling specified in subparagraphs a) and b) of paragraph 3 shall be enforced after a comparative evaluation, in terms of efficiency and effectiveness, the objectives to be pursued and its means, methods and timing. Paragraph 5. If, as a result of the comparison referred to in paragraph 4 it appears preferable to use the grant to third parties, the same will be covered by public procedures, based on a comparative evaluation of the projects submitted.

It appears no longer procrastinated, if not a duty, a design of the whole complex of the cultural asset management activities and, more generally offer "integrated" its use, taking its steps to the observation of the territory and the context and cultural environment in which the object is located in connection with agreements with other local authorities; equally dutiful is the need for an unified vision for a single, homogeneous custody of the overall public service utilization and exploitation.

Subsequent legislation enactment of the Code repeatedly return to the concepts expressed earlier: the quality of the delivery service and the concept of the integration within the scope of the licensing system; it has to be pointed out two other ministerial provisions with which it’s possible to improve the economic conditions and the legal framework of reference in order to encourage greater use of pooling. The first measure is the Ministerial Decree of 28 September 2005, n. 222 [22], with which the Regulations for the management of the ticket offices and the pricing of tickets procedure was changed, has increased the premium in favor of the private and the times have been extended within which the proceed are returned to the State. The second stage is Article. 14 of Decree Law 1 October 2007, n. 159 [23], converted with amendments by Law 22 November 2007, n. 222.

The standard states that the custody of services must take place in an integrated manner with respect to both the various types indicated in art. 117 of the Code and to the various institutes and places of culture in which the services must be provided. The matter is regulated, as expressly provided for in the law, by the next Ministerial Decree of 29 January 2008 [24], that highlights and strengthens, compared to what was stated previously, some of the concepts and directions: reiterates the possibility, already provided for by art. 115 of the Code, to manage services both directly and indirectly, in the case of outsourcing requires the integrated management of the services; assigns to the Regional Directorates, identified as contracting authority, the task of determining which encompass places of culture in this integration, hopes that this management mode can be extended to non-state museums through the conclusion between central government and regional and local authorities to cooperation agreements, as envisaged by art. 112, paragraph 3 and 4 of the Code [25].

The additional services to the particular context in which they are managed are not mere benefits provided to the public by an authorized dealer, but represent activities that still contribute to the enhancement of the assets in respect of which are located in the instrumentality relationship. In addition, the efficiency and the rationalization of the integrated system of additional services, whose responsibility is the dealer's, also depends on the attractive force that the cultural offer proposed by the institution museum has on the public, with the result that, while avoiding those situations, the dangerous confusion of roles mentioned above, it is necessary to imagine forms of cooperation between the two players in the additional services industry in the cultural institutes.

4. From additional services to services to the public

The reform of 2008 innovates the art. 117 of the Code of cultural heritage and landscape only in the section, replacing the previous definition of "additional services" to "services to the public". For the rest, the identification of the categories of activities, the discipline and the institution's legal status in question remain the original ones. The Ministerial Decree of 29 January 2008, followed by, March 6, 2009, the "Guidelines" [26] that put in relief some elements, is specifically referred to the Decree, which more general scope: it emphasizes the discretionary activities, and not the obligation, the activation of the integrated management, not to "constrain the administration to adopt management projects inefficient and ineffective, even (in some cases) clearly not cheap, subjecting also the choices of enterprises, depriving it of the right to evaluate alternative options and the same ability to stimulate the competitive comparison and qualitative growth in the sector"; the wide attention given to how services are activated by the Ministerial Decree of 29 January 2008 is, in the Guidelines, subject to a series of preliminary evaluations of services to offer to the community, organizational financial and personnel resources, to the actual or predicted interest by other public and private entities professionals. Also with regard to the emphasis given in the Ministerial Decree to the signing between the central government and the regional and local administrations of cooperation agreements pursuant to art. 112, paragraphs 3 and 4, it refers, in essence, on the principles of caution and careful preliminary assessment of the prospects and potential of specific sites, using the principle of analytical knowledge of the realities on which it intends to intervene, in order to give rise to projects not only clearly defined, but achievable and sustainable. It is emphasized that the integration between services, as well as being discretionary, should be properly modulated and graduated especially when, in the case of horizontal integration, combines both services to the public and instrumental services (cleaning, security, maintenance of various kinds) [27]. Again the preliminary assessment of the economic viability of this type of integration is crucial for attributing the conduct to the dealer at no cost to the administration or whether the costs should be kept at the administration load.

With the enactment of the Presidential Decree 92 of 2 July 2009 [28] it is resulted, among other things, the establishment of the Directorate-General for the promotion of the cultural heritage. Among the many tasks conferred on it they are counted even those to provide adequate support and address of useful tools to update the system of supply of services to the public as well as policy and control functions in the field of cultural heritage of the public that, as relevant here, are reflected in the identification of appropriate legal instruments to individual projects to enhance and to the local bodies involved in them, the preparation of models of notices and standard agreements for the assignment of services to the public; the development of guidelines for the identification of forms of exploitation activities. Given the mission, it has failed to enhance the direction to face, in the first months of his action, the theme, more and more "hot" of the licensed management of the services to the public in the public cultural sites, obscuring, than the general public, the numerous projects in which were on at the same time, projects that in hindsight are the operational application of the mission entrusted compared to many areas of the development of heritage. In other words, rather than the will to address systemically problematic broader recovering and systematizing studies and experience gained over at least the previous decade, the emergency tax was to provide a solution, as soon as possible, with the critical specific services of the public administration sector. How the search for solutions is no longer put off is also indicated by signs that were long showed by various organs of the State [29], by specific requirements, and finally, from the wording of Article 7 of Decree Law 194/2009 [30], which fixed to 30 June 2010 the deadline for banning tenders for the award of concessions for the management of services

to the public in the public cultural sites, in view of the extension system that characterized many of the concessions with which many places of culture were managed. The activity that preceded this peremptory deadline, has committed the Department in an intense project activity that could lead, in the light of previous experience, to the creation of media and policy instruments such as guidelines, facilities for technical assistance and co-ordinated actions, to support the peripheral Institutes to improve their ability to update their systems of services for the public systems. All was promptly ignored and left in the oblivion.

5. Current scenario

On the 31st of May 2014 it was approved by the Senate, with 159 votes in favor and 90 against, the decree-law n. 83, converted with amendments into law July 29, 2014, n. 106 [31], which introduced as part of urgent measures for the protection of cultural heritage, the development of culture and the revival of tourism, a tax credit to encourage donations to support culture: the so-called "Art-Bonus". The measure also contains other measures: extraordinary conditions for the acceleration of the Pompeii redevelopment, incentives for cinema, for digitization and the redevelopment of the Italian accommodation. According to the Minister Franceschini with this law two barriers would be torned down: that of the relationship between public and private, and that of the separation between the protection and the enhancement. At the beginning of 2015, the Minister announced the means by which it was intended to unravel one of the most thorny tangles of its mandate: the model used will be France, where a public company, the RMN (Réunion des Musées Nationaux) competes with private to win castles and galleries, in Italy there will be the Ales Spa, a company owned by Mibact. The new course also goes from the structure called to develop the criteria and content of the new races. The task was entrusted to Consip, the central of purchases for the government, the goal is to blow up the turnover of the monuments with new races that would attract foreign companies. It was published in the Official Journal the notice of prior information with which Consip announced the launch of a framework agreement that will allow public authorities to carry out a project of enhancement of cultural goods which are part of their heritage, through the instrument of the concession, in a faster and more efficient way. Simultaneously, Consip has also initiated a consultation of the market between the operators in the sector, in view of the final version of the contract notice: the instrument identified is that of the integrated management of the services to buildings that make up the cultural heritage, and additional cultural assistance services and hospitality for the public. The Framework Agreement that will banish Consip has in fact as an object the delivery, in an integrated manner, of management services, services to buildings and services, entrusted in concession, cultural assistance and hospitality to the public, to be performed in institutions and places of public culture. The announced revolution will not be impetuous: to have concrete results we must wait until the spring of 2016, at least a year will be needed, they say from Consip, to select companies and then allow supervisors to elaborate projects, publish notices, cope with any appeals.

The first change relates to the creation of a single national ticket service, with reservations and advance sales online for all the art galleries, monuments and archaeological sites of the country. It will not replace those of each gallery, but tourists and fans can carry through a single national system their choices, buying and accumulating tickets for different places, and perhaps enable the "extra" to skip the queues. The goal is to publish the notice in order to award this mega-Ticket Central in the first half of the year. And finally two intervention groups were defined, for the races by which every museum and regional director will choose the individuals who will work with him. The first group concerns the so-called "operational and management services", clean management, minor maintenance, call centers, computer networks and porterage. The second is the "cultural services" or the bookshop, workshops, guided tours, spaces for exhibitions and events. In calling for competition, choosing the content and major projects for the area, will be the directors, and Consip will help for the technical part.

On July 31, 2015 was launched the tender for the award of management and operational services (facilities management), for institutions and places of public culture. "This race will make available to MiBACT and to the local authorities both the "operational services"(plant maintenance, cleaning and environmental hygiene, maintenance of green areas, porter, etc.) and the "government services" (information systems, call centers, technical master data, etc.), through the instrument of the framework convention. The MiBACT and the local

government departments can buy services directly from the suppliers selected by Consip, without any further races, with considerable savings not only in terms of purchase prices, but also of time and process"[32].

Despite the MiBACT-Consip project also includes a contest for the service of the national ticket office and a number of competitions for the so-called additional services, today it is not put out to tender any project to develop. It ends the period of the extension of the concessions of additional services in the places of culture with a new management model is a goal yet to be achieved.

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[18] Legislative Decree of 20 October 1998, n. 368 entitled: "Establishment of the Ministry of National Heritage and Culture, in accordance with Article 11 of the Law of 15 March 1997, no. 59." (Official Gazette no. 250 of 26 October 1998)

[19] Legislative Decree 22 January 2004 n. 42 stating: "Code of cultural heritage and landscape, in accordance with Article 10 of the Law of 6 July 2002, n. 137" (Official Gazette no. 45 of February 24, 2004)

[20] Court of Auditors, "Survey on cultural customer management services and hosting to the public in institutions and state cultural sites", Resolution 22 of the 12 December 2005

[21] Legislative Decree 22 January 2004 n. 42, Article 115: "Forms of Management", Paragraph 3.

[22] Ministry of Heritage and Culture. Decree of September 28, 2005, # 222 "Amendments to the regulation referred to in the Ministerial Decree of 11 December 1997, n. 507, laying down rules for the establishment of admission to monuments, museums, galleries, archaeological digs, parks and monumental gardens. (Official Gazette no. 255 of 2 November 2005)

[23] Decree Law 1 October 2007, n. 159 "Urgent measures for economic and financial matters, for development and social equity". (Official Gazette 229 of October 2, 2007) Article 14. "Rationalization of additional services - Cultural Heritage" Paragraph 1. In order to ensure efficiency and effectiveness in the delivery of additional services referred to in Article 117 of Legislative Decree 22 January 2004 n. 42, as amended, instrumental to the better use of cultural heritage, by rationalizing the available resources, the assignment of such services takes place in an integrated manner with respect both to the various types set out in that Article 117, which the various institutes and places of culture, in which the services must be performed, in the area of their respective competence, by regional directorates for cultural and landscape heritage and Institutes with special autonomy of the Ministry of National heritage and culture. Paragraph 2. With non-regulatory decree of the Minister for Heritage and cultural activities, in compliance with the rules of Community law, the organization of additional services is governed on the basis of the principles set out in this Article, by the way providing that, in the first application, the integrated custody services take place, if necessary, even with different initial terms, ensuring the natural expiry of existing concessions in progress. Paragraph 3. Pending the entry into force of the integrated discipline on custody of the additional services referred to in paragraphs 1 and 2, reports still in place relative to the same services remain effective until they expire or, if overdue, up the award of the races issued by 28 February 2008.

[24] Ministry of Heritage and Culture, Decree January 29, 2008 "Procedures for the award to individuals and integrated management of the additional services at cultural institutions and places" (Official Gazette no. 88 of 14 April 2008)

[25] Legislative Decree 22 January 2004 n. 42, Article 112: "Promotion of Cultural Heritage of public ownership" Comma 3. The enhancement of public cultural goods outside of institutions and places referred to in Article 101 is ensured in accordance with the provisions of this Title, in line with the performance of the institutional aims which those goods are intended. Paragraph 4. In order to coordinate, harmonize and integrate activities for the exploitation of the goods of cultural heritage belonging to the public, the state, through the Ministry, regional and other local governments enter into agreements on a regional basis, in order to define objectives and to fix the times and methods of implementation. With those agreements are identified appropriate forms of management, in accordance with Article 115.

[26] Ministry of Heritage and Culture - General Secretariat, Circular no. 49 bearing on the subject: "Guidelines relating to activation and concession of services to the public in the state cultural institutes" of March 6, 2009

[27] About it should be stated that also the ticketing services are counted in this category, even if the qualification of this service "as" instrumental "has only one nominal value [...] being undeniable the fact that, in the great majority of cases, the ticketing represents the most significant part of the economic flow that sustains the economic balance of the concession "(See." Guidelines ", p. 9).

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[31] Law 29 July 2014, n. 106 "Conversion into law, with amendments, of Decree-Law of 31 May 2014, n. 83, on urgent measures for the protection of cultural heritage, the development of culture and the revival of tourism "(Official Gazette 175 of 30 July 2014)

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The land tenure of family Minister Camillo Benso Conte di Cavour

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Abstract
The analysis is part of an research concerning the Vercelli area, where in this land of water, a perfectly preserved heritage landscape is that wildlife, surrounded by a man-of considerable value, this wall of analysis concerns the farms scattered in this territory, our attention is on some highlights, such as the farm of the Count of Cavour. The term farm is present in numerous medieval documents, in ancient statutes of Piedmont 700 'is, for example, the Latin voice capsina, caxina, fate as container work, built according to a number of areas of land to serve often focused on the Roman centuries. The open form needs to work, he closed to contain animals with fences, buildings accommodated with forms to L and U contained drying barns and warehouses and granaries. Fundamental was the presence of a well for watering both animal and human, for the fields irrigation channels and ditches that were ruled from the farm, which initially serves to store work tools and animals while the houses stood near the castle or monastic estates They were fortified and in case of danger from immediate shelter. The relationship between the monastery and castrum in northern Italy is very diverse and provides a glimpse of a complex reality, to the inability to distinguish the primary role of either element, often the monastery stands on a castle now abandoned, as it happens at the end of the eleventh century in many foundations of Cluny. Once belonged to the Principality of Lucedio abbey, are located to the south near the rural complex, and Ramezzana Montarolo while, Leri and Castelmerlino are located in the part of territory that extends north-west of the Principality, and correspond to the possessions of family Minister Camillo Benso Conte di Cavour. These places are abandoned today but worthy of preservation this purpose are reported to the Piedmont Region.

Keywords: Cavour, Leri, land tenure,

1. History
The place is mentioned by name in Aleramo of Otto III degree of 999 and to Alerh, in one of Frederick Barbarossa in 1159. In 1179 the grange was purchased by the monastery of St. Genuario, which belonged already to a large extent. in the act of that year they are named the castrum and villa de site Alerii (GIORDANO, 1979, p. 94; PANERO 1979, p. 153).
So this was a fortified center, of which more than you lose memory and of which there are no visible traces. Leri was bought in 1822 by the Marquis Michele Benso di Cavour, father of Camillo, and Leri Cavour transformed into a large business model, possibly eliminating or riattando oldest buildings.
This site will, Therefore, keep a discreet archaeological interest for the presence of ancient fortification, which was not localized to the current state of knowledge. Some utility may be, in this respect, the comparison between the situation of the buildings the beginning of the nineteenth century and the present.
Abbey Lucedio was founded by Ranieri, Marquis of Monferrato, which in 1123 I called the Cistercians, probably in place of the Benedictines (GIORDANO 1979, p. 73). The name is already present in a card of 904 (PANERO 1985, p. 17) and some traces of occupation from Roman times (BORLA 1982 25, p. 92) suggest that the place was inhabited even before the founding of the monastery, as well as in many similar cases (COMBA 1985, p. 372).

Lucedio had important donations from the Marquis of Monferrato, in whose territory once stood (SINCERE 1897, p. 212; GIORDANO 1979, pp. 77-79), and his fast expansion led to repeated disputes with the neighboring abbey of St. Genuario. To six grange that constituted the primitive budget of Lucedio (Montarolo, Montarucco, Leri, Darola, Castelmerlino, Ramezzana)

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1.2 Leri and Cavour

The future statesman in 1835 assumed responsibility for the administration of the estate under the auspices of a company formed for this purpose which included the Marquis of Cavour, the young Camillo and the Duchesse de Clermont-Tonnerre. With the death in 1837 of the Duchess consort, the noblewoman left the company behind the assignment of rental fees and interest for the next eleven years. In November 1849 the estate remained at Benso father and son, was given again in a formal lease to a company formed by the brothers Gustavo and Camillo Cavour and Giacinto Corio. The contract was then renewed in April 1857: since then the company remained the same part only Camillo Benso and Giacinto Corio. Leri has always occupied a central role in the life of the statesman: a sort of refuge made of reflection and quiet, but also home to economic and agronomic activities initiatives. Cavour relies on aid from 1843 Giacinto Corio, a big farmer from Livorno Vercellese, today Livorno Ferraris, a good tenant and then partner. The two partners worked together, doing tests of machines, fertilizers, seeds, rotations, fattening cattle and their activity is followed in Cavour's letters to her director. The Leri estate still represents a unique heritage of history, emotions and traditions. He has stood on the unification of Italy. There the modern rice farming was born. ou can consider also the epicenter of the birth, as there lived Camillo Benso di Cavour, bulwark, symbol and flag of that nation that fathers have handed down to their children, often with the sacrifice of life. The Unification of Italy was not made for a concatenation of historical coincidences, as if it were a free gift of fate. It was imagined and desired with tenacious faith and concretely implemented by means of a heroic mobilization of minds and passions. All this happened in large part precisely in Leri estate. Cavour always had a soft spot for the Leri estate; He used it as a resting place, but also of experimentation of new productions, new techniques, new machinery. Also, when the events they put him on the sidelines, the love for Leri and for invigorating agriculture and was grateful to those who gave him the innocent pleasure of rural idleness and peaceful satisfaction of being able to admire a well-cultivated field or a meadow covered by bushy herbs. It includes his attachment to Leri, "the crowded courtyards, the fertile life, the increased wealth were the result of fifteen years of struggle against the earth, against water, against prejudice and against fever". A Leri, of course, coming, as well as those who wanted to take agriculture cognition Vercelli, attracted by the fame of man, even eminent visits: King Victor Emmanuel had to go there in 1854, Verdi visited him in '59 and in that same year, while seemingly Cavour took care of the rice paddies and bedding of its assets, Nigra, La Farina and Sir James Hudson came and went from Leri in Turin.

Fig. 1: Leri aerial photo

Fig. 2: Grange Leri. House Cavour

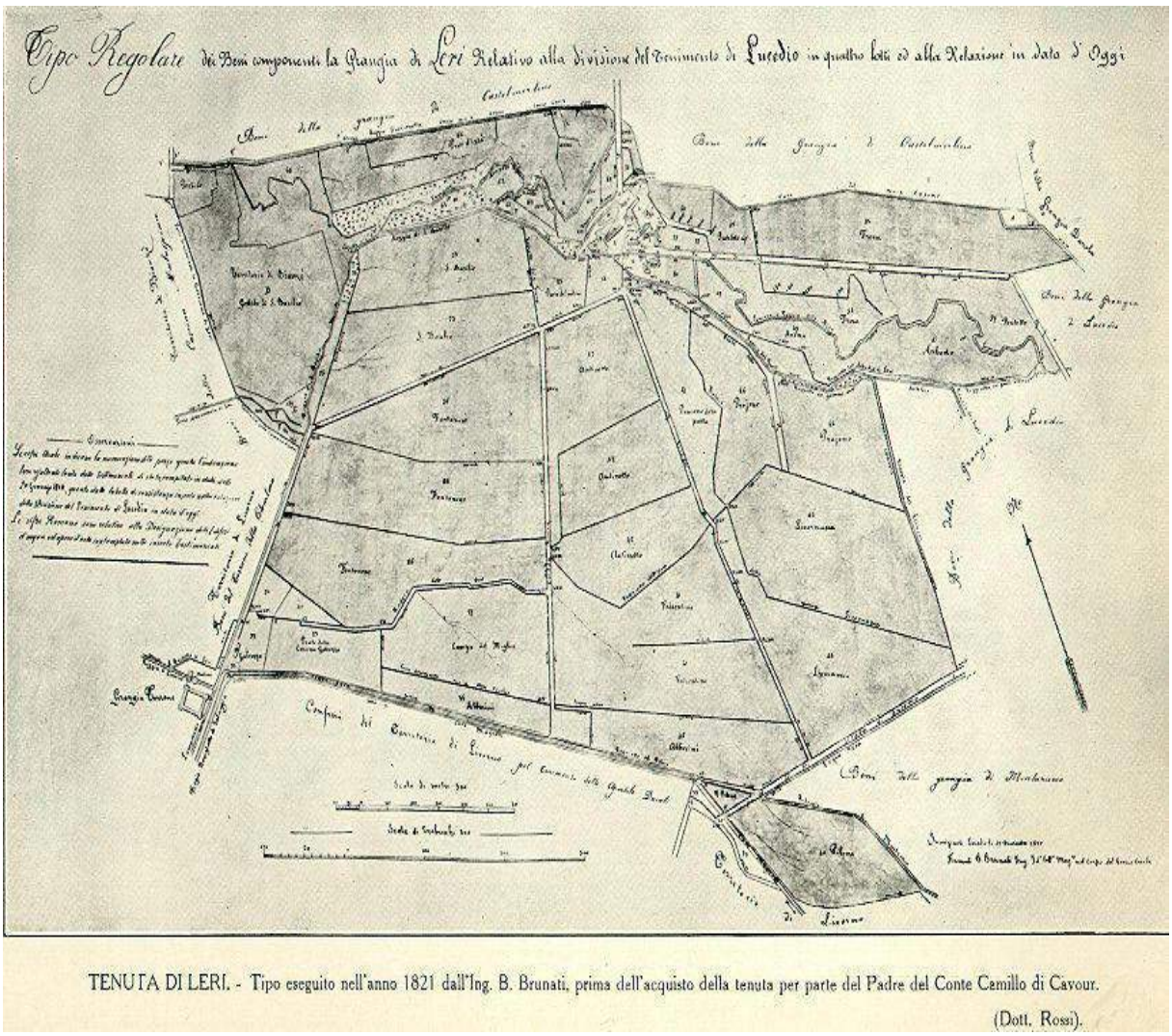

Fig. 3: Map of Leri held before the arrival of Cavour (1821)(From Mattirolo - Count Camillo Cavour and the Royal Academy of Agriculture of Turin, Turin 1931

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Medina Traditional Roshan– the Effected Role

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Abstract
Islamic civilization, born in Medina, has created its own specific urban environment, producing enormous consequences for social life. The urban pattern and traditional houses are essentially influenced by the Islamic norms. Some important features like wooden screens covering window openings, called Roshan, had an important role for environmental conditions and the urban image of the city. This reflected a craft sensibility and fine skills using materials and natural colors.
The traditional façades in Medina were characterized by using these Roshan screens for light, wind and vision purposes. These large wooden structures, built with small slim columns, project a three-sided wooden structure onto a building's façade forming a sort of balcony, with a recognizable latticed component.
Modern urban regulation, the influence of the International Style and the physical transformation of built forms (due to new construction materials and building technologies) have substantially canceled the valuable role of Roshan, becoming just decorative elements attached to the façades of luxurious hotels in the old centre of Medina.
Arch. Paolo Portoghesi visited Medina in 2013; he formulated some important observations concerning the use of Roshan, which are documented in this paper. Other important architects have studied the original aspects of the traditional use of Roshan in Medina, recommending the revitalization of it use, in order to reassert an appropriate image of the first city of Islam and recover the social life of local people.

Keywords: Medina Roshan, Tradition, Innovation, Architectural Regulation.

1. Introduction
The Roshan screens represented an important component in the formation of the urban character of Madinah. The beauty of its geometric design contributes to enrich the Islamic architecture of the city. Unfortunately, nearly all traditional buildings have disappeared in the new urban expansion, substituting most of the old context of Medina. The local authority was trying to re-find the 'spirit of place' which Medina has lost, inviting scholars to make their observations in order to improve the contemporary architectural style of the city.
Concerning the façades of Medina traditional buildings, Portoghesi [1] notes: "Walking around the city today, it would appear that this widespread and instinctive collective desire to design buildings starting with the interior space has been lost and replaced by a search for a less profound and basic balance, one which is visible in the independent façades designed as isolated and separate entities… It's easy to understand how the Roshan contributed to the character and appeal of the urban image of Medina; its many varied forms and interpretations communicated a way of living together, of cohabitation inspired by religious sentiment, the central role of the family, and the search for a balanced relationship between man and the environment. If the city of tomorrow were to lack this element, or something that is its natural heir, then this would be an irreparable loss, an ungenerous gesture

towards future generations who would be deprived of a direct link with their historical past which, to all intents and purposes, we can consider a true and tangible social heritage".

Arch. Taha [2] wrote an important book concerning particularly the Roshan of Medina, analyzing carefully all its components, he refused the contemporary use of Roshan, denouncing the "bad copy" and inviting the architects to appreciate the proportion and the accurate design of its various elements. Arch. Al Oqbi is well known in Medina for his particular projects, re-using the proportion, forms and technique of Medinan traditional architecture. He assisted arch. Rasem Badran implementing a sort of open museum "the Traditional Village of Medina" in Fahd Park, re-designing some old buildings and using reclaimed Roshans of the old Medina.
Arch. Tokan has implemented an important public building in Medina in 1998 using a few traditional elements of Medina, like Roshan and arcades, but following his own style; for Tokan and also for Badran the contemporary architecture should manifest the originality and integrity with the modern technology parallel to the culture of people. Both agree to re-use Roshan in a contemporary architecture, but not necessarily copying the same components. Unlike Tokan and Badran, Al Oqbi, prefers using the same proportions, forms and colors of the traditional architecture, his design of the gate of Medina's Prince is an example.

In this paper we have documented these various opinions concerning Roshan, illustrating the most important characteristics and exemplifying some contemporary use of Roshan, especially in the old center of Medina. We have noted that its effective social function is difficult to re-obtain, unless without re-thinking the instruments of planning and the architectural criteria of design. Meanwhile, for the environmental function of Roshan, this is discarded; people prefer using air condition machines due to the extreme hot and arid summer (within 50 degrees). These A/C units became part of Roshan, which is used to disguise the ugly A/C machines. (see fig.1 and 5)

2. The main components of Medina's Roshan

Al Medina's Roshan forms a balcony with a depth of 60-90 cm. The most characteristic Roshan in Medina is composed by 5 essential elements [see ref. 2].
These are;

3. Al kabuli: the ornamental base
4. Ardiyat : ledge
5. Al Dalf: openings (two units 1:2)
6. Al Hizam: ornamental fixed openings (one unit 1:1)
7. Al Taj: the ornamental head

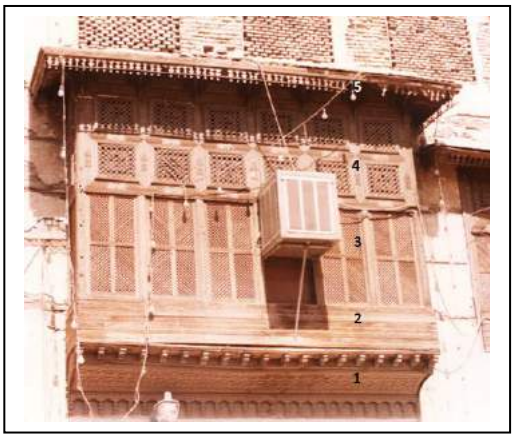

Fig. 1: typical roshan of Medina

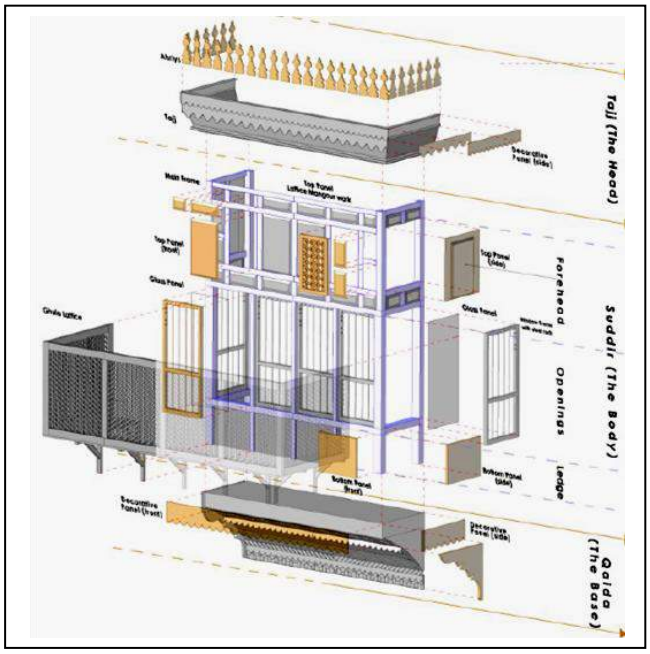

Fig. 2: 3d model scanning of Mashrabiya in the Jedda [see ref. 3]

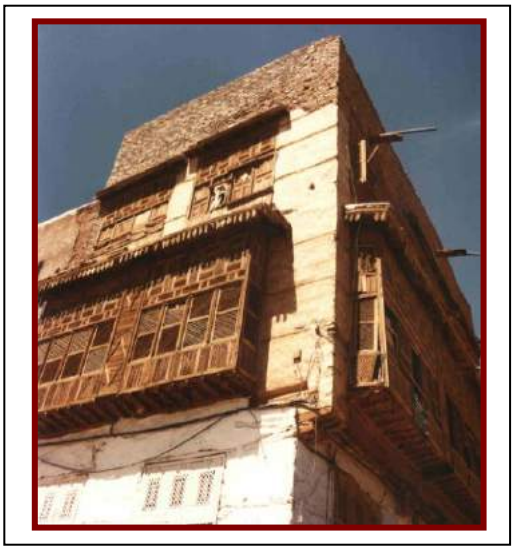

Fig. 3: old roshans of Medina

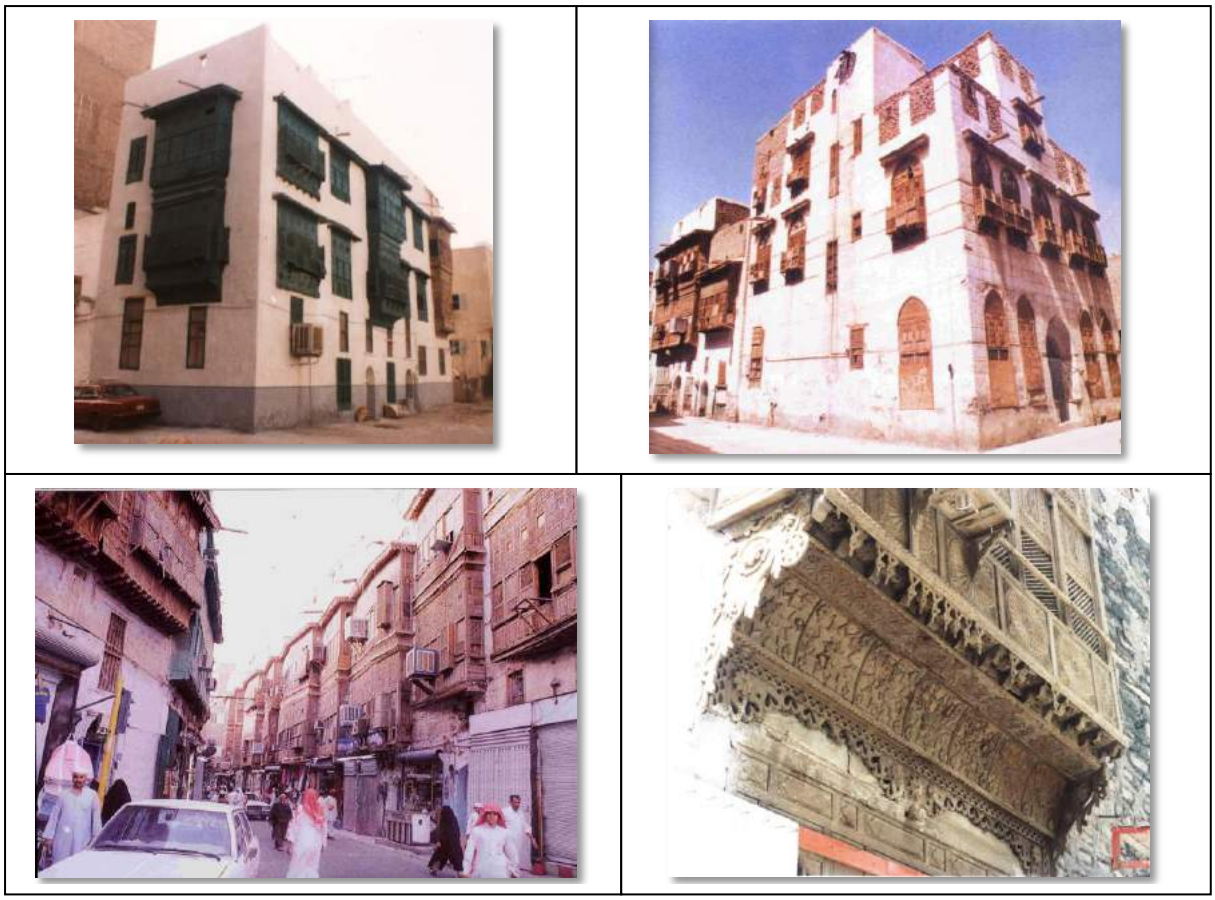

Fig. 4: Samples of the Medina's traditional buildings. All the above buildings are demolished in 1985.

Fig. 5: some traditional buildings still existing in the old centre. Note particularly the use of air conditioning units on the Roshans.

3. Module, colors and shapes

Roshan of Medina are generally designed according to specific modules with various proportions, Al Oqbi [4] synthesis the most frequent dimensions and proportion of openings (fig. 6). The modules are:

1- a□a/a □2

2- a□a (0.41 □square root of 2□)/a□ 1.41

3- a□1/3a □ 1.33

The artisans in Medina had a commune sense of proportion, we note this also in deferent ornamental features and in deferent architectural forms.

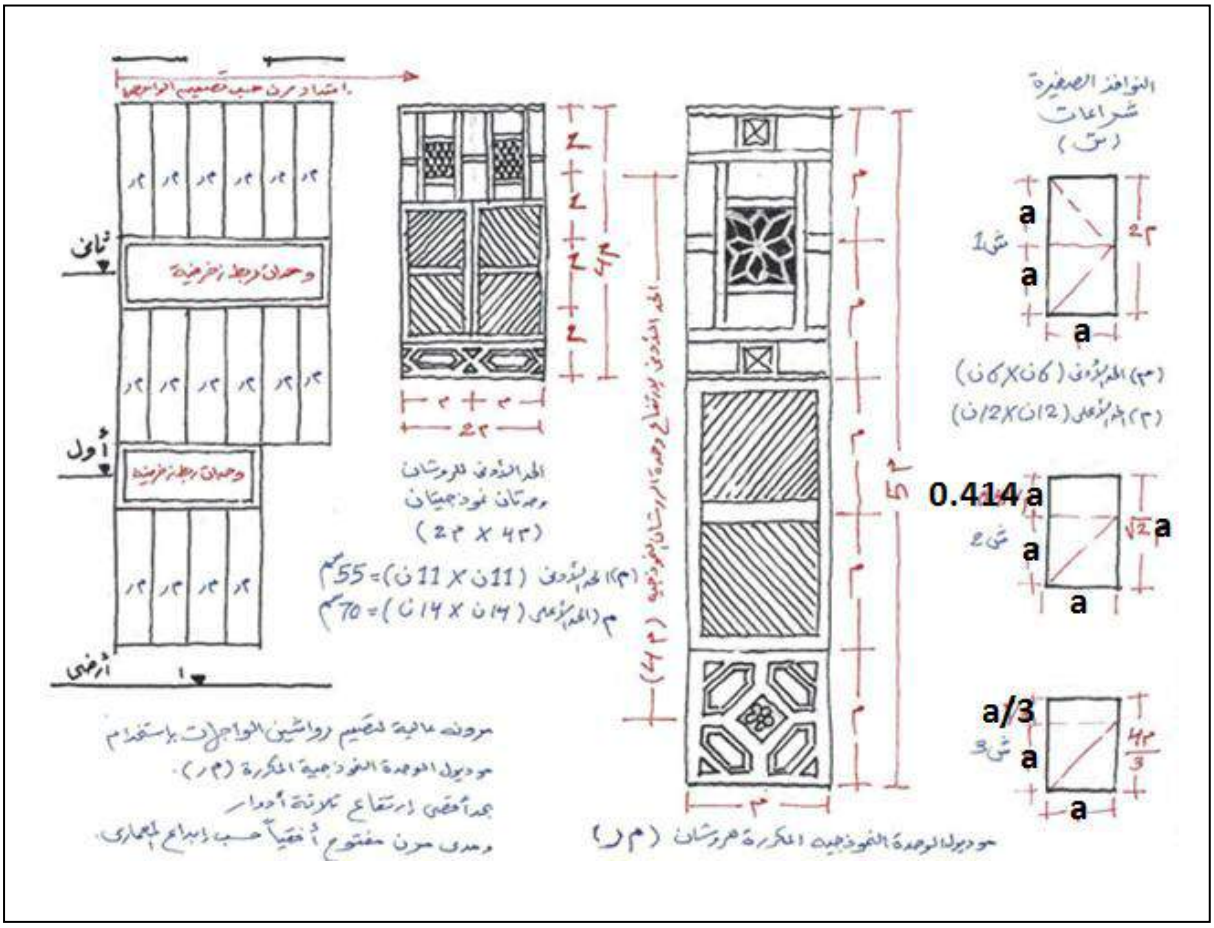

Fig. 6: Study of Medina's Roshan proportion and dimensions.

The most typical colors and shapes of Medina's Roshan are summarized as in fig. 7 and 8:

Fig. 7: Some traditional colors use in the roshan

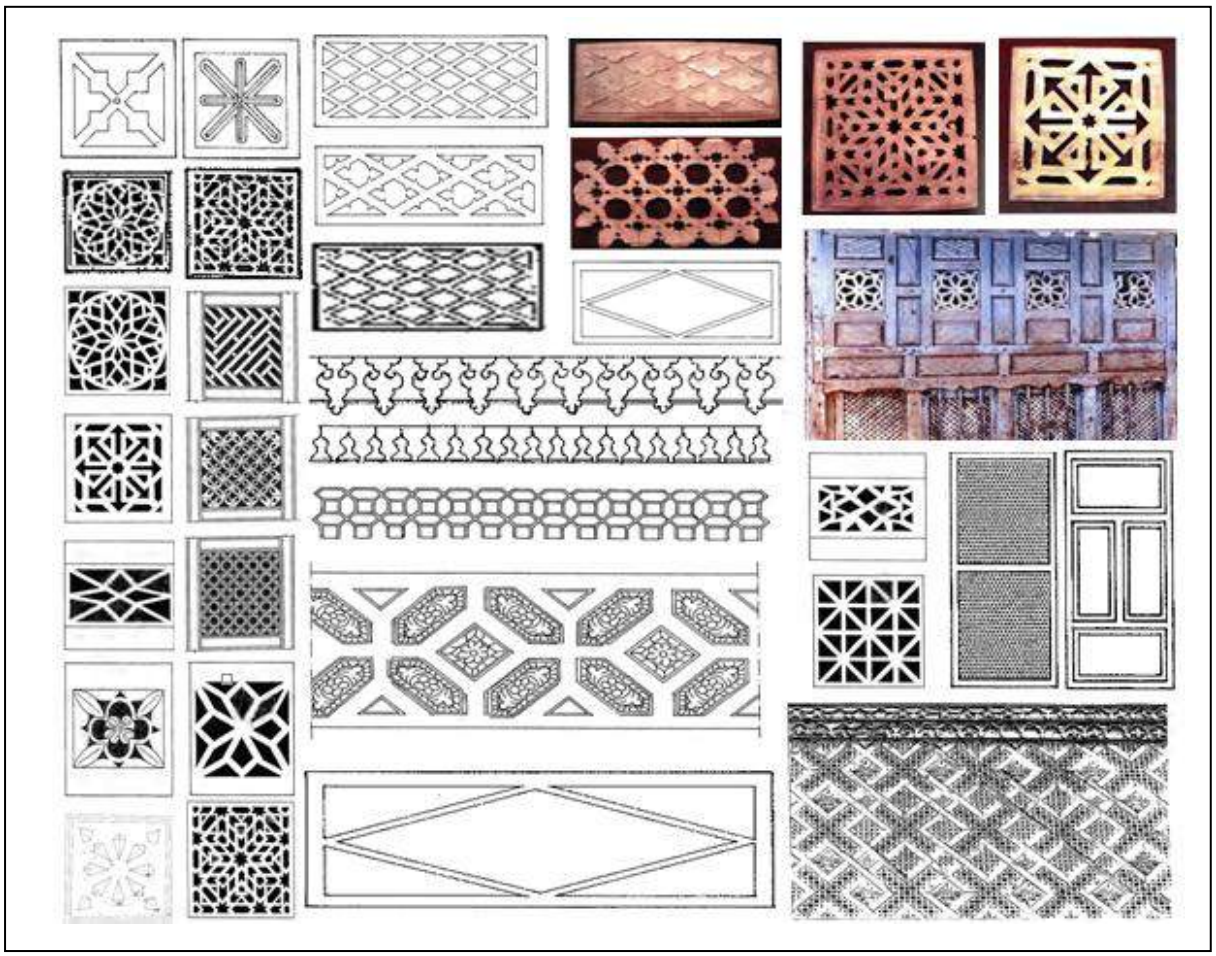

Fig.8: Some traditional shapes of Medina's roshan.

4. The original function and names

Residents in Medina use the name Roshan rather than Mashrabiya , which is used in differant Arab countries. The name Mashrabiya is derived from the Arabic word “drink” and originally meant “a drinking place, this is a cantilevered space with a lattice opening, where small water jars were placed to be cooled. Roshan in Arabic means the place of light. Medina, Roshan is used more than Mashrabiya due to its importance for privacy, but, without excluding the natural light. In some cases Roshan is equipped also with small water jars placed to be cooled (similar to the Mashrabiya), in this case in Medina they use the name Ghoula.

The original function of Mashrabiya is summarized by Fathi [5] as follow: controlling the passage of light, controlling the air flow, reducing the temperature of the air current, increasing the humidity of the air current, and ensuring privacy. In addition to these physical effects the Roshan serves an important social function: it ensures privacy from the outside for the inhabitants while at the same time allowing them to view the outside through the screen. Therefore, a *Mashrabiya* covering an opening that overlooks the street has small interstices except at the top far above eye level. [See also Portoghesi ref.1]

5. The new function of Roshan

Most of the old buildings in Medina are demolished and substituted by luxurious hotels in order to accommodate the high number of pilgrims around the Central Mosque. More than 9 million pilgrims visit every year Islam's first city and the tomb of the Prophet located in thel Masjid Al Nabawi "The Prophet's Mosque". The new urban regulation has encouraged the use of Roshan, but without offering specific norms concerning forms, colors or shapes or craft technology. Fig. 9 shows samples of these new buildings with particular attention to the use of Roshan. The new function of Roshan is becoming aesthetic in form, taking into consideration that the introduction of air conditioning has changed its traditional use.

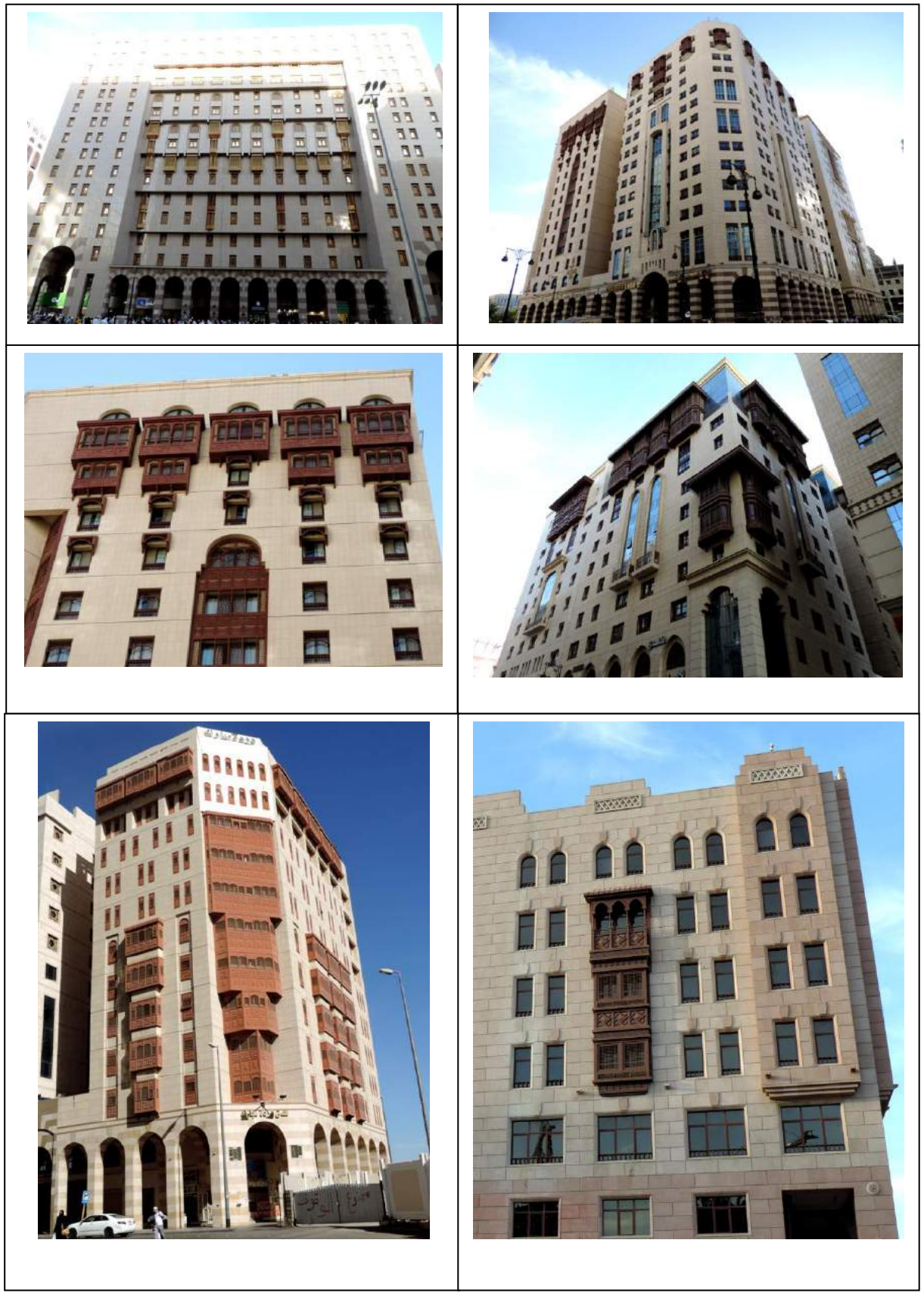

Fig. 9: The use of Roshan in the new buildings located in the old center of Medina.

Arch. Hatem Taha has a critical opinion concerning the incorrect use of Roshan in the old center; as Deputy Mayor, he was involved in the development process of Medina for more than 30 years. But he realized that the urban regulations of Medina had negatively affected the use of Roshan, neglecting the substance of its natural use. [6]

6. The use of Roshan in some contemporary projects

Arch. Jafar Tokan won an important local prize for the design of a public building "Dar Al Hadith" located close to the central area of Medina. He used local materials introducing Roshan, but according to a modern vision, this reflects a new sense of order concerning the opening and the decorative use of Roshan (fig. 10). The rectangular windows (1:3 of proportion) and quadrate Roshan (1:1 of proportion) reflects nontraditional dimensions and proportions.

Fig. 10: Dar Al Hadith.

Arch. Rasem Badran was invited by the local authority to design a traditional village in Fahd Park located in Medina, the objective of this work was to re-create similar character of the old demolished city center. The use of Roshan is particularly highlighted in the composition of the facades as illustrated in fig 11 and 12. Even though these works tried to recreate an 'old Madinan; sensibility, they were not authentic' either as a mass or specifically within the Roshan manufacture. They are fabricated rather than hand made without the geometric depth of knowledge in the original.

Fig. 11: the façade of the urban quarter in Fahd Park.

Fig. 12: The traditional village located in Fahd Park .

7. Conclusion

We share Portoghesi thoughts about the real function of Roshan; He stated [1]: Like the inhabitants of Medina, pilgrims arriving in Medina should be able to not only enjoy the international features and material comforts of hotels all around the world, but also have the chance to experience a “local” way of life resonating with the sentiments which prompted them to obey the spiritual obligation of their pilgrimage…we should avoid using the simple decontextualised citations generally chosen to provide visitors with a feeling of harmony with the site and its meaning; instead we should find new solutions for the façades and interiors. We shouldn’t forget that there are buildings in Cairo and Jeddah in which the Roshan were used not only to enlarge single windows, but also to embellish an internal or external wall and enhance the interior with the magical effect of its filtered light…In short, the use of wooden screens inspired by local traditions could give rise to studies focusing on improving their technical and aesthetic potential. Local authorities could then publish a handbook to provide designers with a range of possible methodological options.

Medina still needs to evaluate its own social and urban criteria in order to create a harmonious and beneficial urban society. Modern development must be seen to undermine this; As Carl Schmitt [7] says 'A trans-valuation of values' needs to take place. The continuing expansion of Madinah's core center, demolishing as it expands, removes essential parts of its cultural heritage and removing the spirit of place in favor of a 'modernist' urban and architectural imprint without regulation, context or social dialogue [8]. The new luxury buildings which replaced the old centre, built around 20 years ago, are now to be demolished in turn for the new expansion of the Mosque. This ongoing process of demolition will finally remove the traces of the old Medina urban memory [9] see also [10].

The new demolition plan approved in 2014 should be an opportunity within the next urban development to re-think in depth how to plan the urban texture and norms. This includes the appropriate use of Roshan and its functional and artistic criteria within the new build framework. The following general criteria should contribute to improve the use of Roshan:

- The urban pattern should reflect the Arab/Medinan cultural sensibility.
- The introduction of Roshan as an important element for lighting and privacy.
- The variety of materials, color use and geometric forms prevalent in Roshan
- The respect of proportion and scale characteristic of Roshan.
- That high-rise hotels can be located outside the central areas of Medina. Therefore, they are not obliged to "attach" Roshan.

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Fig. 5, 9,10: The Authors (2016)

Fig. 6, 7, 8: AL OQBI, Abdelhaq, study of the most characteristic traditional Mashrabiya in Medina, Al Madinah Municipality publications, 2015

Fig. 11,12: AL OMRAN, Municipality of Medina. Wakalat Al Taameer , 2013

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The Domitia coast between Volturno and Garigliano: requalification opportunies of a violeted landscape through valorization of the historical-archaeological heritage

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Abstract
The area in the research's interest is comprised between the Volturno and Garigliano rivers, in Campania, where along the Tyrrhenian coast, for about 42 km, was builted extensive settlements in the 60's and 70's.
The built conurbation is extending across some municipalities (Giugliano, Mondragone, Carinola, Sessa Aurunca, Cellole) especially along the coast, developed without planning therefore it's discontinuous, irregular, without regulators criteria and without a balanced distribution of equipment or services.
These urban fragments, different but contiguous, appear almost like a mixture of rural and suburban landscapes with farmhouses and villages, residual testimonies of a profound transformation in the landscape where, since the early sixties, they appeared the first landfill and the first large settlements of holiday houses, developed without control in a scenery of absent programming.
The presence, extensively in this area, of an important historical-archaeological heritage, may develop many opportunities for a sustainable valorization of this territory.

Keywords: Landscape, strategies, valorization, cultural heritage, archeological heritage.

1. Introduction
This paper is part of a wider research that aims to identify requalification strategies of the site through the development of the historical and archaeological heritage.
The interest in this area stems from a scientific coordination experience of the European project European Regional Development Fund - P.O.R. 2000-2006 "Integrated Project Domitian" (PIT).
POR Campania 2000-2006 was built based on the directions outlined in the Mezzogiorno Development Plan which identified for some regions, social and territorial development goals:
1. Dejection of the unemployment rate;
2. GDP development;
3. Infrastructure increase;
4. Productive activities strengthening;
5. Improvement of the environmental quality.

2. The scope of interest
The territory considered by the PIT extends between the Volturno and the Garigliano zones (over the area of the Patria lake in the town of Giugliano), and it is rich of identity values although the development of the expansion of hurban centers and "seasonal" settlements has strong influence on the morphology.
Urban areas and very important territorial develop from the southeast to the northwest:
Lago Patria and its mouth, in the town of Giugliano territory, are part of the Natural Reserveof the Volturno-Coast mouth of Licola and they represent an important environmental heritage.

Mondragone is a coastal urban area, with an hybrid nature between the low-cost building expansion and the proximity of installations for bathing, submitted to the development of the mass tourism which has pointed out, strong levels of overcrowding.
The urban center of Carinola is located at the foot of the mountain Mount Massico, an area characterized by a vegetation of medium trees, where the cultivation of olive is highly developed.
Sessa Aurunca is an urban center of considerable historical interest, architectural, urban and landscape that dominates the basin located between Mount Massico, Roccamonfina, the Tyrrhenian Sea and the plain of the Garigliano. The urban structure has a central position on the ancient route of the Via Appia between Capua and Gaeta.
Cellole, is the smaller urban center of the Domitia conurbation, is set back from the coastline, with features of *Vico* or *Pago*; located between the coastline and the hills of Mount Massico, it presents itself as a consolidated district, with a mainly rural landscape.

2.2 The historical and archaeological heritage

The main research's approach is aimed to identifying requalification strategies extended to the whole territory based on recovery actions, regeneration and enhancement of archaeological sites and cultural heritage in general, through the identification of some "cultural leaders".
1. Municipality of Giugliano: archaeological area of ancient Liternum;
2. Municipality of Mondragone: archaeological site of Monte Petrino along the ancient Via Appia;
3. City of Mondragone: historical building Palace Tarcagnota;
4. City of Carinola: Episcopio of Ventaroli;
5. Municipality of Sessa Aurunca: Ducal Castle;
6. Municipality of Cellole: archaeological area of San Limato.

In the town of Lago Patria, in the municipality of Giugliano, it is the archaeological area of Liternum, site chosen by Scipio as his headquarters.
The valorization of this area is a main focus of the project, implemented through the creation of an archaeological park and a museum and with some works aimed at the recovery of important historical and archaeological remains as well as the natural landscape.
To the north of the city of Mondragone it rises the eastern promontory of the Monte Massico that corresponds to Monte Petrino, on top of which lies the fortified settlement known as Fortress of Mondragone.
Monte Petrino is located in an area characterized, in the north-west by the plain of Sessa Aurunca extending until Liri-Garigliano, bounded by the city of Traetto, Formia and Gaeta; to the east by the slopes of Mount Massico; to the south from the plains crossed by the Volturno river and extending to the Vesuvo and to west by the sea.
The architectural ensemble on the Rock of Mondragone (mount Petrino), constitutes a settlement fortified center of considerable interest. The survey was conducted on the setting fortified in the first place by making the surviving of the remains still present in the area on a sampling of various construction techniques used in the settlement and cataloging the archaeological material surface [4]. The conservation status of the whole site, while presenting itself completely abandoned and in a state of ruin, maintains still legible the plant and the topographical arrangement of the last phase of occupation.
The Tarcagnota Palace in Mondragone is a typical example of a noble residence of the century. XVIII. The original structure is rectangular with two square courts and the main facade is characterized by two portals, one of which is topped by coat of arms, balconies with wrought iron railings, a plaster decorations which depicts human faces and a decorative rusticated that is elevated to the roof. The front that overlooks the garden has a porch on the ground floor; at the first floor there is an open gallery with segmental arches; on the second floor there is a long balcony. The garden on the longitudinal hall-yard articulates with two paths crossed by a transversal.
Santa Maria in Foro Claudio is a small basilica of the Early Christian age, founded between the fifth and sixth centuries A.D. on the remains of a Roman temple.

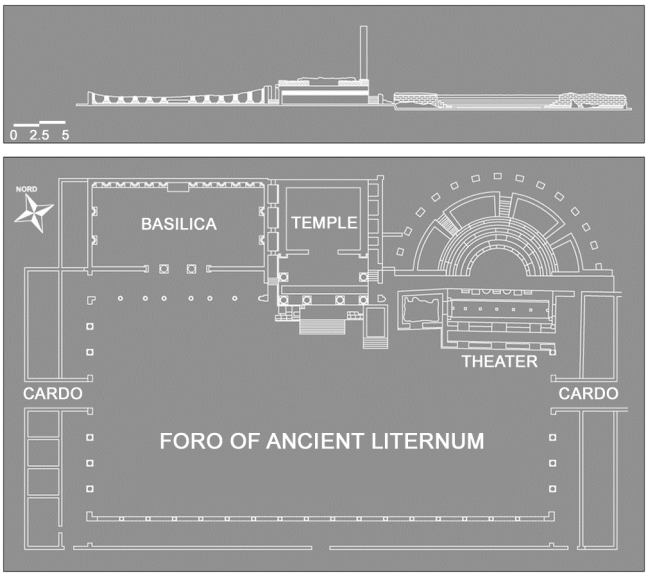

Fig. 1: The site of ancient Liternum. Plan of the *foro* with principal buildings (down) and section (up).

Also known as the Episcopio of Ventaroli, from the sixth century to the 1099, it was an episcopal Church (afterwards the episcopal Church was transferred to Carinola).
It is a very important example of Early Christian age architecture, and inside it there are some valuable frescoes made from tenth to the sixteenth century.
The ancient fortress of the Ducal Castle of Sessa Aurunca dominates the market square of the town. It's origin is dates back to the 963, but there are no traces of the original morphology. The actual castle plant dates back to the Norman transformation. Under this rule it assumed the role of *castrum* but also *palatium,* i.e. residence of the court as well as seat of city magistrates and place of the local Curia. On that occasion corner towers were build, on the same height of the curtains.
With Federico II, the castle took an important defensive role; It was subjected to consolidation and integration works with the construction of new towers in the center of the quadrangle curtains. Fallen into disrepair it was as a local schools, then it was destined to other public functions including the public library of Sessa Aurunca. It is also used as a Civic Museum hosting a permanent exhibition of archaeological remains from the territory of Sessa Aurunca.
The "seaside villa" of San Limato, whose surviving structures are incorporated in an eighteenth century rural building, is a superb example of suburban residential housing in Sinuessa. Most of the ruins are related to the thermal plant. The villa has two areas separated by a corridor: in the southern one there are some rooms with mosaic and marble slabs; in the north one there are the thermal areas, with the *frigidarium* for cold water baths - with a black and white mosaic that depicts marine animals. Even further to the south there are heated rooms, the t*epidarium* and the *calidarium* for baths of warm and hot water. The villa testifies to the dense presence of the Roman patricians in the northern Campania since the third century BC until the end of the imperial age.

3. Conclusion

the common methodology of the project aims to consolidate and extend the valorization activities of the archaeological, architectural and historical heritage in the area as the main tool for economic and social development of the territory.
In particular the common strategies are aimed at improving the quality and quantity of public use of archaeological sites and the complex historical and monumental and emblematic in the Domitian Coast, in the perspective to realize the "Archaeological Park of Campania Northern coast", mainly object of the "Integrated Project Domitian".
The approach to the project is developed with a homogeneity planning logic, that starts from the narrow operational coordination that characterizes the action of the Municipal Administrations Participants in the PIT.

Fig. 2a: The archeological site of Monte Petrino.

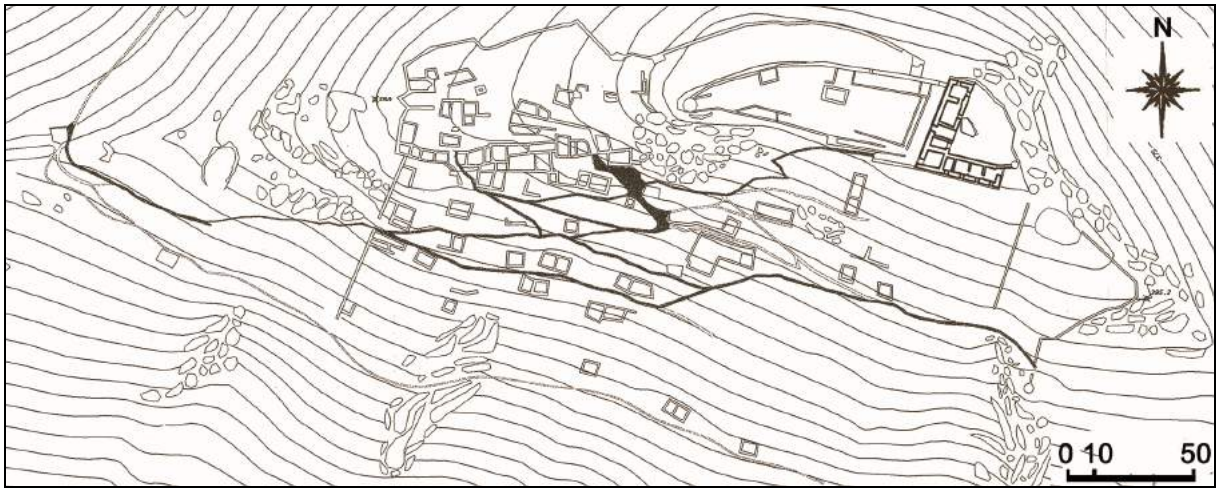

Fig. 2b: The archeological site of Monte Petrino. Site plan (reworking by the survey in Integrated Project Domitian).

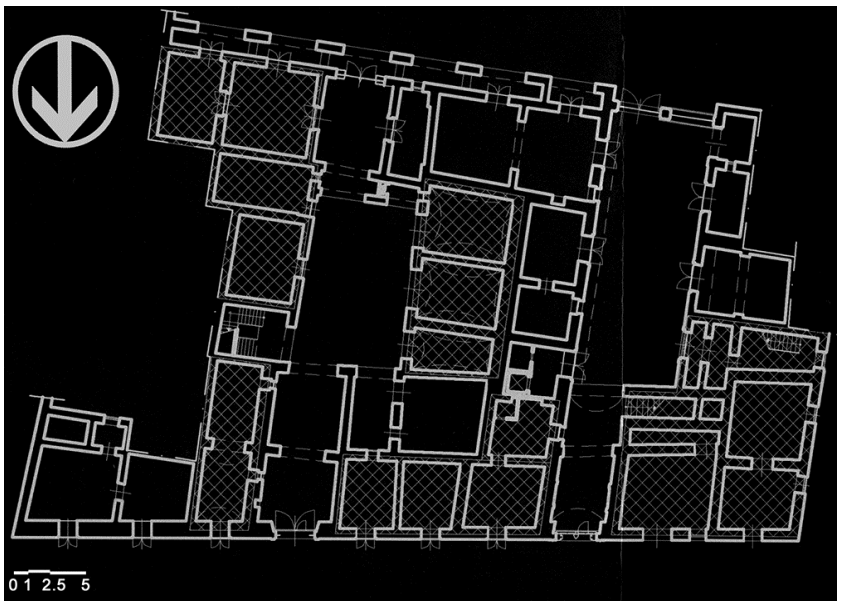

Fig. 3a: Tarcagnota palace: ground floor plan.

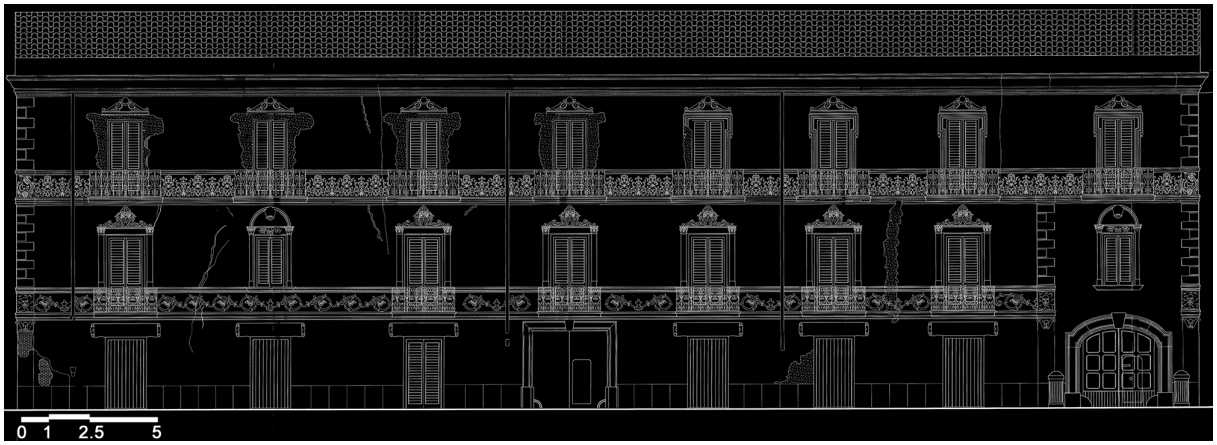

Fig. 3b: Tarcagnota palace: main elevation (reworking by the survey in Integrated Project Domitian).

Fig. 3c: Tarcagnota palace: section, (reworking by the survey in Integrated Project Domitian).

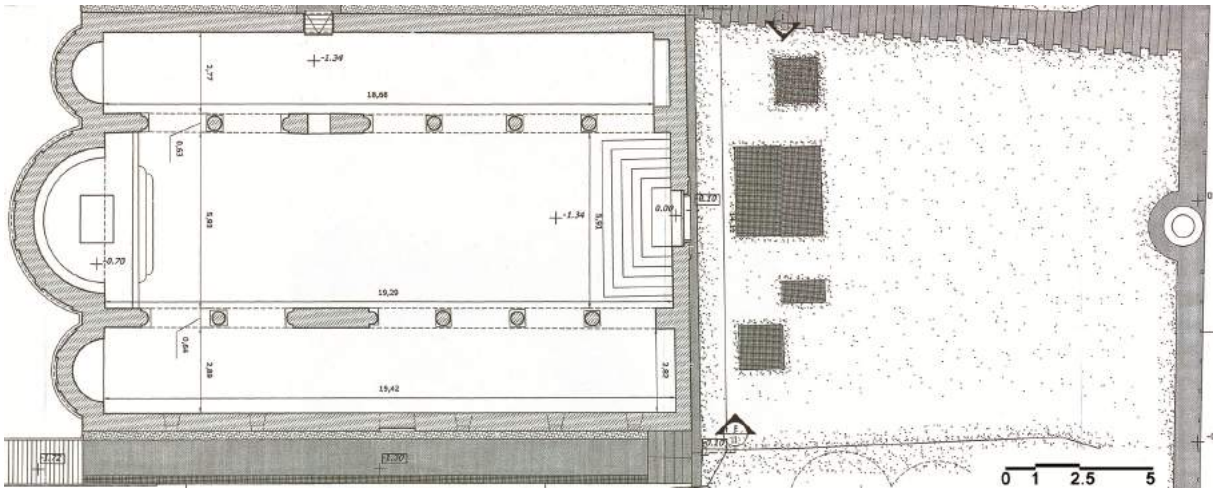

Fig. 4a: Episcopio of Ventaroli: ground floor plan.

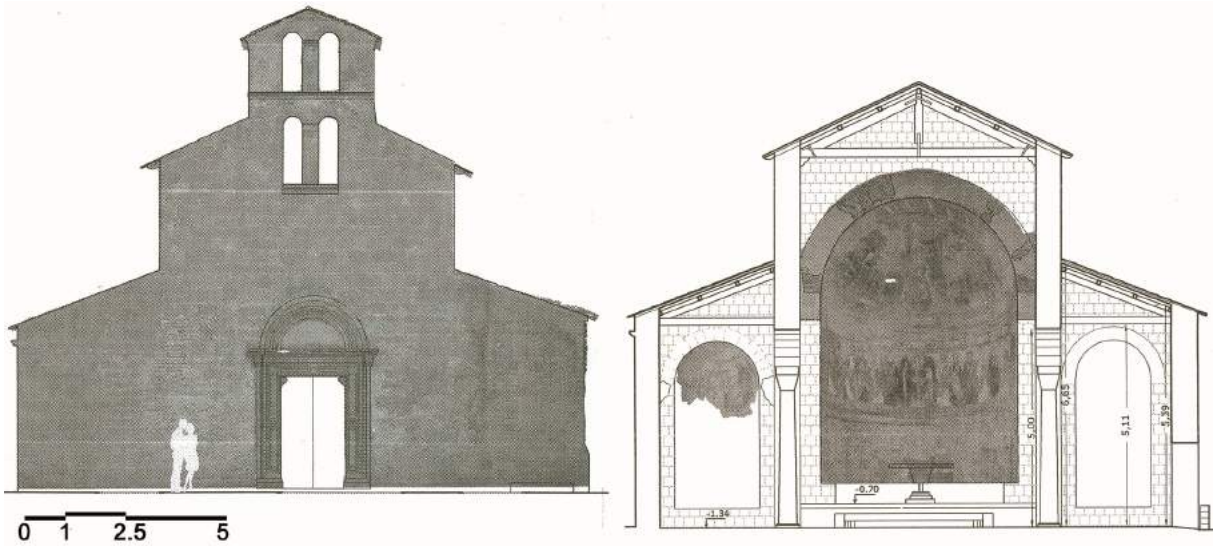

Fig. 4b: Episcopio of Ventaroli: main elevation (left) and section, (reworking by the survey in Integrated Project Domitian).

Fig. 5: Sessa Aurunca, the castle of the Dukes.

Fig. 6: Cellole, the archeological site of San Limato.

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Reflections of pluralized accessibility in Cimitile. Geometry, Light, Matter, Conservation, and Enhancement of the Cultural Heritage. Geometric Layer, as 'dimension' of deep knowledge.

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in memory of Eduardo

Abstract

This research is focused on the direct sun light distribution analysis inside the *Basilica Vetus* in Cimitile (Nola, Naples) and its potential use by anybody (thinking also to disabled people) through simulation in 3D digital models acquired by 3D laser scanners and image based technologies.

From a 3D georeferenced model - as a basic geometrical layer to form thematic models - this research topic was also to develop and validate a methodology for analyzing the direct sun light distribution inside early Christian churchs as well as identifying the presence of particular areas or elements inside them. The proposed methodology was applied to the *Basilica Vetus* in Cimitile, and the Baptistery of Santa Maria Maggiore, located in Nocera Superiore.

The simulation results highlight the reliability of the proposed methodology and confirm the strong influence of the position of the Sun, in some specific moments of the year, on the shape and orientation of the buildings as well as the size and position of the windows. Then, data processing and critical evaluations open to a different interpretation of the chronological stratifications of the *Basilica Vetus*.

These new thematic acquisitions confirm the need to devise new forms of plural accessibility for the fruition of very complex monuments by anybody.

Keywords: early Christian church buildings, digital remote sensing, 3D modelling, daylight analysis, sun radiation, traditional building materials, "La Città di Alceo" laboratory.

The first phase of this research consisted of the composition of the 'geometric layer', through the planning and the actualization of the integrated digital surveying of the archaeological area in Cimitile, which was followed by a complex processing of geometric data acquired with topographic GNSS technologies and 3D laser scanning instruments. This first step was carry out with Eduardo Fiorillo, man of great moral depth before being wise and passionate topographer.

Fig. 1: Cimitile, the apse and the bell tower of the Basilica Vetus.

1. *Basilica Vetus*, from point cloud model to 3D surface modelling

Ilaria MININI[2]

Thanks to the collaboration of several researchers - experts in the scientific disciplines necessary to conduct the research project - the Multidimensional method allows the study the anthropic and natural phenomena, regardless of scaling and timeline, in an uninterrupted reference between induction and deduction. [1] This methodology is based on 'measuring' of the continuous and complex reality, and the resulting discretization in minimum and homologous elements, analytically organized on monothematic layers. Each layer defines a ‘disciplinary research dimension’, which can be defined as 'multi-dimensional' at the end of the scientific path, because the active collaboration of several researchers is greater than the simple addition of individual knowledge. [2]

A complex reality reading, like it is possible in the early Christian basilicas of Cimitile, is well facilitated and oriented systematically, and its critical analysis will be integrated, because it is the result of scientific speculation conducted by several investigators on their disciplinary sources, through high-tech instruments.

According to the Multidimensional Analysis’ protocol, the first action is the composition of the “geometric layer", on which 3D metric data representing the study subject converge, as a multi-relational system. Echoing the etymology of ‘geometry', the set of three-dimensional coordinates will be 'geo-referenced' and will have a variable resolution, in relation to the expected degree of morphological detail. This suggests that the characterization of the ‘geometric layer’ is a crucial step for the multi-dimensional approach, because it is the concrete reflection of the conscious knowledge of the study subject. From this layer derive the following research phases, and at the same layer the critical search results concur at the end of the investigations, in a continuous deduction and induction flow. [3]

Returning to the case study of Cimitile, the characterization of the ‘geometric layer’ can be synthesized in three phases carry on site out, to which correspond other three phases in laboratory. [4]
The instrumental acquisition was planned synthetically from a closed polygonal, georeferenced with GNSS antenna, to which they were bound by an ordered set of targets (natural and artificial), such as homologous points of the 64 3D laser scans, used to record in cloud points throughout the site.
The result was a single discrete 'model' - made up of more than 500 million points - which is the three-dimensional crystallization of the site at the date of instrumental acquisition.
The point cloud, in particular, can be understood as a geometric data base (made of xyz coordinates, relative or absolute) of scanned reality, to which recourse - remotely or in the absence of the original - for reasons of quantities, structural, reconstructive, eidetic, replicative, as broadly defined by Luigia Melillo [5].
Within the framework of the research on natural light inside the *Basilica Vetus*, the site digital model was selectively queried, in order to extract the necessary data to 3D geometric modeling. This data is needed for the apparent Sun movement simulation into the processing software.
Formed the point cloud model of the area, it was possible to operate several geometrical queries, realizing a selective discretization through coordinated plans, in order to extract the generative shapes of the architectural elements (walls, apses, oculus , trusses, foundations, drums, arcades, arcosolia). [6]
Three-dimensional modeling of the *Basilica Vetus* and the fence mosaic of San Felice has taken this dual approach. The architectural space - the specific alternation of full and empty spaces - it was drawn from the geometric vertical and horizontal lines that intercept the main morphological discontinuity of architecture.
For example, with reference to the architectural space that contains the peristyle mosaic, after having sectioned the cloud of points, feature points, profile derived in the coordinate direction has been translated in the corresponding segments. these orthogonal segments, are the generative geometric surfaces that define the space.
The columns’ modeling, however, refers to the geometric characteristic of radial symmetry, and therefore, after having sectioned the point cloud model of each column, according to a vertical plane containing its axis, it is possible to draw the column profile, following the ‘entasis’ if it exists. This profile generates the column surface by revolution around any horizontal circumference, approximate always from the point cloud source.

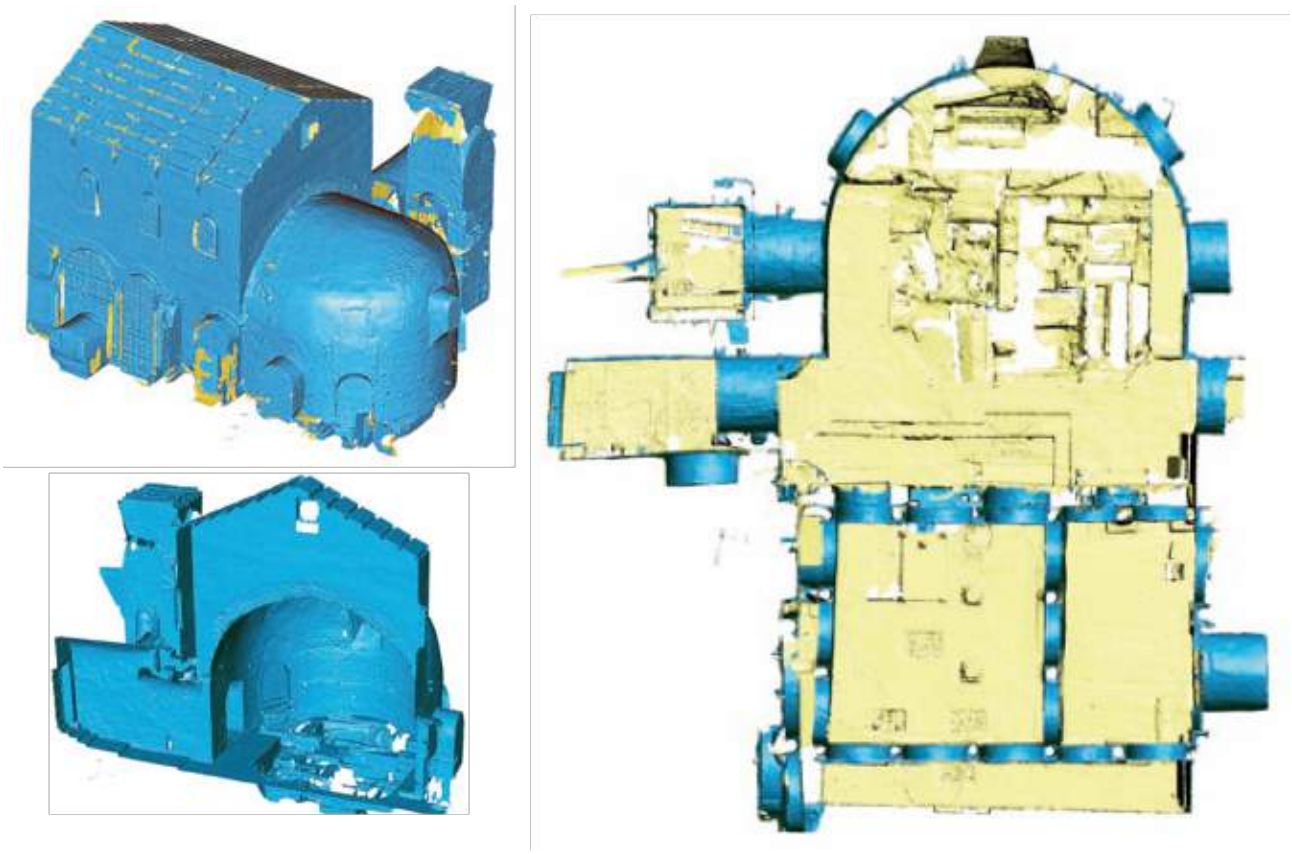

Fig. 2: The 3D mesh model of the Basilica of San Felice is drawn from the model cloud of points (geo-referenced and filtered) and represents the inner skin of the monument that corresponds to the surface 'touched' by the laser. Any 3d and 2d representation is processable by the model three-dimensional mesh, for example, the isometric plan.

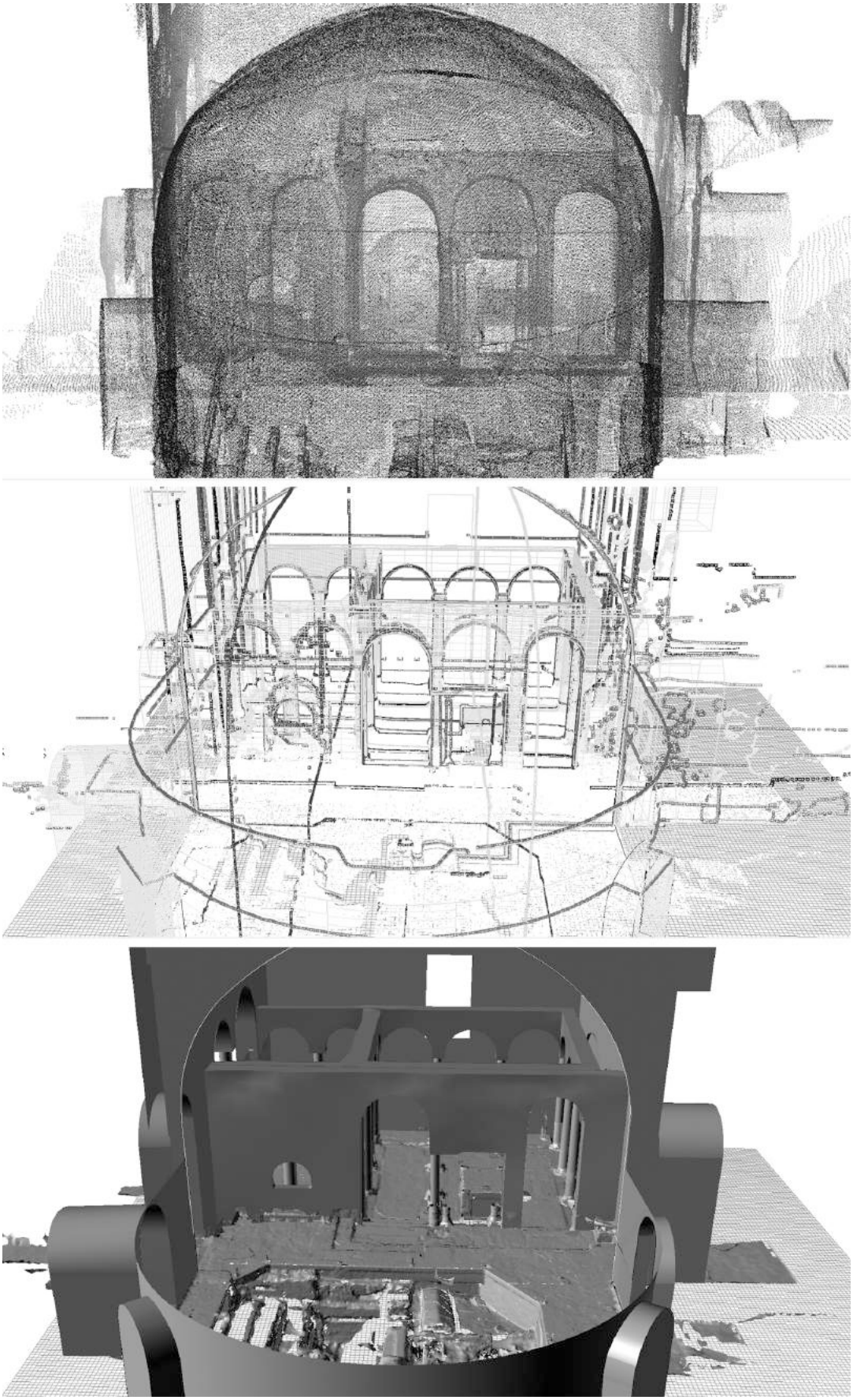

Fig. 3: Basilica Vetus. 3D modelling process from point cloud model to surface one. The mosaic fence seen from not real point of view beyond the apse.

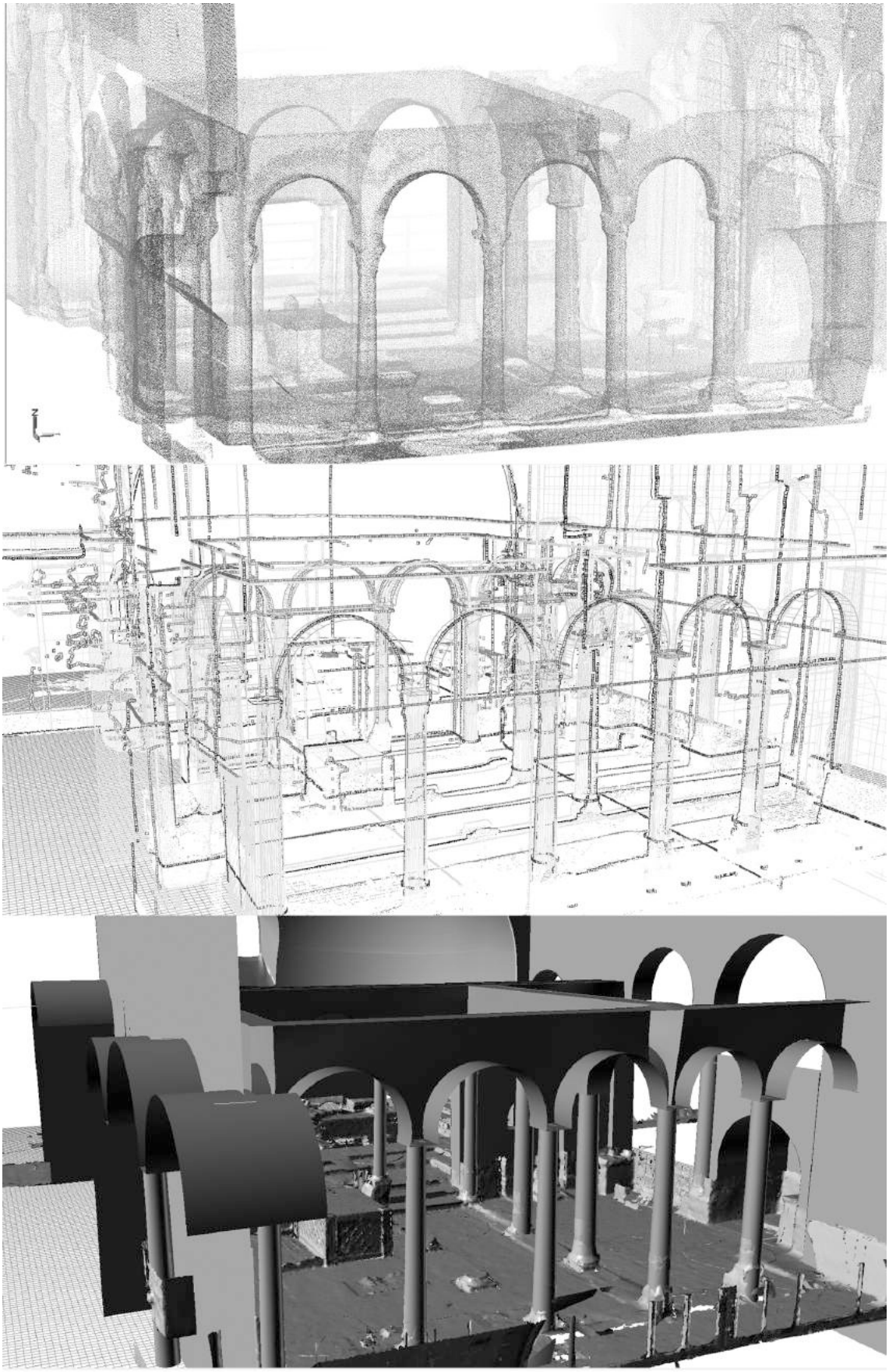

Fig. 4: Basilica Vetus, mosaic fence. 3D modelling process from point cloud model to surface one.

The most unique architectural elements - such as the apse and the arches of the fence mosaic theory - were instead modeled according to a geometric mesh lines oriented in the three coordinate directions, intersecting to form a network of segments and curves - variously dense with respect to roughness of surfaces - in order to adhere more accurately the actual morphology.
The varied plasticity of the capitals, as well as the complex surface of the pavement is not paved and the archaeological excavation in the apse, were represented by selective meshing operations.
At the end, it is a hybrid model consisting of rational surfaces, grooved and triangular, variously shaped in relation to the reality of the place and the specific morphology of the monument, which balances the reliability of the morphological representation of 3D with the best features of lightness or digital files and display speed.
If on one hand this approach has a specific critical value for the three-dimensional modeling of the architectural elements related to elementary geometric shapes, on the other it did not find immediate use in the lighting data processing software, highlighting various methodological and procedural misalignment between data processing software, and scientific disciplines that should govern the design of simulation algorithms. The architecture geometric complexity in Cimitile has strongly stressed that the lighting simulation software, to the point of not being able to realize the 3D model of *Basilica Vetus*, processed as described above. In addition, some issues have to be highlighted, regarding the 3D data interchange between the solar simulation software and other ones on architectural geometric modeling. These problems were such as to require a new 3D modeling, following a different graphical approach, into the lighting simulation software using specific graphic tools.
This approach has a specific critical value for three-dimensional modeling of architectural elements, due to basic geometric shapes or modular starting from them.
Direct knowledge of the archaeological area, the freehand architectural sketches - made during the 3D laser scanning capturing data - and the critical, thoughtful and meticulous modeling of the point cloud data of the *Basilica Vetus* allowed an easier 3D modeling into the lighting simulation software, despite the elementary 3D shape tools.
The new 3D model was composed with geometrical primitives, whose dimensions and positions were derived from previously developed model.
Very briefly, this “3D modeling" experience had the successive approximations of architectural geometries as preferred topic, starting from point clouds data that are the most realistic shape could be captured by digital instruments.

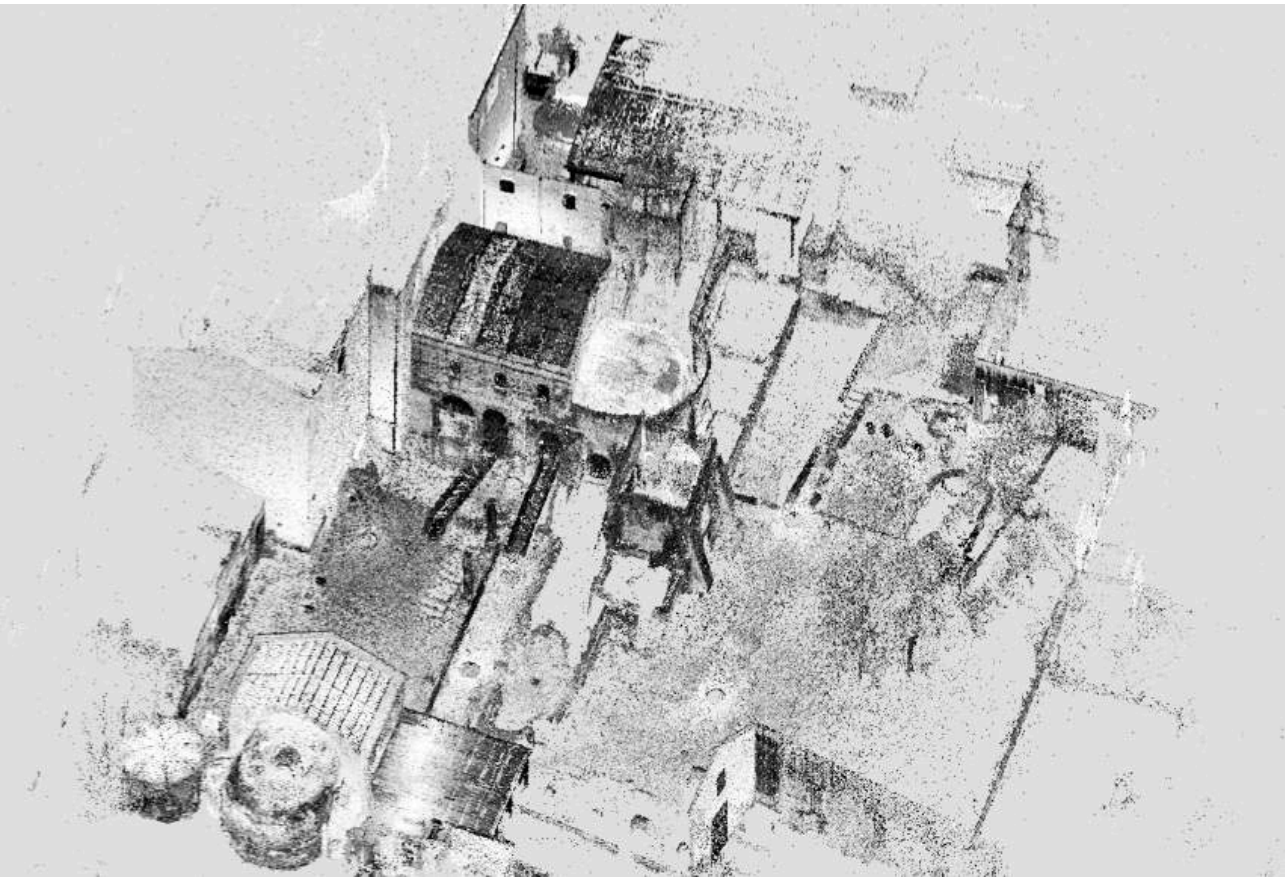

Fig. 5: Cimitile archaeological area. The complete point cloud model made by union of 64 scans.

2. Sunlight software simulation undermines the architectural CAD modeling

Pasquale ARGENZIANO[1]

In the researches' range applied to the case study of Cimitile, the related issues of pluralized accessibility and natural light (as a medium of knowledge of the buildings' diachronic evolution and of use for the wider public) activated numerous critical reflections on 3D modelling of cultural heritage. It is particularly exciting that these considerations derived from a rigorous study began with an insight of a student of the Department of Architecture of the SUN during an educational workshop in the *Basilica Vetus*; and then that those considerations lead up to a multidisciplinary degree thesis. Finally, this research continues and deepens some specific issues by the same researchers' group. [7, 8]

During the workshop on "Architectural Restoration" that Prof. Carillo held annually inside the archaeological area of Cimitile since 2006, Ilaria Minini noted a specific trajectory of the sunlight, filtered through the Basilica's windows that was illuminating particular architectural elements. Following this observation, prof. Carillo and the present writer made other targeted inspections with the student, and noted other special lighting effects, and therefore decided to organize a multidisciplinary research involving the team of prof. Sibilio, specialized in light simulation in architectural field. Everything came together in the experimental degree thesis entitled "La dimensione della luce nel recinto mosaicato di Cimitile. Accessibilità plurale e realtà aumentata" (Light dimension in the mosaic fence at Cimitile. Pluralized accessibility and augmented realty), discussed by Minini and supervised by Prof. Carillo and Prof. Sibilio. Now these research continues with some focuses on Sun lighting within the early Christian basilicas, and on pluralized accessibility in very complex and stratified architectural sites.

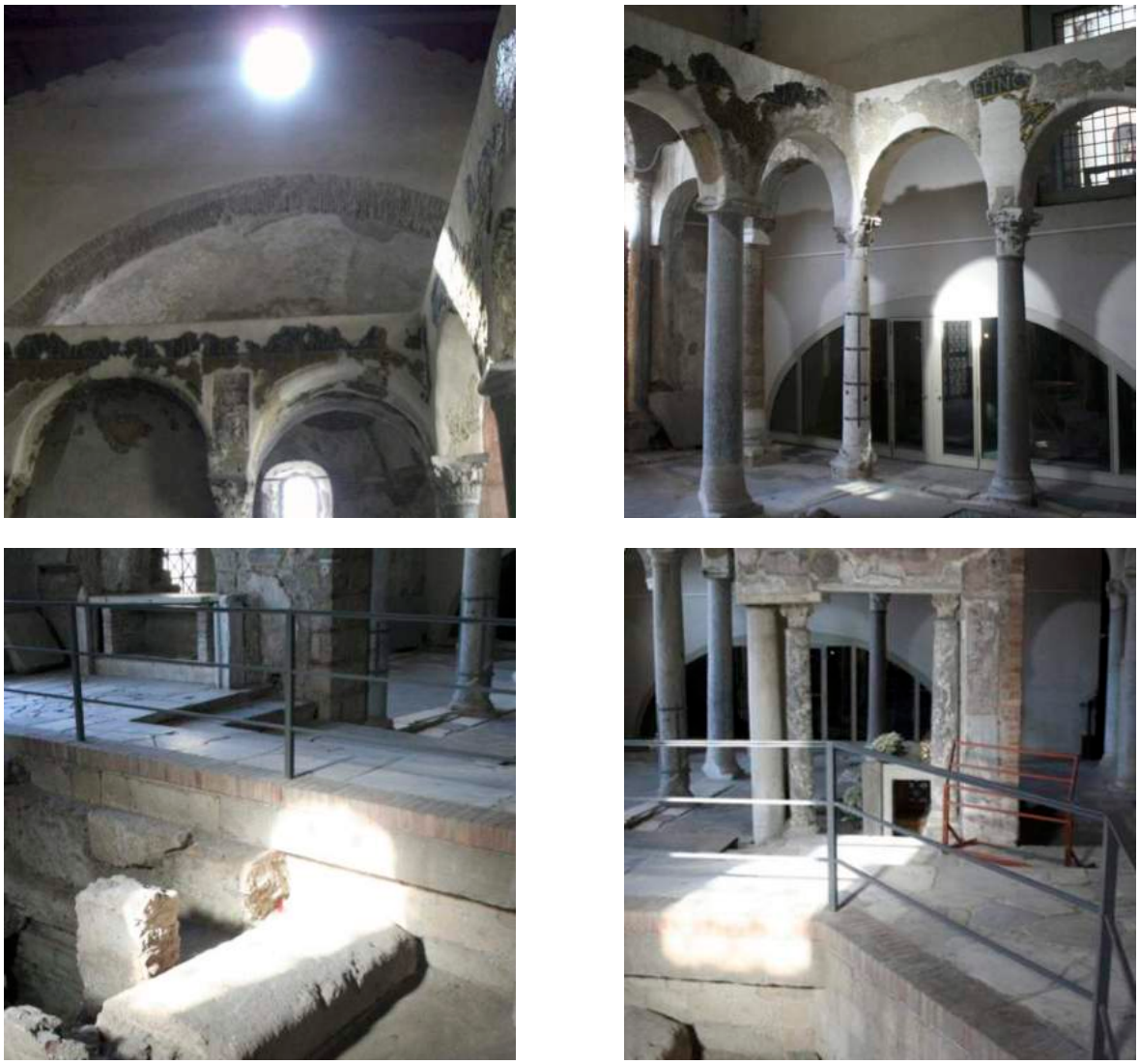

Fig. 6: Basilca Vetus. The sunlight's spots watched before the research beginning.

Very briefly, the thesis of Minini proposed the experimental verification of the spatial relationship between the apparent motion of the Sun filtered through the windows and the lighting of specific architectural and liturgical elements in the *Basilica Vetus*. The experimental verification was made through two investigative paths: the solar lighting simulation applied to the georeferred 3D model of the Basilica, in a specific software; and the simulation using a scaled model placed in Heliodon, in the laboratory

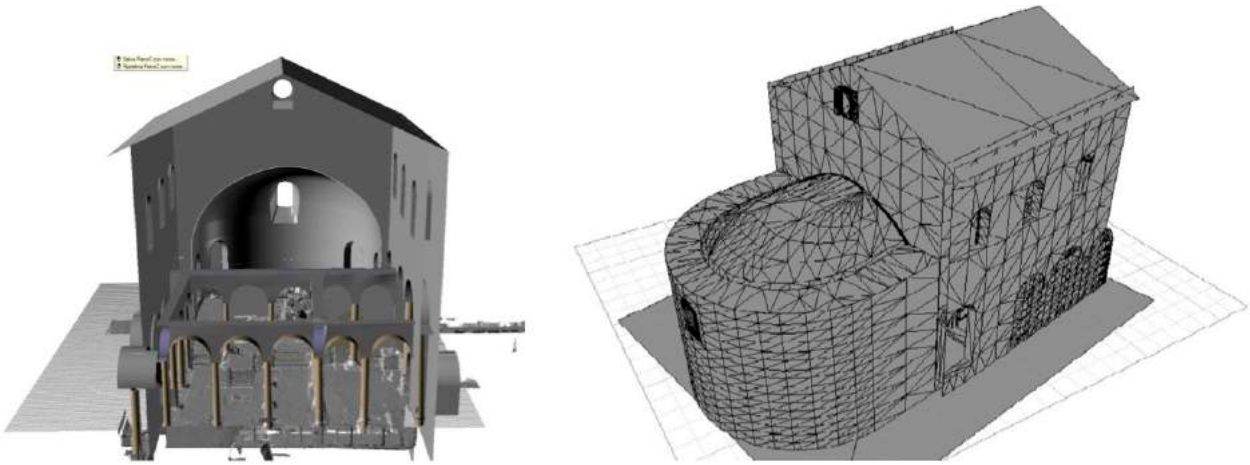

Fig. 6: Basilca Vetus. The surface 3D model processed from point cloud model and the 3D model processed into solar simulation software, by Ilaria Minini (2015).

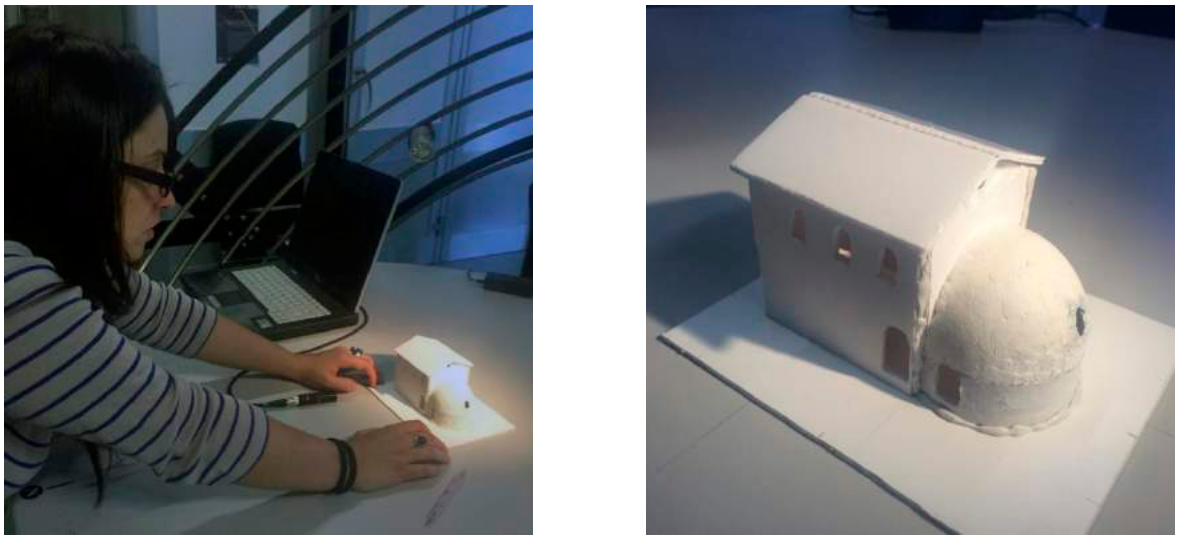

Fig. 7 : Ilaria Minini tests sunlight into the Basilica vetus with Helidon instrument (CRdC Benecon), according with proff. S. Sibilio and M. Scorpio teachings (2015). The plastic model was realzied keeping measurements from point cloud data.

The geometric knowledge of the site was therefore the first essential step in the research. The GNSS surveying, 3D laser scanning and digital photogrammetry close-range were the technologies chosen for geometrical survey of the archaeological site. Modeling of acquired geometric data was carried out through a detailed exercise of critical recognition of homogeneous architectural elements, or of rational geometries, operating selective plane sections through the site's point cloud model, and then shaping the architectural elements in CAD.

If on one hand these procedures followed the scientific literature, on the other hand they showed various issues regarding the graphical management of geometries, and the critical analysis of the architectural elements during the 3D modelling phases.

The main graphic difficulties involved:

- the rationalization of complex architectural elements in primitive shapes, such as the arches of the mosaic fence;

- the management of very complex surfaces, or very complex models in CAD software not always performing;
- the simultaneous management of the acquired data with various digital technologies, and the related processing in various specific softwares, not always linkable.

The attention paid to the selection of the best geometric schematizations of the point cloud model highlighted instead the limits of surfaces' modeling of the architectural elements. The architecture (like any other artifact) is made of tangible and solid elements. In the brief contemporary history of architectural LIDAR surveying, the surfaces' modeling supported more the diaphanous point cloud's characteristic, that the "real" material consistency of the building, seen as a diachronic sedimentation of solid elements to be read synchronously to appreciate the unity of the building, and to query selectively to reach the critical knowledge of the Cultural Heritage.

In other words, during the long process of geometric data processing, the draftsmen took the risk to focus more on the detailed 3D modeling, aimed at the solar simulation, and shortly on the architectural significance of each element, risking of falling into an 3D modeling's orthodoxy, rather than stretching to the best model for the simultaneous management of data characterizing the architecture.

This path was stopped from the first practice of exchanging data between CAD modeling software and those of solar simulation. Given the insignificant distance between the light source and the building, the morphologic accuracy and geometric complexity of the CAD model, which can be achieved with the 3D laser scanning, were to be ignored in favor of the correct orientation and the absolute geographical position of the building. The writer started therefore to re-modulate the CAD modeling procedures, orienting the drawing's activities towards the processing for subsequent geometrical simplifications from the point cloud model which, as is known, it can be regarded as the crystallization object of the digital survey at the acquisition date.

The point cloud model is the digital source for the geometric processing and from it were derived different models depending on the purpose of the investigation. That used for the solar simulation is certainly the most simple and schematic among those produced.

Within this study's framework, however, the lighting issue had to be matched with the semantic ones about architectural elements (or not) highlighted by the sunlight beam. And again, the pluralized accessibility subject, the preservation and enhancement should find concrete reflections in Architecture for its management (including economic issues) and its function from the broader public.

These aspects open up to another critical issues.

Are the cross-media enough to satisfy these aspects in an integrated way?

Even if it recognizes the primacy of thought than capturing, processing and management technologies of multidimensional data, the logical progression of this research is towards Building Information Modelling, applied to the Cultural Heritage.

In other words, according the writer's point of view, the most effective response to the issues about the architectural semantics, simulation, use and management of the Cultural Heritage, is the logical structure of BIM. Its modelling is much more organic than the CAD, however, it still suffers from ideative logic aimed at optimization of the new buildings design rather than surveying and documentation of the built heritage.

The methodological choice to turn from CAD towards BIM for critical knowledge of Cultural Heritage lies in the convergence of several issues:

- the improvement of the cultural debate on those issues by the international scientific community;
- the availability of many BIM modelling softwares (also educational), implemented into the 3D parametric design as well, freed from pre-packaged library;
- the real possibility of model interoperability by the multidimensional research stakeholders within the same web-based software;
- the political push of the European Institutions.

And it is this last point to mark a cultural turning on the topic: EU Directive 2014/24/EU on Public Contracts calls for implementation of BIM protocols for new public buildings, and gradually to the management of existing public housing stock. On April 19, 2016, Italy introduces a clear reference to BIM protocols in the New Contracts Code, transposing the EU Directive.

It is very current the BIM implementation to Cultural Heritage - already anticipated methodologically by Rebecca Volk [9] - and Italy you can aim for the leader role in the re-modulation path of US BIM protocols, from design to heritage documentation.

Scientific research is a circular path (not linear!) and involves a team of several players. Therefore, the case of Cimitile still lends once outlining new data investigative paths: the large amount of disciplinary acquisitions, acquired under coordination of prof. Carillo, and the Site peculiarity that in just over 7000 square meters preserves more than 2000 years of architectural sedimentations. In European scene, Cimitile may be one of the emblematic case studies for the improvement of the Heritage-BIM.

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Reflections of pluralized accessibility in Cimitile. Geometry, Light, Matter, Conservation, and Enhancement of the Cultural Heritage. The role of sun light inside an early Christian church.

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in memory of Eduardo

Abstract

Daylight plays a fundamental role in both energy saving as well as improving the quality of life. Especially in heritage buildings, sun light has been used to create a particular visual perception, along with an identity of the building.

The design and orientation of churches, as well as the shape and location of the windows were often chosen in a way that the direct sun light underlined a particular component or area inside them. The main object of this study was to develop and validate a methodology for analysing the direct sun light distribution inside early Christian church buildings as well as identifying the presence of particular areas or elements inside them.

The proposed methodology was applied to study the direct sun distribution inside the *Basilica Vetus*, located in Cimitile and the Baptistery of Santa Maria Maggiore, located in Nocera Superiore.

The simulation results highlight the reliability of the proposed methodology and confirm the strong influence of the position of the sun, in some specific moments of the year, on the shape and orientation of the buildings as well as the size and position of the windows.

Keywords: early Christian church buildings, daylight analysis, sun radiation, Basilica Vetus, Baptistery of Santa Maria Maggiore

1. Introduction

The sun has always represented the most important free source of energy and light. For this reason, many studies have focused on underlining the benefit of daylight to reduce the energy consumption for lighting as well as improve the thermal and visual comfort of the occupants [1-3].

If nowadays sun light is very important, in the past it was fundamental for human activities. In fact, for years the sun represented the only light source able to produce an adequate lighting for the visual needs and environment perception. The correct use of sun light was so important as to influence the design and construction of buildings. Sometimes, in historical buildings, the sun light was used for ornamental purposes, to realise a particular visual perception so as to give a specific identity to buildings.

The first indications for the correct use of sun light were given by Vitruvius in one of his works [4]. In [4], Vitruvius highlights the need for architects to have a good knowledge of the optical field. The light was described like a fundamental architectural element for buildings, in particular for churches, and a great deal of

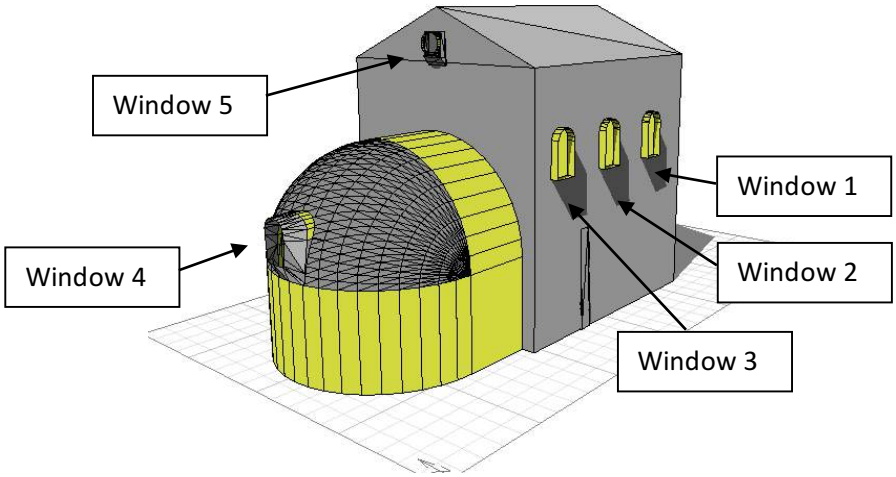
attention had to be given to the building orientation as well as the size and position of the windows in order to control solar radiation as a function of the building use.
Over the years, sunlight became so important as to be used as an emblem for liturgical functions and to symbolize Jesus Christ (Sol justitiae, Sol Invictus, Sol Salutis). In order to emphasize the use of direct sun light, the design and orientation of churches, as well as the shape and position of the windows were chosen to guarantee a characteristic internal daylight distribution on particular days of the year or hours of the day.
The first religious buildings were indicated with the adjective of early Christian [5]. All early Christian churches have similar characteristics: they were built on catacombs or near martyrs' graves [16]. Another feature was the presence of apses with a precise exposure according to [7]. Following the criterion "versus solem orientem", decreed by the Council Fathers at the Council of Nicaea (325 A.D.), the exposure of the apses eastward was recommended. For any length, until the second half of the 400 A.D., the places of worship were built with the apse exposed westward rather than eastward.
Later, the churches were designed and built with the apse facing east, so the officiant as well as the faithful prayed facing toward the rising of the sun [7]. This takes in analysing the early Christian *Basilica Vetus* (40°56'N, 14°31'E), located in Cimitile (Italy), built at the beginning of the IV Century A.D. [8]. The building constitutes the heart of the entire basilica complex because it was built on the grave of the patron saint Felice in Pincis. Even if it has undergone many changes over the centuries [8], it remains the oldest part of early Christian complex in Cimitile and was the subject of numerous archaeological studies [9,10]. Inside the building, a mosaicked aedicule [1], as a frame around the saint's grave, was erected. Generally, in early Christian churches (especially those with the apse oriented East), the windows were specially designed and located with the aim to allow the direct sunlight to hit a particular element of the church in certain hours of the year [12].
The main object of this research was the definition of a methodology to investigate the interaction between the sun light and specific elements inside early Christian churches.
The proposed methodology starts with the geometrical characterization of the building and realization of its virtual model in the simulation software ECOTECT [13]. The virtual model was calibrated comparing the experimental acquisition of the sun position inside the building and the simulation results.
In order to evaluate the presence of characteristic relationship among the direct sun light path throughout the year and some elements inside the building, shading masks and sun path diagrams were calculated for different internal surfaces and points of the building. Information about the time of the year in which the direct solar radiation falls on a considered element can be obtained by superimposing the two diagrams.
In the aim to evaluate the reliability of the proposed methodology, it was applied to the early Christian *Basilica Vetus* and the analyses results have been presented.
Finally, the preliminary results obtained for another early Christian building (Baptistery of Santa Maria Maggiore located in Nocera Superiore), have been presented.

2. Methodology

At the beginning, the research activities were focused on the early Christian *Basilica Vetus* located in Cimitile. With the aim of obtaining an accurate daylight analysis, a careful geometrical acquisition of the building was performed through a 3D laser scanner [14,15]. On the basis of the experimental geometrical characterization, a virtual model of the *Basilica Vetus* was realized in the simulation software ECOTECT [13]. Figures 1a and 1b show the internal view of the *Basilica Vetus* and the virtual model. Considering the time in which the *Basilica Vetus* was built, all the simulations were performed not considering the daylight saving time. Figure 1c shows the external view of the virtual model with the identification of the windows being taken into account during the simulations.
A preliminary calibration of the virtual model was carried out comparing the position occupied by the direct sun light inside the Basilica and the results obtained with the simulation software. The comparisons were performed for different days during the summer and hours of the day. Figure 2 reports one example of the comparison performed. The results underlined a good agreement of the virtual model in predicting the behaviour of the sun light inside the building.
Following the indications reported in [12], the validated virtual model was used to investigate the presence of some particular elements inside the church. The evaluation was conducted calculating the shading masks and sun path diagrams for different points and/or surfaces inside the buildings.
The shading mask is calculated considering an imaginary hemisphere over the considered point and projecting on it the surrounding objects. For a point, it is a representation of all the obstructions between the point and the sky vault. For a surface, the shading mask is realized in the same way followed for a point, with the difference that the values obtained were given in terms of shading percentage, in other words, the ratio between the part of the surface hit by direct sun light and the total area of surface for each hour and day of the year.

a)

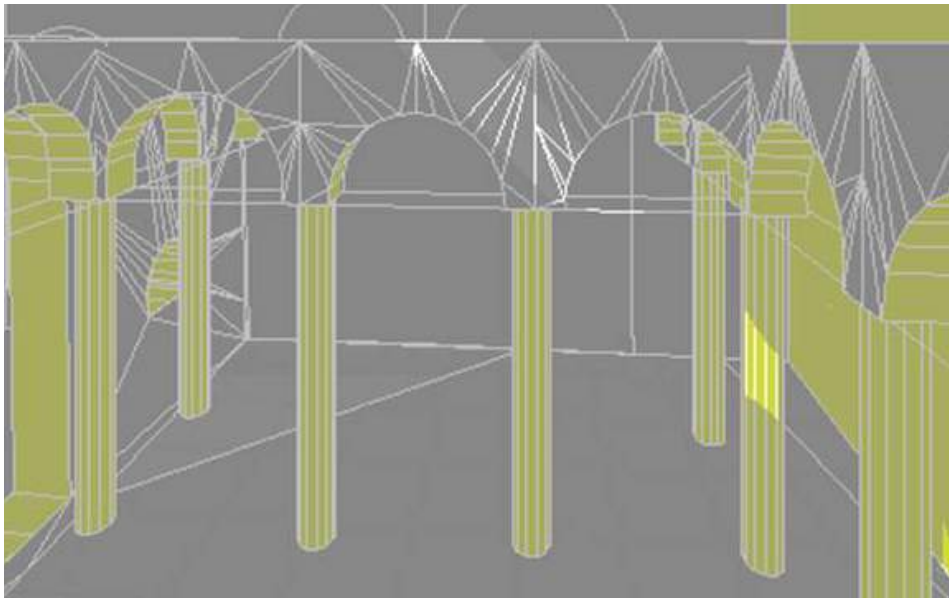
b)



c)

Fig. 1: Internal view of the *Basilica Vetus* (a) and the virtual model (b) and external view of the virtual model with identification of the five windows considered for the simulations (c).

a)



b)

Fig. 2: Comparison between the real picture and simulation of the direct sun radiation inside the *Basilica Vetus* on 15 July 2011 at 15:20, respectively, (a) and (b).

The sun path diagram allows to know the azimuth and altitude of the sun upon varying the day of the year and the hour of the day as well as the length of the daylight, for a specified location on the earth. Superimposing the shading mask and the sun path diagram for a point or surface, it is possible to easily identify the date and time in which the point or surface is illuminated by direct sun or shaded by other buildings.
With the aim of having preliminary information about the points and/or surfaces to take into account for the daylight analysis, a comprehensive historical research for the building considered was carried out.
With the aim of understanding the effect of every window, for each surface of interest, the shading masks and sun path diagrams were calculated considering one window open at a time. Later, the effect of all the windows were considered together with the purpose of identifying if there was one or more days during the year in which the surface was struck by direct sun light. A surface was classified as a particular element of the building if, for one or more days of the year, from the shading mask it is possible to identify different hours of the day in which direct sun light passing through windows follows on the surface.

3. *Basilica Vetus* in Cimitile

With the aim of obtaining information about the reliability of the methodology above presented, it was tested taking into account the early Christian *Basilica Vetus* located in Cimitile. The particularity of this building is related to the position of the apse; in fact, nowadays there are only a few preserved structures of the early Christian age with a west oriented apse. In addition, the shape and position of the window realized on the apse seem to have a particular relevance for the building. The church has an East-West orientation, three windows were realised on the South oriented wall and three on the North oriented wall. Another window, with a circular shape, was realised on the west oriented wall over the apse. Only the three south oriented windows and the two west oriented were considered for the simulations, even if at present two of the south oriented windows are walled up.

On the basis of the historical research conducted, five surfaces were considered for the daylight analysis:

1) the upper surface of saint Felice's grave;
2) the four surfaces of the aedicule columns oriented to saint Felice's grave.

Figures 3a, 3b and 3c show the shading masks and the sun path diagrams calculated for the upper surface of saint Felice's grave, considering windows 1, 2 and 4, respectively. In contrast, the shading mask and the sun path diagram obtained for the same surface, but considering the effect of all five windows, are reported in Figure 3d. The shading masks calculated considering window 3 and window 5 opened were not reported because the sun radiation that passes through these windows did not hit the considered surface.

In the shading masks, the presence of one or more areas coloured with different gradations of grey (from black to white) means that, for the period of the year included in these areas, the surface analysed was illuminated by direct sun radiation. Upon increasing the percentage of the surface considered that is hit by direct sun radiation increase, the colour of these areas passes from black (0% of the area is hit by sun radiation) to white (100% of the area is hit by sun radiation). The simulation results highlight that:

1) the maximum exposure of saint Felice's grave to direct sun radiation is during the 1st May;
2) the direct sun light hit the grave in three particular hours of the day, at about 10:30, at about 12:00 and at about 17:30.

The existence of a day in which saint Felice's grave is hit by direct sun radiation leads to believe that the shape and geometry of the main body of the Basilica and the apse as well as the size and position of windows belong to the same project.

These considerations agree with all the historical studies on Cimitile, that underlined the fundamental importance of the grave for the building and that the basilica was built around it

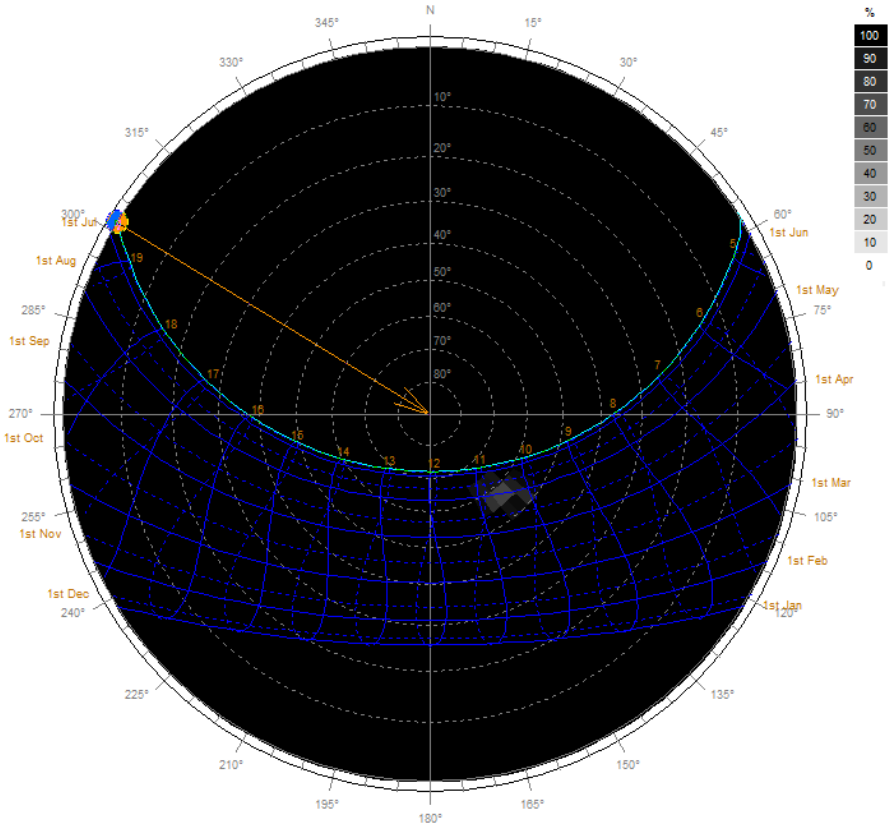
The same analyses, described above, were also conducted for each of the four surfaces of the aedicule columns that are oriented towards saint Felice's grave. Differently from the results obtained for the upper surface of Saint Felice's grave, in this case it was not possible to identify any characteristic behaviour of direct sun light on them from the simulations.

4. Baptistery of Santa Maria Maggiore

The proposed methodology was used also to perform the analysis of the direct sun light distribution inside another early Christian building. With the purpose of comparing the analysis results with those obtained for the *Basilica Vetus* the research took into consideration the baptistery of Santa Maria Maggiore, located in Nocera Superiore (40°44'N, 14°40'E). Similar to the *Basilica Vetus*, it is composed of a main body and one apse, the apse is west oriented and on the external wall of the apse, there is a single window. On the contrary, the main body of the Baptistery has a circular layout. A baptismal font with an octagonal layout was placed in the middle of the main body of the Baptistery.

The early research step conducted on the *Basilica Vetus*, started by creating a preliminary virtual model of the Baptistery in the simulation software on the basis of a preliminary geometrical characterization of the building; 3D laser scanner measurements were still not performed. From the review of the historical research about the baptistery, it is possible to notice that the main element of this building is represented by the baptismal font. The daylight simulations were conducted for the upper surface of the baptismal font, considering only the effect of the window placed on the apse.

In Figure 4a, the external view of the virtual model of the Baptistery with indication of the window considered for simulations is reported, while Figure 4b shows the shading mask and the sun path diagram calculated for the upper surface of the baptismal font. Even if a preliminary model was used for the simulations, the results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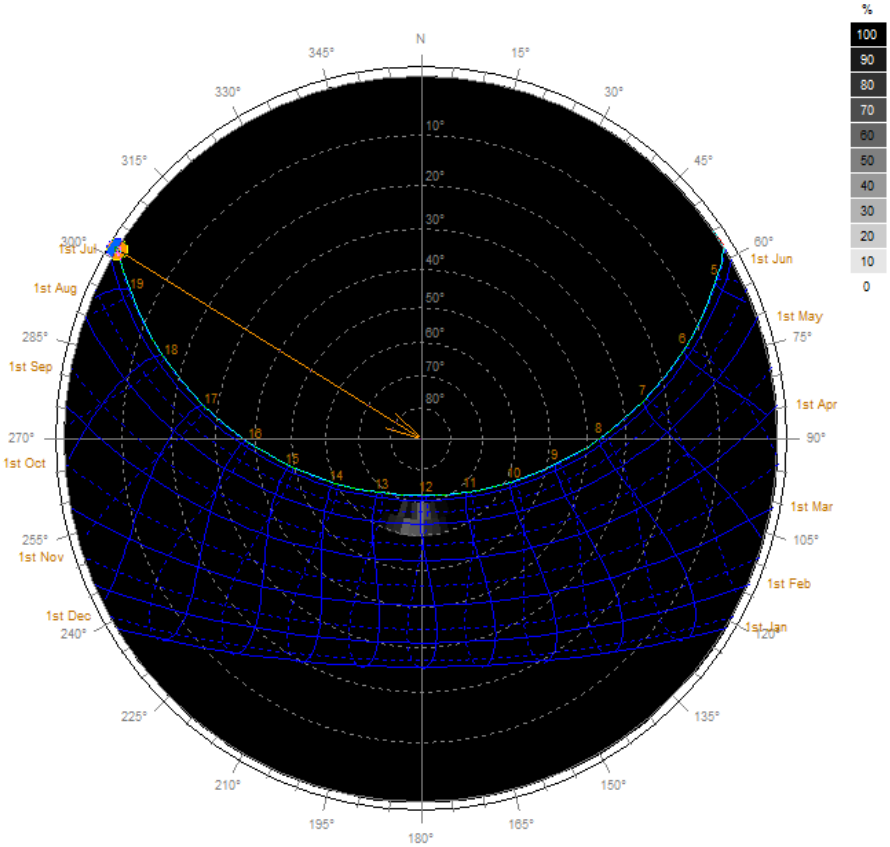
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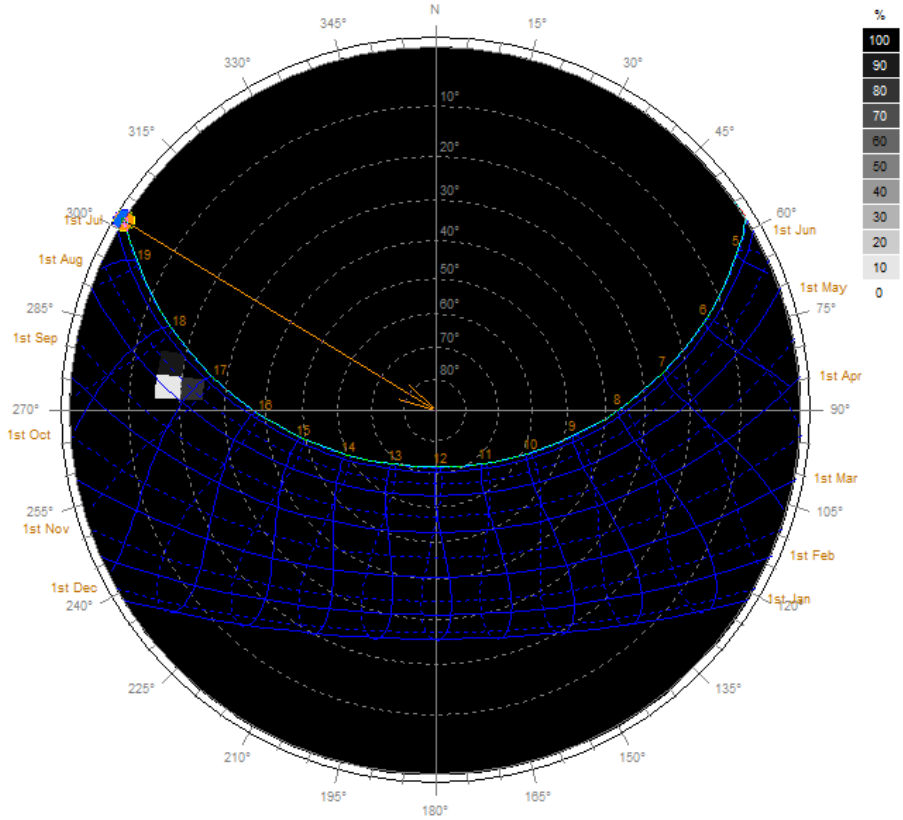

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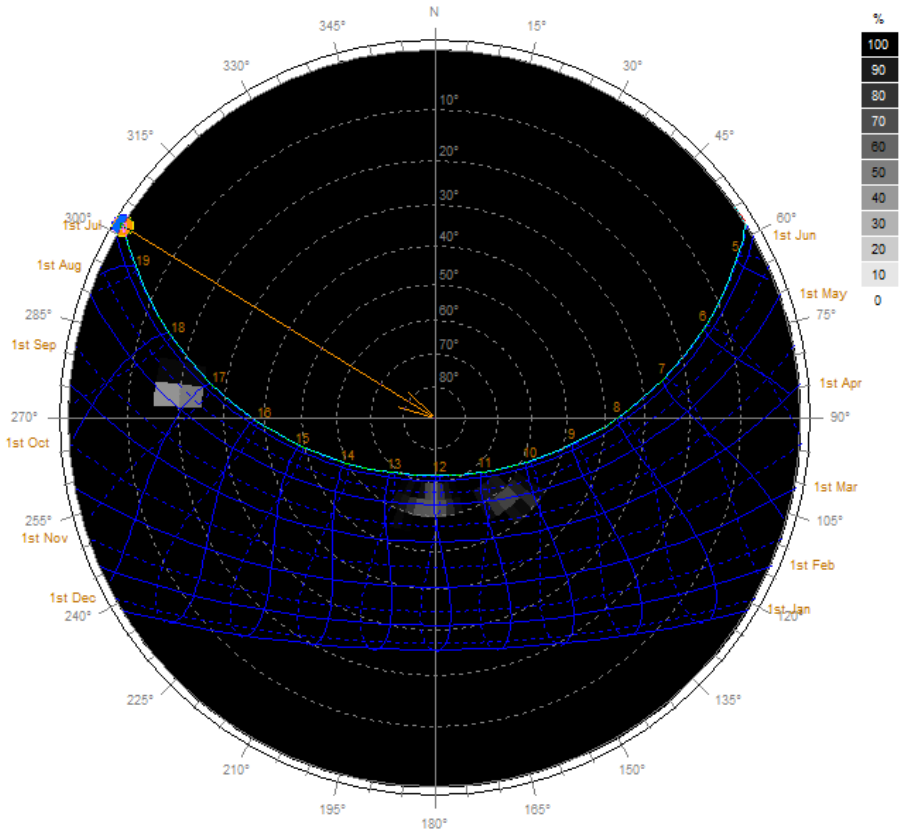


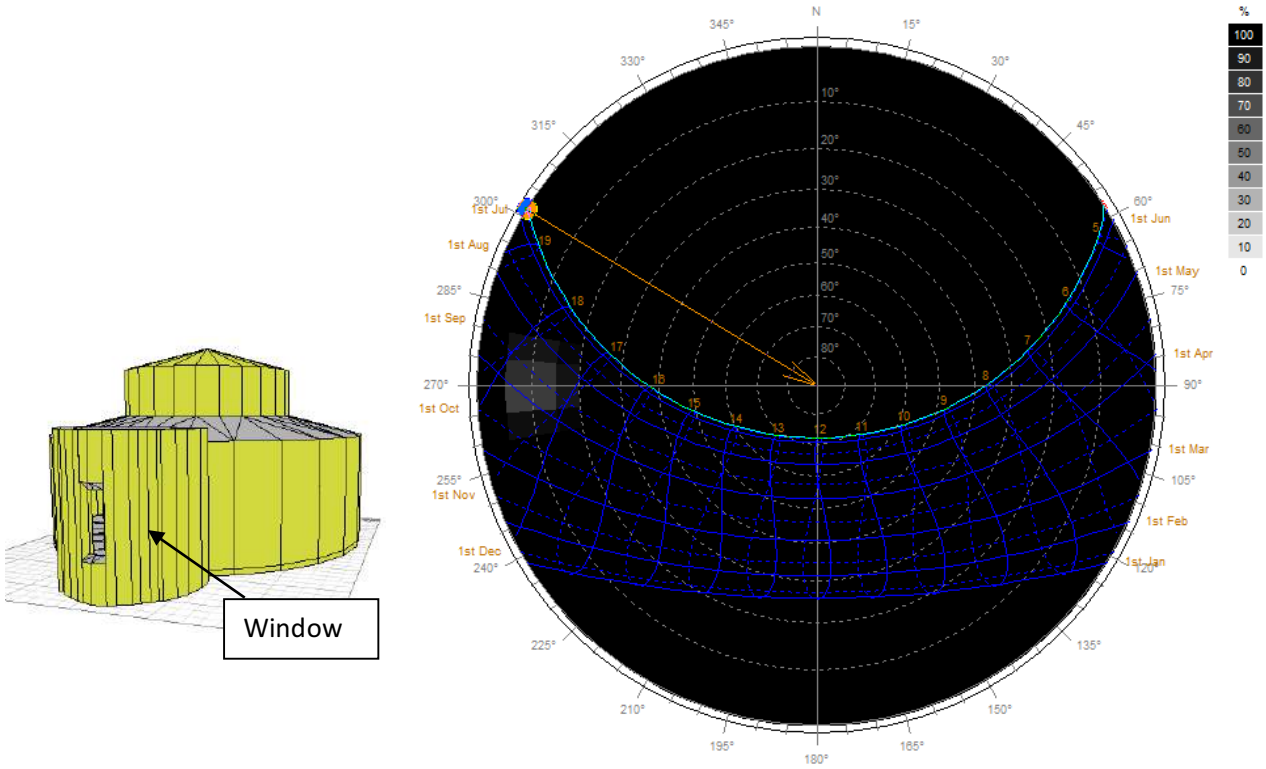
d)

Fig. 3: Shading masks and the sun path diagrams calculated for the surface of saint Felice's grave, respectively for window 1 (a), window 2(b), window 4 (c) and all the windows (d).

agree with those obtained for the *Basilica Vetus*. In particular, from the simulation results, it can be noted that:

1) the maximum exposure of the upper surface of the baptismal font to direct sun radiation is during the 9th April;
2) the direct sun light hit the upper surface of the baptismal font from about 17:00 to about 18:00.

From the simulation results, it can be deduced that the shape and position of the apse and its window were designed and realized with the purpose to use the direct sun radiation for lighting the baptismal font. In addition, the main body of the building, as well as the size and the position of its windows were probably designed with the same purpose.



a) b)

Fig. 4: External view of the Baptistery with indication of the window considered for simulations (a) and simulation results obtained for the upper surface of the baptismal font (b).

Comparing the simulation results obtained for the *Basilica Vetus* and the Baptistery, it is possible to note a similar behaviour of the direct sun light inside the two buildings. Even if the days of maximum exposure are different, the direct sun radiation passing through the window placed on the external wall of the apse hits the two characteristic surfaces in the same hour of the day (at about 17:30) for both buildings.

5. Conclusions

On the basis of the information reported in different research studies about the importance and use of sun light in early Christian buildings, a methodology to evaluate the direct sun light distribution inside old buildings as well as identify the presence of one or more characteristic elements inside them. With the aim of evaluating the reliability of the proposed methodology, it was applied to two early Christian churches, the *Basilica Vetus* in Cimitile and the Baptistery of Santa Maria Maggiore in Nocera Superiore.

The analysis conducted on the *Basilica Vetus*, started with a comprehensive geometrical characterization, from which a virtual model was realized in the simulation program ECOTECT. The analysis results show that (i) saint Felice's grave can be considered the main element in the structure, (ii) thanks to the position of the south and west oriented windows, on the 1st May, the direct sun light hits the grave in three particular hours of the day, at about 10:30, at about 12:00 and at about 17:30 and (iii) the main body and apse, as well as the size and position of the windows belong to the same project.

A preliminary analysis, following the proposed methodology, was conducted on the Baptistery of Santa Maria Maggiore, considering only the window realised on the apse. The simulation results highlight a good relationship between the position of the apse, the size and position of the apse window and the position of the baptismal font.

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Reflections of pluralized accessibility in Cimitile. Geometry, Light, Matter, Conservation, and Enhancement of the Cultural Heritage.

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in memory of Eduardo

Abstract

This research is focused on the direct sun light distribution analysis inside the *Basilica Vetus* in Cimitile (Nola, Naples) and its potential use by anybody (thinking also to disabled people) through simulation in 3D digital models acquired by 3D laser scanners and image based technologies.

From a 3D georeferenced model - as a basic geometrical layer to form thematic models - this research topic was also to develop and validate a methodology for analyzing the direct sun light distribution inside early Christian churchs as well as identifying the presence of particular areas or elements inside them. The proposed methodology was applied to the *Basilica Vetus* in Cimitile, and the Baptistery of Santa Maria Maggiore, located in Nocera Superiore.

The simulation results highlight the reliability of the proposed methodology and confirm the strong influence of the position of the Sun, in some specific moments of the year, on the shape and orientation of the buildings as well as the size and position of the windows. Then, data processing and critical evaluations open to a different interpretation of the chronological stratifications of the *Basilica Vetus*.

These new thematic acquisitions confirm the need to devise new forms of plural accessibility for the fruition of very complex monuments by anybody.

Keywords: early Christian church buildings, digital remote sensing, 3D modelling, daylight analysis, sun radiation, traditional building materials, "La Città di Alceo" laboratory.

Into the "Materia Cimitile" multidisciplinary workshop of the Department of Architecture and Industrial Design, Second University of Naples "L. Vanvitelli" – professors S. Carillo, D. Jacazzi, R. Serraglio, P. Argenziano, M.C. Campone, P. Petillo – the researches on "pluralized accessibility" produced several interesting results about relationship and usage types of the wider audience involved with the Cultural Heritage.

The reflection core insists on the character and the capacity of the historicized product reception by the individual user, regardless of the disability type that he may have (physical, cultural, geographical, religious), using the modern technologies, and the reproductive techniques of artifact, to ensure a closeness relationship to the item itself. It's important to remember Eduardo Fiorillo, man of great moral depth before being wise and passionate topographer.

1 Cimitile. Pluralized accessibility as a conservation tool

Saverio CARILLO[1]

The archaeological complex of Cimitile Urban Park constitutes one of the centers of major interest for the history of architecture and restoration. The uninterrupted frequentation of the site, already inhabited from the Third century B.C., is certainly the most interesting peculiarity because, due to the succession of transformations over centuries, it testifies the mutable human attitudes and the cultural choices behind those of artistic and architectural kind. These characteristics, in itself already considerable, contribute to the *unicum* for which the stratigraphic sequence of the monument is accompanied by a precise documentary evidence. In fact, *epistulae* and *carmina* by Meropio Ponzio Paolino, bishop, writer and poet, as well as the contracting authority of the buildings of the Fifth century bear witness to the story of the building of the place, offering the possibility to make findings and comparisons with other coeval early-Christian sites. It is for this reason above all that the site saw a steady attendance of scholars and architects who, especially in the last two centuries, tried to reconfigure -some only graphically, others with more untrammelled operations- what could have been that ancient place, so precious and celebrated by Paolino of Nola.
The research opportunity that here takes beginning, therefore, is very interesting because it allows to show new and original ways of relating to cultural heritage, through a series of experiences as well as treasuring all those study activities carried out in the past years with academic thesis dedicated to the site peculiarities.
Similarly, with recent study and research activities carried out by the Department of Architecture and Industrial Design "Luigi Vanvitelli" at the Second University of Naples in collaboration with the Veneranda Fabbrica del Duomo of Milan for "La Protezione" project, intended to implement a model in real scale of the noble patterned image of the Virgin of the Spires -perhaps, the greatest Milanese symbol from the late Eighteenth century, it was possible to experiment extremely pleased opportunities of cultural heritage usage by the large and diverse EXPO 2015 audience. The occasion also increased, concretely, the possibility to reflect in a timely manner on the factors and on the valences, which underlie cultural heritage. Of course, the fact is considerable even for the epochal context in which creation event is realized -three decades from the end of the Twentieth century and a hundred years since the beginning of the First World War, facing a complex *scenario* determined by the socio-economic processes

Fig.1: Milan, EXPO 2015. The pavilion of the Veneranda Fabbrica hosts an exhibit that is a one-of-a-kind: an actual-size reproduction of the statue of the Madonnina, the five-meter, gilded, copper laminate statue that has been atop the tallest spire of the Duomo since 1774. All around is displayed the history of this, the very symbol of Milan, and providing, to paraphrase the Expo Milano 2015's theme, an example of, **Feeding the Mind: Energy for Culture**.

Fig.2: Materia Cimitile, 20th Scientific Technological Culture Week (October 18-20, 2010). The restorers of the Archaeological Museum of Naples Laboratory are explaining the restoration techniques to the students directly on site.

Fig.3: Architectural Restoration Workshop coordinated by prof. Carillo. The students woks inside the Basilca Vetus.

triggered by globalization- whereas the project aims to identify in a 'strong value', such as the Marian devotion of the Milanese tradition, identity areas and cultural references of peace and tolerance in the unfocused Western world, inherent from what an exegete of our time calls liquid modernity. The figurative image by Bauman -instrumentally, here can be used to refer to the nature of the materials used in the Twentieth century that, in a specific period of the building history, also took the fluid configuration- properly fits the treated case, is to describe the production of works of art in bronze, either to describe the architectural culture of the past century or to remember the city center that houses the Marian effigy that, for a lucky refrain borrowed from advertising marketing, distinguishes a *drink up place*. Thus, the fluid connotation of today's contemporaneity suggests a more extensive reference framework in the relevant reasoning experiences of art and social values that are connected by, no longer considered to be expression of the poetics and theoretical meditations typical of the first half of the Twentieth Century. These principles are capable to confront an unexplored and unseen world of art where conditions and traditional concepts -*time*, for example, or *vision*- relate to contemporary mankind in an absolutely and heretically heterogeneous way with respect to the canonical positions thought only thirty years ago, according to which the *stillness aura* and the *permanence* described the value judgment. If, therefore, the project "La Protezione" promoted by the Veneranda Fabbrica may have an explicit cultural value not only for the occasion in itself, but also and above all, for its being an event and for the ability to inevitably amplify the experience well beyond the mere Lombard context, due to its role of pilot experience in the cultural heritage field, then it is the case to illustrate the methodological content of the initiative aimed at strengthening the *ethical* nodal core that justifies the safeguard action for cultural heritage. It is due to be remembered that one of the most common subjects encountered in discussions of the culture of conservation, especially in the last two decades, focuses on the of accessibility issues, as an ethical imperative, now essential for certain verses, which scientific and social community can not ignore if aspiring to be recognized with an overall *status* of accomplished civilization.
The accessibility feature is indissolubly related to the varied and vast world of disability which, in the first place, also in reason of a cultural definition of greater attention to the social context can not be imagined only based on physical impediments: disability actually testify, even if it has not gained full awareness, the *individual singularity* of each man. In reason of a broader concept intended to involve, rather than list the difficulty of access to a site, sometimes even temporary impediments or more generically behavioural difficulties – i.e. language or habit, but heterogeneous ethnic origin, as well – the key node for a wider opportunity of enjoying a monument should release an option that encourages the *proximity fruition* to the monument itself.

Fig. 4,5: Nola, Fonderia del Giudice. The craftsmen complete actual-size reproduction of the statue of the Madonnina. On April 26, 2015 the statue was presented to the public, before the transfer date to Milan.

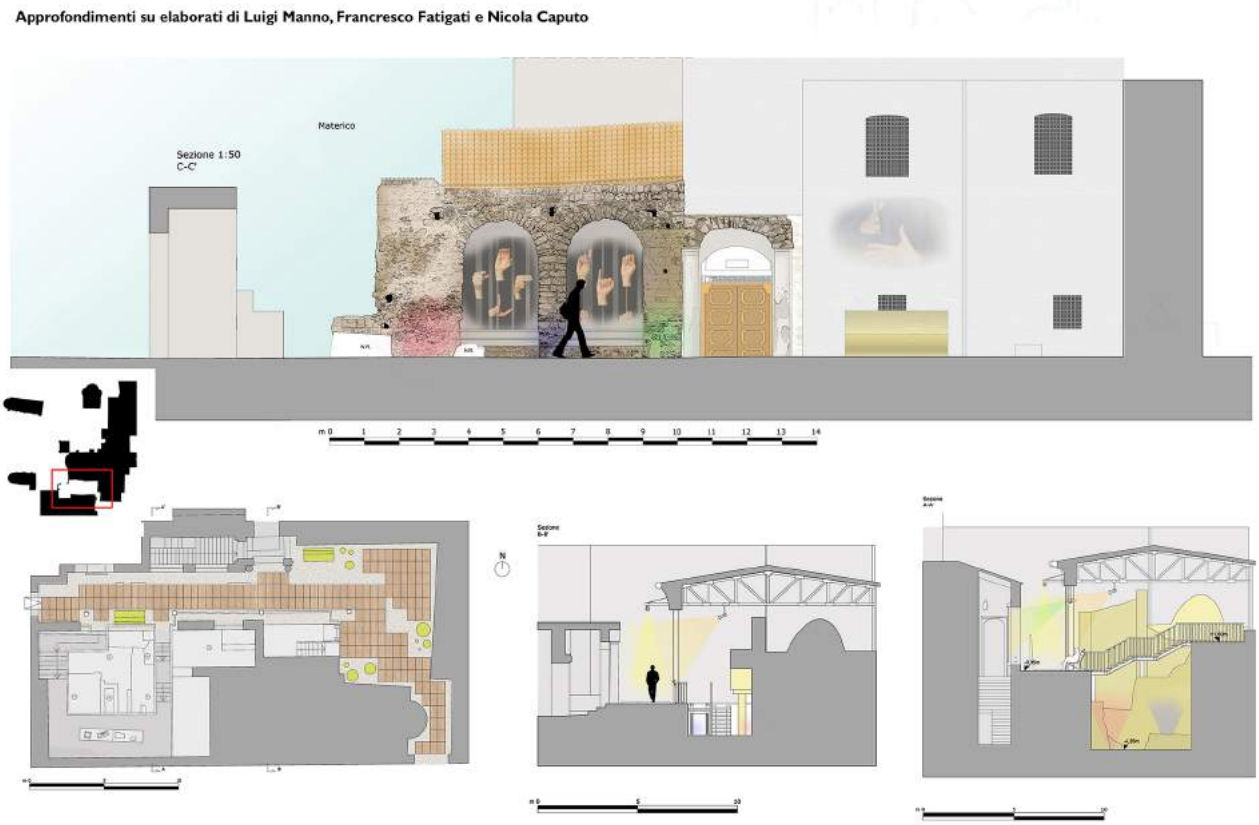

Fig.6: Cimitile. One of the several projects on pluralized accessibility, developed by the students, that participate to the "Architectural Restoration" Workshop.

The here mentioned two factors concerning the fluid consistency of our contemporaneity and the theme of accessibility for art objects should be added the feature regarding the value of copy, replication or reproduction that here gain -even though remaining in the margins of the historical culture- the terms used as synonyms, but these are not synonyms. It remains, however, to consider that in the context of the current spate era -compared with high level of sophistication and disseminated technologies in such a way that everyone can autonomously make use that believes- the Eight-Nineteenth century critical visions, according to which a work-of-art copy has a tight relevance with a falsification work, would seem to linger, at least. The operational perspective that seems to emerge would rather find, right in the scientifically validated copy, the opportunity to address the need of satisfying the pluralized accessibility that, basically, characterize the more complex today's request of cultural heritage. If an admission of guilt should be attributed to the historical concept of the conservation culture, with the accompanying operational guidelines of the safeguard institutions, perhaps this should be identified in the excess of specialization wherein the cultural heritage is confined. The result is an approach like *initiation societies*, fully and consciously indifferent to the most common communication languages, according to which the same matters are included in perimeters, enclaves and disciplinary labyrinths from which it is very difficult to escape.
Likewise, ideological/bureaucratic barriers -sometimes even functional to academic/administrative careers- have identified the paths and the conceptions of the art encouraging or sanctioning fortune criticism of objects or sites, however doing other potential wane, sometimes exclusive of specific matters; if properly evaluated, on these potentialities could be addressed sustainable tourism.
The same specialist slant of cultural heritage increased implicit psychological misunderstandings to the promulgation of scientific culture appropriate to the specific context of *Art History*, even if just for printing the masterpieces of the past. For example, it is striking to observe that an anthology can publish a miniature of a few centimetres to the *whole page* while an altarpiece, several meters height, in the narrow typographic box without any attention to the dimensions of the subject, almost as a *representation of tastes* or *scientific preferences* of the author. Similarly, there are areas and archaeological sites published on scientific guides with photographs selected on the basis of impressive spectral and isolated spaces, such as to constitute an implicit invitation to the potential visitor to … *let it go*.

2 Cimitile. Pluralized accessibility and interpretation of the site as requirements to an effective conservation project

Manlio MONTUORI[2]

The considerations that emerge from the pluralized accessibility is first to rethink the working hypotheses on which, for several years, the commitment of the conservation culture lagged; by its very nature, it can not refer but to the mutations that occur in social habits, having to leave space for the guidelines that emerged from the change in sensitivity and needs of the public. Nor even less, it is possible to ignore roughly the languages of the communication *medium* that, in other respects, represent formidable instruments of cultural heritage enhancement. Interesting experimentation, for example, is the work-of-art paintings transfer in plastic simulacra capable of providing, through the haptic manipulation, the approach to masters such as Caravaggio visually impaired users, as occurred in the significant and evocative interpretation of 'Seven works of corporal Mercy', in Neapolitan church of Via dei Tribunali. The reproduction of the Madunina, in this way, could be a recipe not only effective but, even on the thought path, substantial with developments for the future dialectics seasons of the restoration domain.
Consideration on the topic of the pluralized accessibility regarding a whole archaeological area or a deeply stratified site would require a new approach to the considerations on the documentary heritage guarded, for instance, inside the Urban Park of Cimitile. It would be necessary to locate also different and articulated roots of work, to provide multifaceted descriptions useful to comprehend in a pluralized form the research project site.

Fig.7: Cimitile. "Architectural Restoration" Workshop, Department of Architecture and Industrial Design, SUN. Some ideas to solve the pluralized accessibility to the Basilica Vetus.

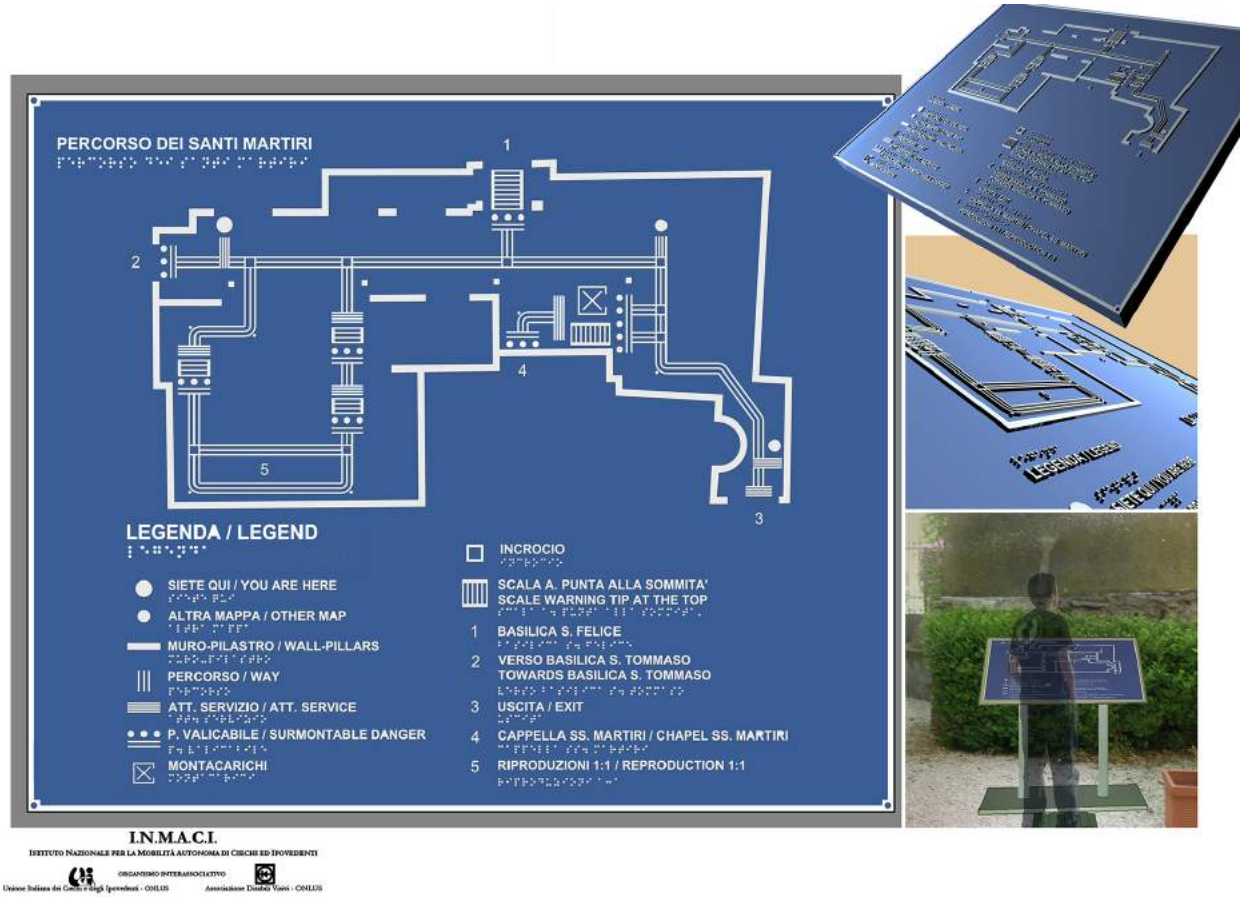

Fig.7: Cimitile. “Architectural Restoration” Workshop, Department of Architecture and Industrial Design, SUN. Tactile signage of the Santi Martiri’s Basilica. (made by L. Manno)

The settlement of Cimitile -already attended from the Third century a.C- especially hosted the site of a necropolis at about one kilometer north of the current city of Nola, in the physical core of Campania, halfway between the cities of Naples and Avellino. The cemetery, whose transliteration gave the name to this portion of territory, was characterized by an important transformation in Christian era when, with the burial of the presbyter Felice, acquired the sanctuary configuration, becoming a continuous destination of pilgrimage. The incentive to the complete transformation of the site is ascribable to the erudite Governor of Campania, Paolino, Ausonio’s pupil, that placed his residence in Nola, instead of Capua. Indeed, due to his conversion to Christianity, he decided to reside near the saint to whom attributed the adherence to the new faith. The archaeological complex inside the Urban Park counts, together with the two vetus and nova basilicas, several worship spaces built through centuries; among these, some of them were actively used until the Sixties of the Twentieth century when, as consequence of the enthusiasm in rediscovering the most ancient evidences, it was decided to dispose of the worship places, leaving for the religious needs only the Parish Church, dating at the end of the Eighteenth century and the shrine where, protected by the superb mosaic chancel screen, the remains of the holy priest are buried. In the context of the monumental complex are preserved sacred spaces dedicated to St. John and to the Saints Thomas and Stephen, to the Martyrs, housing an interesting frescoes cycle on biblical themes; other sites are titled to Our Lady of the Angels and Calionio. Built on the design of the Neapolitan architect Gaetano Barba in the last decade of the Eighteenth century, the Parish Church invaded and occupied part of the old structures of the *vetus* basilica in form of the foundations for the new erecting building. Thus, the new constructions definitively transformed the shrine in a sort of lower basilica -just like a crypt- which endorsed the general idea that, in some ways still widespread in the common language, the holy places of Cimitile had to be Catacombs.
The hypogeum appearance, which the modern archaeological complex is supposed to have until the beginning of the twentieth century when the advent of the Superintendent Chierici started a series of excavations lasted up to some decades ago, was completely changed causing a laborious and very dialectic interpretation of the stratigraphy analysis. Thus, for the evaluation of the stratigraphic variety and the thickening of architectural specimens, in its constant evolution through centuries, the present research topics identify in the case-study of Cimitile one of the places of greater assessment, not only for the amount of surviving traces but, perhaps above all, in order to comprehend those missing or deliberately removed signs, too. Of course, this would represent the

Fig.8: Cimitile. Dr. Luigia Melillo, the Restoration Laboratory Director of the Archaeological Museum of Naples, explains to the students, her conservation work carried out on the frescos of the Santi Martiri's Basilca.

Fig.9: Cimitile. Santi Martiri's Basilca. Some students of the Fashion Design (Dept. of Architecture and Industrial Design, SUN, proff. A.Avella, P.Argenziano, S.Carillo) copy the column's decoration to design new textile patterns.

subject of research and investigation activities in plural and multi-center directions that would effect, according to the conjugation of knowledge and new technologies, new research horizons. Furthermore, these activities, based on non-destructive techniques and the interpretation of graphic, photographic and iconographic samples, would enrich the comprehension of historic construction values that could have an undoubted feedback not only operational, but also in terms of employment promotion. Literature on the specific topic produced the emergence of studies and evaluations that alternated overlapping each other into a kaleidoscope of imaginative hypothesis, claiming to provide the authentic keynote for the interpretation of Paolino's work, due to the sensitivity and to the particular character of the period in which the individual authors lived.
Dating at the Third century, the same location of Felice's burial remains within a pre-Cristian necropolis, named with the specific term of in Pincis, transformed the site into one of the most appealing pilgrimage centers in the Mediterranean area. Hence, Cimitile became the Crossroad of the Spirit especially for the meeting between the authoritative Fathers of the early Church that, in the period of Paolino, were in continuous correspondence with the bishop of Nola. Among the bishop's interlocutors are figures such as Agostino d'Ippona, Melania senior, Sulplicio Severo and Ambrogio of Milan, therefore contextualizing a cultural environment of undisputed value that found, in the expressions and the architectural inventions of Paolino, certainly one of the most important prototyping activities to the birth of autonomous spaces for Christian worship places, to be built after the edict on religious freedom of 313, promulgated by the emperor Costantino. The writings of Paulinus from Bordeaux, in fact, thus constitute a fundamental dialectic knot to understand problems and ideological relationships related to the birth and the development of the embryonic Christian art. In fact, he is to be a first hand source to understand the *status* of foundation in the thought of art for shaping the initial theological assumptions of the early Christian Church. In the building of the so-called *Basilica nova*, in the early years of the Fifth century, the Paolino's statement, assumed in initiatory value of having residence in Cimitile, has the character of true experimentation. The opportunity to conceive a Sacred Christian Space that synchronously combines liturgies, theological guidelines and physical architectural orientations into a wisdom merge, putting together reflections from North Africa, Middle East and Mediterranean Europe. The expressive peculiarity, physically represented by this synthesis, is the tri-apsed space of the current San Giovanni's basilica that embodies the spatial remains of greater 'integrity' from Paolino's *Basilica nova*.

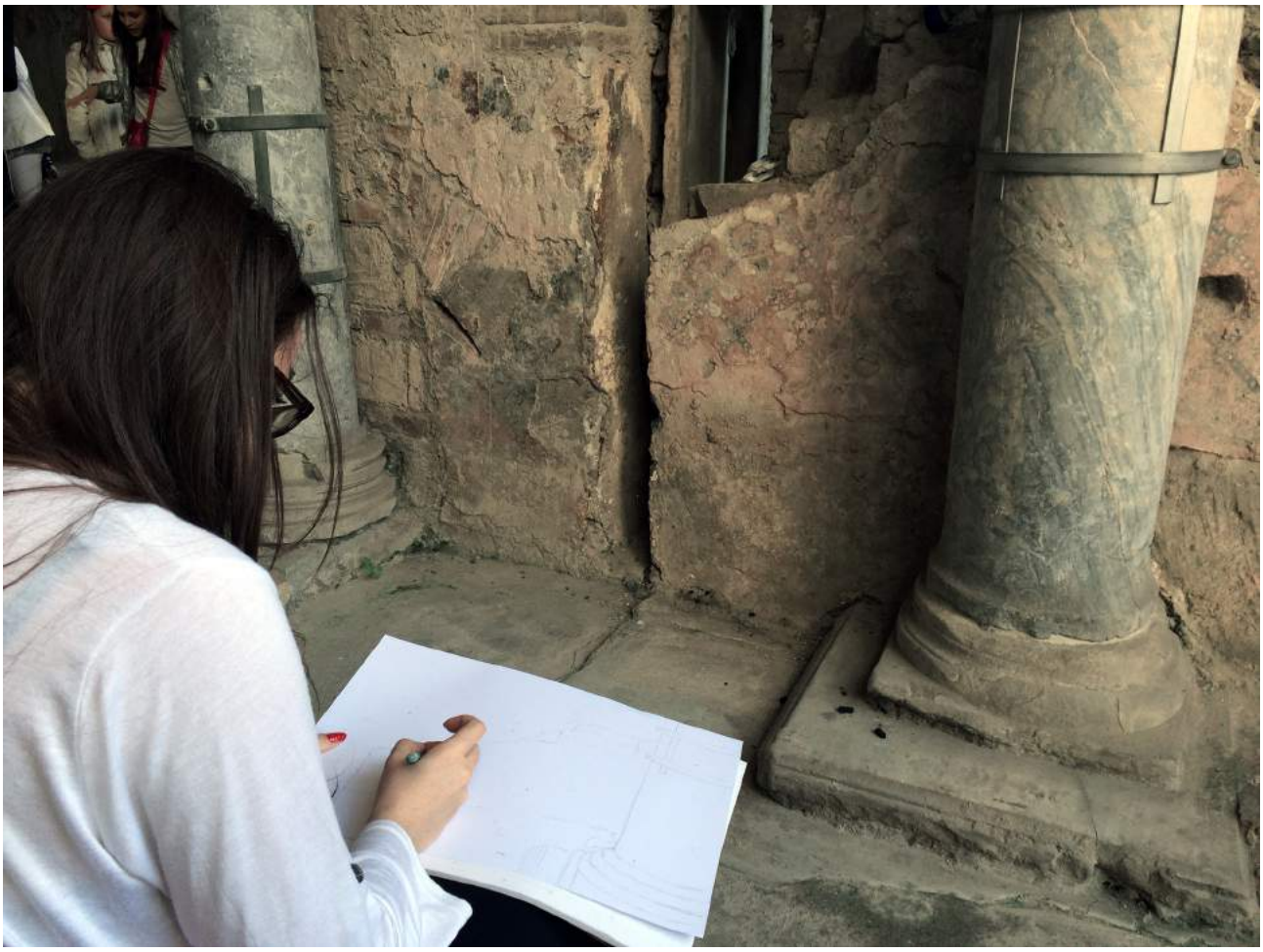

Fig.10: Cimitile. A student sketches the architectural elements into the Basilica Vetus.

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The restoration of historic towns and interventions in agricultural areas.

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Abstract

A first reason for interest in this argument I owe the fact that I just did a design workshop in Saudi Arabia, in the region of Al-haba for the village of Thee Ain where we measured with the restoration of the ancient centers. Our proposals have been appreciated but there remained the feeling that the project had not fully understood and that our ideas remain only on paper. The question we asked is what happens after the restoration of these centers So there is a choice between the city museum or Disneyland

In Italy more than 60 of the population lives in the suburbs, very different in economic, social, demographic, and also for urban and architectural levels of degradation. Here we find, especially for young people and new families, a shortage of housing. There are data that show the picture of the situation and should give us pause. In Italy there is a heritage of more than 200 million homes. The inhabitants are about 60 million. This means that each of us would have to take more than three dwellings.

They appear, however, tentative signs of a turnaround. Not only older people leave the big cities to the high cost of living, especially for rentals; smog, traffic, and they return to their countries of origin. Some young people, for the lack of jobs in large cities move in the small villages with new people and remit to the culture abandoned countryside. Among the most interesting experiences of this turnaround we point out some emblematic cases as two small villages that are Santo Stefano di Sassanio and Solomeo.

As to the second aspect of our communication I want to point the intervention at the margins of a common agricultural essentially of Tuscany. It is San Casciano Val di Pesa, which has 17,247 inhabitants in the metropolitan city of Florence, on the hills dividing the river valleys of the Pesa and Greve. Crossed by the Via Cassia, 15 km south of Florence and about 45 km north of Siena, it is in the Chianti area, known for its production of wines, extra virgin olive oil, and agricultural products in general. An agricultural land with the presence of Officine Graphics Stianti, a very important in the economic of the City.

Keywords: Intervention in small towns, restoration, reuse, new housing in rural areas

Full Paper
We do not ask to be immortal.
We only ask that things do not lose
All their meaning

Antoine de Saint-Exupery

□ou move, or homo, to abandon their new homes in the city and leave them relatives and friends, to go to places and rural mountains to valleys, at the natural beauty of the world, which, as I consider, with sol sense of seeing enjoy□ [1]

Leonardo da Vinci

A first reason for interest in this argument I owe the fact that I just did a design workshop in Saudi Arabia, in the region of Al-haba for the village of Thee Ain where we measured with the restoration of the ancient centers.

Fig. 1: The students of the design workshop in the village of Ain Thee in the province of Al Baha, Saudi Arabia

Our proposals have been appreciated but there remained the feeling that the project had not fully understood and that our ideas remain only on paper. The question we asked is what happens after the restoration of these centers□ So there is a choice between the city museum or Disneyland□

The example of Matera, the city of culture and heritage of humanity and especially the work done over the sassi in its different aspects is not yet fully understood and valued.

Between the fifties and the seventies of the twentieth century Italy went through a period of strong economic growth and technological development, due to the wide availability of labor. Thousands of people were willing to move from small agricultural centers, where they were born and lived, especially in the south of Italy and the poorest regions in the north, in the industrial triangle formed by the cities of Genoa, Turin and Milan. There has been a real transfer of peasants agriculture who became industry workers. The consequence was the depopulation of small agricultural centers and the rapid growth of the suburbs of large cities.

Today we are still living the contradictions due to the time, he called the economic boom.

There are in fact heavy contradictions that mark contemporary Italy. To start from a given macroscopic view we have whole areas almost uninhabited, with the abandonment of many countries, especially in the hills of the Apennines. The consequences are large agricultural areas have become unproductive. There is no supervision on the rivers and streams. Consequently grow landslides and other environmental disasters.

In Italy more than 60 of the population lives in the suburbs, very different in economic, social, demographic, and also for urban and architectural levels of degradation. Here we find, especially for young people and new families, a shortage of housing. There are data that show the picture of the situation and should give us pause. In Italy there is a heritage of more than 200 million homes. The inhabitants are about 60 million. This means that each of us would have to take more than three dwellings.
Obviously someone like Silvio Berlusconi is far beyond the three that belong to everyone. It is true that many Italians, especially those who live in large cities, do not even have a house. Many young couples live with their parents while the housing stock and entire small towns are likely to collapse for lack of maintenance.

They appear, however, tentative signs of a turnaround. Not only older people leave the big cities to the high cost of living, especially for rentals; smog, traffic, and they return to their countries of origin. Some young people, for the lack of jobs in large cities move in the small villages with new people and remit to the culture abandoned countryside. Among the most interesting experiences of this turnaround we point out some emblematic cases as two small villages that are Santo Stefano di Sassanio and Solomeo.

Sassanio, a small town not far from L'Aquila in Abruzzo, probably derives from Sextantio, a small Roman settlement located near the present town. The first news we have in 760 A.D. The work of the monastic orders has allowed an increase in arable land, the repopulation of the areas at high altitudes, the emergence and consolidation of fortified villages, safer from marauding barbarians because in an elevated position.

Fig. 2: Santo Stefano di Sassanio, L'Aquila

At the beginning of our millennium the ancient village is having a rebirth, thanks to the will of the few young people remained or returned, tourism crafted by the will of an entrepreneur: Daniele Elow Kihlgren, of Swedish origin, who bought a part of the village to realize ourselves a popular hotel.

This Act has attracted the interest of other investors who are restoring other homes and are developing considerably different activities in the area, starting with agricultural crops quality.
The restoration has respected the architecture of the old houses, the friezes, the angles, the paths, the history and the tradition. The houses are built of white limestone darkened by time as in the Middle Ages. Even small shops, finally reopened, are built into the rock and triumphs over all the amazing view of the Gran Sasso.

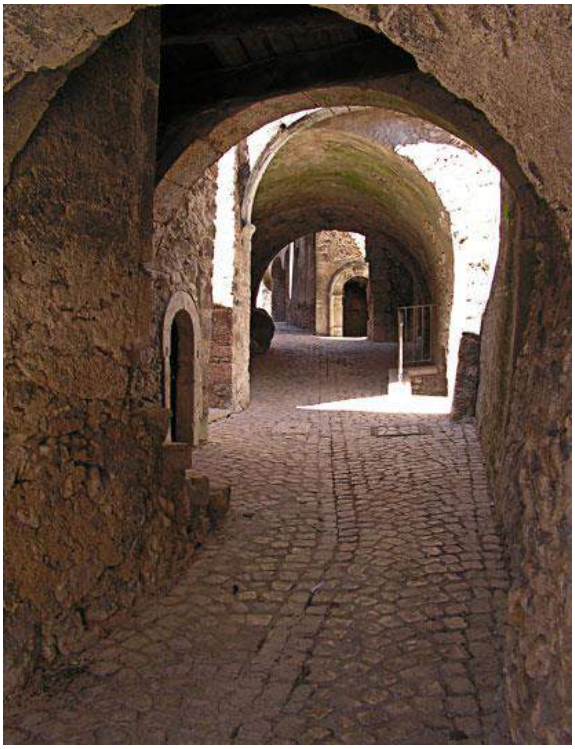

Fig. 3: The road in the restored village of Santo Stefano

The new digital technologies make it possible to connect with the world. They are also reported numerous specialties qualifying point of the Mediterranean diet. This experience speaks to us of the beauty of the landscapes spread, the quiet of the ancient villages pedestrian, the charm of the place populated by the generations that preceded us. Da nobis hodie incantum quotidianum reads an ancient prayer and is known as the spell is that useless thing that is essential as bread.

Fig. 4: St. Stephen's top Picture of Sassanio with mountains in the background

Solomeo is a small village in the municipality of Corciano, near Perugia. Populated by 436 inhabitants in 2001, it is perched on top of a hill at 273 m. above sea level. Date back to the third century BC of Etruscan artifacts found in the area while the name evokes the Etruscan god lumn hence then San Lumeo with whom he began to identify the place.

Fig. 5: The village of Solomeo, Perugia

Here is a sort of leading textile mills in Cashmere: the Brunello Cucinelli SpA that has industrial plants in the valley, while in the village, in addition to the showroom of knitwear, has developed, thanks to the presence of buyers, also the armature linked to gastronomy and tourism in general.
A Solomeo Cucinelli has built, restored and made many cultural plants. He realized the Arts Forum, the Peace Square, the Theater, the Library and the School Aurelian, and sewed up the wounds that time had dealt with the old houses and streets, in keeping with the teachings of John Ruskin. The whole area has been turned into a sort of garden spread in tune with the genius loci, or listening to the voice of the spirit of the places that involves constant physical contact with the land and the landscape to create a continuity between man and nature .
This entrepreneur wanted to evoke the spirit of the medieval building site that is the basis of the restoration of the village, headquarters, turned into a place for the soul, for the mind, for the study and culture. Later also the knitwear factory was installed in a large industrial factory that was abandoned in the valley at the foot of the village. Here large windows contact the inside with the outside, opening up a view of the most beautiful landscapes framed by trees and flowering shrubs and garden visible from all jobs. Operate in visual contact with the surrounding nature, see their houses while you are at work is intended to make less repetitive and more human labor.
And 'in courses carrying an agricultural park of about seventy hectares of land intended for gardens, vineyards, olive groves and orchards spread like trees. Various crops such as wheat, corn, sunflower. Where we cultivate the land with respect for nature and the products are for local consumption in company canteens and for working families.

As to the second aspect of our communication I want to point the intervention at the margins of a common agricultural essentially of Tuscany. It is San Casciano Val di Pesa, which has 17,247 inhabitants in the metropolitan city of Florence, on the hills dividing the river valleys of the Pesa and Greve. Crossed by the Via Cassia, 15 km south of Florence and about 45 km north of Siena, it is in the Chianti area, known for its production of wines, extra virgin olive oil, and agricultural products in general. An agricultural land with the presence of Officine Graphics Stianti, a very important in the economic of the City.

Fig. 6: San Casciano Val di Pesa with Chianti area in the background

Fig. 7: Ex Stianti area, San Casciano Val di Pesa

The project, designed by architects Nataliani Associates, as the next, over an area occupied by equipment for the work they have fulfilled their purpose and are precious reserves of space on which the city can expand without taking up new ground.
The historic building has been renovated internally while maintaining the original layout. On the ground they are placed against the cellars and the connection to the car park of the new residences. 152

apartments overlooking the street that develop on parallel dimensions and degrade downstream, as an addition of the historical nature. At the first level we have commercial spaces while upstairs apartments of various sizes. On the ground floor the building is crossed by a public path that passes through the courtyard and on to the lower level of the sector while the underside we find parking. On the ground floor, separated by private courtyards connected by pedestrian public, there is a dense connective tissue of relational spaces.

To the northwest of 's-Hertogenbosch, between the villages of Engelen and Bokhoven, where the Meuse, the river makes a large curve and a canal connects it to Dieze, stretches over an area of about 200 hectares, green and flat, torn waters and protected by a levee built by the new settlement Natalini Associates in Holland.
The general plan for Haverleij, developed by Sjoerd Soeters and a group of landscapers, invented a new land with bars of wood, chess trees, triangles and green circles, between nature and artifice. The plan was a great golf course with 27 holes, an area in the forest, a nature reserve and about 1,000 houses, 600 of them gathered in a village on the other closed and divided into groups of 60, called "castles", positioned the nodes of a regular grid superimposed on the new landscape.
A Natalini was asked to design a "castle" in a pond where shooting a model ideal for groups of houses: a fantastic car metaphor of separation between an external (chaos) and an extension (cosmos). To protect the quality of the city and live. The designer has transformed diagrams of castles and fortifications in mixtilinear a path on which they organized a door and a lunette, a semicircular rampart and walls with corner towers. The houses are set against the fortifications and gradually have conquered and replaced with a fence to get enchanted with the water out and a court-garden inside. The houses are of bricks of different colors: darker parts in contact with the water, the more red in the upper ones. The gates and towers are made of stone, with some walls covered with zinc, as all covers.

As recalled by Le Corbusier "Architecture is a fact of art, a phenomenon of emotion, beyond the issues of construction, beyond. The construction is to hold; the architecture is to move. The excitement is when the architectural work sounds you like to pitch a universe of which we suffer, we recognize and admire the laws. When you reach certain relationships we are captured by the work. The architecture is' relationships' is' pure creation of the spirit. "
It seems that everything is shown from the proposed actions.

Fig. 8: The Haverleij Castle in Den Bosch

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WORLD HERITAGE AND DEGRADATION
Smart Design, Planning and Technologies
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Togliatti Research Institute Project. Human Practices in the System of Industrial Cities Development

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Abstract
Nowadays there is no center in the city of Togliatti that cements interests of the city dwellers, authorities, and business. Starting from the 1990s, the creation of a competent resource capable of studying the local industrial agenda and to work out an efficient tool for interaction of different views, methods and approaches to urban development and policy has been repeatedly discussed. The experience gained while working with such a large-scale urban development phenomenon as Togliatti can be useful to other factory cities, which are currently in a transitional political and economic situation due to the "freezing" of considerable budget infusions from the federal center into their territory development, the full completion of the complex urban planning projects, the need for overcoming their monodependence on the main employment and taxation sources (the automobile manufacturing and chemical sectors) and the gradual diversification of the city economy. The main point is the attempt to find the way out from the growing social tension.
The aim of the research is to update and problematize the necessity for an interdisciplinary and cross-cultural dialogue of the key stakeholders of the urban development (communities, business and authorities), to work out common reference points, priority directions, the rules of the "game", and the tools for interaction. In order to achieve this aim, the following tasks are to be solved: to consider the principles of urban development and its management; to analyze and generalize the experience of urban integration and cooperation through the example of the institutions of development, and determine the role of the system forming elements and factors of sustainable development; to study and identify the problematic issues of interdisciplinary cooperation, the role of humanitarian technologies and social innovations in the new competences formation process; to develop practical recommendations for improving the tools for coordinated urban development through the example of Togliatti Research Institute Project.

Keywords: human practices, city research institutes

1. Organizational forms of accumulating tools for urban management and development in Togliatti

The distinctive features of strategic planning evolution in the city of Togliatti can be considered at several stages of the city management mode development. The most vivid and competent approach to the issue was demonstrated in the second half of the 1990s and at the beginning of the 2000s. This experience has been described in a number of research papers and books where the key statements and conclusions are based on practical, research, and project activities of the mayor's team and the expert community involved into the strategy implementation process: Sergey Zhilkin, Vera Andrievskaya, Arkady Estrin, Elena Akhmedova and others "Strategic Urban Planning", 2001 [1]; Vladimir Rokhchin, Sergey Zhilkin, Kira Znamenskaya "Strategic Planning of Russian Cities Development: System Approach", 2004 [2]; Sergey Zhilkin "Formation of Strategic Planning System for Complex City Development: Scientific Basis", 2006 [3].

Starting from 1997, the successive steps of the city development strategic planning, which still remain actual, have been recorded: “the development and discussion of the Concept of Complex Social and Economic Development of Togliatti; signing the Declaration “On Strategic Choice of Togliatti”; the adoption of the Concept of Complex Social and Economic Development; the formation of strategic planning bodies; constant work of thematic committees on priority directions of the city development, tracking of measures for the program (projects) implementation and making adjustment; the acceptance of the mission of Togliatti by the Strategic Planning Council; the development and implementation of projects in strategic areas of the city development; holding of annual city conferences aimed at attracting a wide public and specialists to discussion of Togliatti strategic development issues” [1, P.235]. The strategic reference points for enhancing the city management practices were defined: “strengthening of the city self-government authority; coordination of all government levels and branches activity in the territory of the city based on the balance of interests; social adjustment of local authorities following the principles of social partnership and reaching a consensus; a considerable increase in the quality of management of the local self-government bodies” [1, P.236].

The continuity of strategic planning of Togliatti can be tracked through several decisions of the Togliatti Duma: “About the Strategic Development Plan of Togliatti till 2020“ (dated 07.07.2010 No335), “About Strategic Planning Regulations in Togliatti“, (dated 18.05.2011 No541) and “About the Requirements Specification for the Development of the Social and Economic Development Strategy of Togliatti till 2030“ (dated 04.02.2015 No599). The coordination of the Strategic Plan is carried out by the Public Strategic Council of the Togliatti Duma [4].

The establishment of *the Institute for Rehabilitation of the Cit□ of Togliatti* in 1995 can be considered as one of the first centers of urban competencies. In 2006, there is again a need for returning to the topic of coordinated urban management and discussing the establishment of the interdisciplinary *Center for Cit□ Regulation, Urban Studies and Environment Development* as a permanent body in Samara and Togliatti (discussion “Challenging Issues of Togliatti Architecture”) [5]. It was then that a number of important conclusions regarding the specific features of Togliatti as a polycentric territory object and the identity of the city with vividly highlighted problems in managing the development were identified. Five groups of problems in the city that require thorough analysis were defined: the city as an integral spatial formation, the environment – the man, the city – the center, the city – the water, the city – the factories with their sanitary zones, the city – the forest with its protective strip; the conversion of the industrial city into a market-oriented one, which becomes an essential condition for its future transformations. There is a number of other topical problems: the spontaneous, unstructured joining of the districts, the lack of realization of the city development and transportation framework; the problems of different level of architects’ freedom and dependence on the administration, the city authority and policy, market and investors; strengthening of the legal base and increasing the role of competitive practices as major levers of architectural and territorial development in full alignment with the interests of stakeholders: local authorities, politicians, investors, customers, and community; the existence of joining components of the city’s three districts: the river front, the common structure, the transportation network, however, different approaches to project and construction development were applied to each district.

In 2007, there was a wide discourse regarding the discussion of the project of establishing *The Regional Center for Development of Design* on the basis of Special Economic Zone “Togliatti”. The tripartite agreement between the Ministry for Economic Development, Investment and Trade of the Samara Region, the Mayor’s Office of Togliatti and Togliatti State University was signed at the International Forum of Design and Architecture “New City” (curator of the forum Elena Shlienkova).

In 2008, the idea of this project was transformed into a center with wider possibilities: *The Center for Development of Industrial Design and Urbanistics* within the framework of the regional targeted program “Development of Togliatti Industrial and Technical Park” for 2008-2015 (the initiative of the Ministry for Economic Development, Investments and Trade of the Samara Region).

Starting from 2012, International Forum “City of the Future” has become a major communication platform in Togliatti for discussing the issues of the center’s strategic development [6]. In 2014, the main focus of discussion was the attempt to perceive a possible reaction of the local community to the current social and economic situation in the city and the country, as well as the search for a solution of the issues regarding the development of the city as a harmonious territory for a fulfilling life, enhancing social activity of the city dwellers and business community, and increasing its attractiveness for investment. “Economy and Culture of Urban Spaces” thematic platform became the place for searching evolutionary scenarios of the city’s spatial development, for focusing on its potential, quality, functional diversity of the territory, opportunities for its development and diversification, revival of the role of public spaces and the city centers, the economy of collaborative consumption, as well as the efficient strategies, partnerships, technologies, management models and leadership, the ways of renovation of the experiment-city. The expected result was aimed at working out an evolutionary morphogenetic model of Togliatti as a spatial strategy for developing local communities; joint

monitoring and scenario planning of the basic territory cases development taking into consideration their impact on the investment climate, image appeal and involvement into the "landscape" of the city and region; legislative and legal aspects of supporting complex urban development projects; investment packages and a development project algorithm; formation of strategic, project and public-private partnerships.

The year 2015 continues the dialogue format and demonstrates the need for integration of municipal and regional resources with independent expert platforms in the process of monitoring, analysis and working out specific solutions for the territory development issues. International Forum "City of the Future" focused again on a multidisciplinary spatial-economical and spatial-environmental approach to the discussion: "Monofunctional Cities in the New Coordinate System. The General Plan and the Mechanisms for Coordinated Spatial Development Management". It raised the issue of insufficient urban research facilities in a deep study and understanding of the special features of industrial cities, as well as the need for formation of appropriate professional competences.

2. Resource-intensive technologies of urban development through the example of Togliatti Research Institute Project

Nowadays municipalities are not fully responsible for the city development due to a number of reasons, which include: a limitation of the actual authority and tools of influence on problematic areas of responsibility, a chronic budget and tax shortage, the lack of strategic thinking, a challenge of going beyond ones competences and independent decision making at the local level, a direct dependency on the regional and federal policy and a "vertical" management model, as well as a complete refusal from participation into urban management and territory development on the part of such major players as city-forming enterprises. At the same time, the representatives of both executive and legislative branches of power need to score political points and gain the electorate's trust. Business (from a private entrepreneur to major enterprises and multinational corporations) is interested in the development of the market, which is not limited to merely goods and services, but also includes qualified personnel and creating conditions for social stability. The search for new forms of dialogue and community government or revival of the "old" ones that proved to be reliable is a challenging task, which is often out of the attention of the local establishment and city dwellers. A number of long-standing problems in the field of urban development in Togliatti can be singled out:

- Incomprehension of specific character and postindustrial identity of the city's territory phenomenon and its historical and cultural heritage.
- Lack of systemic fundamental, applied, independent and critical studies of urban development and management.
- Low level of professional and lack of interdisciplinary competences in the field of territory management and urban development.
- Historical lack of professional system of training and retraining of specialists in the field of urban development, architecture and urbanistics, and, correspondingly, inconsistency in conclusions, decisions, poor continuity and capitalization of basic principles and up-to-date approaches in the urban management system.
- Low ability to communicate at all levels of decision making and consolidation of local communities due to the lack of interaction, inability to have a constructive dialogue with different local actors: from authorities and business to professional and expert communities and ordinary city dwellers.

Therefore, there is a need for establishing a cementing center, an urban development institute, creating new communication practices and formats of interdisciplinary dialogue between all interested parties. Togliatti Research Institute Project can become such an independent expert platform as it does not lobby interests of stakeholders and at the same time is accessible and open to different approaches, views, and initiatives aimed at the city development. The institute is a resource-intensive technology or an integration of shared access resources. In this case, we can see an algorithm made of two major positions: "tools of development – coordination of interests" and "space of the city – space of relations". Thus, the local authority will get an entry point for open and constructive dialogue; business will get an opportunity to have an up-to-date map of resources, applied research of the intensity of the city environment, guaranteed sales and presentation of their goods, accumulation of the leading expert opinions; professionals will have an opportunity for self-realization, growth, and exchange of best practices; the city dwellers will generate the order and at the same time will become customers of a qualitative model of territory management and will have an opportunity to influence the "vector" of decision making.

Fig. 1: Algorithm of the city

Togliatti Research Institute will be established as a non-profit foundation aimed at carrying out coordinated policy of the city spatial and environmental development on the basis of interdisciplinary collaboration of the territory management bodies, professional expert and local communities.
The Institute is to solve the following tasks: 1) *monitoring and stud* of the condition of the postindustrial urban environment and the periphery, its quality, comfort, safety, and viability of the environment; 2) *design* of objects, services and systems of different complexity and functional levels, as well as participation in the development of programs for complex territory development and regulations, initiation, integration and coordination of the programs; 3) *forming* an education and communication strategy of managing the city spatial development and promotion of its positive practices.
The object of the Institute's activity is scientific research, project, and analytical work. In order to achieve its aims, the Institute focuses its activity on the following 9 key areas: monitoring and analytics, research and forecasting, complex programs and regulations; design and project management, expertise and consulting, training and retraining, raising awareness and promotion, event management, cooperation and communication. That is

1. *monitoring and analytics*: taking part in the analysis of the environment condition, investment and innovative potential of current social, economic, and technological process, project platforms, civil society and business institutions;
2. *research and forecasting:* application of fundamental, applied and prognostic research of quantitative and qualitative indicators of functioning of the urban environment, including those based on sociological methods; development of prognostic scenarios and models of the territory development, transformation of spatial and environmental landscape; study of behavioral and consumer experience and priorities of the city dwellers, local entrepreneurship and communities;
3. *complex programs and regulations*: carrying out research and development work needed for working out documents, regulations, strategies and concepts of territory planning, urban development zoning, projects of layout and land survey of the territory, landscape design, navigation, communication and advertising, executing other consulting and project work on a contract basis; taking part in the development and implementation of specialized areas of the complex development program of the Samara-Togliatti agglomeration; taking part in the preparation of a regulatory base in the field of innovative developments and intellectual property protection;
4. *design and project management*: project and expert support in the field of urban development, architecture and design, business planning and project development, innovation management

systems, social programs and complex projects of urban development, corporate and territory branding and rebranding; rendering assistance to municipal and regional government, as well as entrepreneurial organizations in the field of ensuring effective managerial decisions connected with the development of organizations and/or municipal entities, transformation of local and regional policy in the field of economy, innovations, social and cultural sphere, formation of competitive business environment in the city and the region and an entrepreneurial community, development of design strategies for companies taking into consideration regional and sectoral peculiarities [7]; master planning, urban development and architecture; prototyping and design of environmental objects and systems, as well as introduction and testing of experimental technologies, structures and materials; promoting the principles of interactive environment, accessible mobility, “green design” and “smart city”;

5. *e pertise and consulting*: methodological and organizational support to the organizations that put forward initiatives; initiation, organization and expertise of architectural and spatial design contests aimed at the urban environment development; support for protection, renovation and maintenance of objects and territories that have historical, symbolical, cultural or nature conservation importance; strategic consulting;
6. *training and retraining*: implementation of a lifelong learning system in the area of territory planning, industrial, communicational and environmental design, urban development zoning and layout; carrying out research of cities and local communities; development of integrated training and retraining programs for state and municipal government employees and executives, specialists and workers of enterprises, company executives, investors and developers, big and small owners of land resources. The programs are based on real-life cases with step-by-step testing in the process of design and implementation; creation of a mobile distributed infrastructure for implementation of interactive and distance learning, attraction of additional resources, production capacities of the Institute’s partners and leading experts and practitioners; accumulation of an integrated methodological and research basis that reflects the distinctive character of managing the projects of local and regional levels initiated by the Institute and its partners;
7. *raising awareness and promotion*: establishment of an open resource for monitoring of the city environment and feedback communication; formation of ecological view of the world, popularization of knowledge about the natural and cultural environment, experience and principles of activity for preventing ecological crises of a local, regional and global scale; carrying out image, advertising and publishing projects aimed at the popularization of the best urban practices and their promotion at different levels and in different formats; organization of public and expert platforms for facilitating the formation of communities of active city dwellers;
8. *event management*: conceptual development, organization and holding of various events in the area of urbanistics, architecture, design, strategic management, economy of innovations, the development of professional potential, innovative entrepreneurship, territory development;
9. *cooperation and communication*: organization and implementation of joint research and applied projects with leading specialized Russian and international universities, project institutions, scientific and professional organizations, territory management agencies and companies; search for investors for the development and implementation of innovative projects in the field of urbanistics and technological innovations; the development of interethnic cooperation, preservation of identity, culture, languages and traditions of the peoples of the Russian Federation; facilitation for the development of social entrepreneurship.

The structure of the Institute embraces five main areas of activity that are integrated within the implementation of the following closely related tasks: spatial and environmental development management; social innovations and economy; information space and communication; industrial design and engineering; innovations in education.

While implementing the project of creating the independent expert platform Togliatti Research Institute, the results and target reference points will be formed taking into consideration the priority development tasks and problems: the number of specialized and interdisciplinary research; the number of specialists with new competences; the formation of education and communication strategy; the up-to-date monitoring system for different spheres of activity and problem zones; project methodology; the development of prognostic scenarios and models of territory development, transformation of spatial and environmental design; the creation of an open information resource for monitoring of the city environment condition and feedback communication; a continuous event network; scalability and multiplicativity of projects; the number of new local businesses and social entrepreneurs; strengthening a professional lobby on the issues of territory development and questionable management decisions.

3. Consolidated urban development through the example of the Institute of the City project

The city of Togliatti is one of the centers in the structure of the dual-core Samara-Togliatti agglomeration in the Samara region. Each of the centers has its vividly expressed distinctiveness both in the historical aspect and in the modern situation. Being the regional center, Samara is considered from the perspective of partnership relations and accumulated experience, which is especially valuable as the city has a strong urban planning school.

Nowadays it has become obvious practically throughout the world that a full-value territory development is not possible unless common guidelines and priority areas for strategic development are elaborated. It is only possible provided there is an effective tool for interaction of different point of views, approaches and methods of urban development and management. The organizational mechanism of the Institute of the City, which was developed for Samara within the Strategy for Complex Development of Samara up to 2025, is one of the examples of such effective tools. The Institute of the City is necessary for establishing a project and research platform. The basis for the Institute's project-oriented methodology is the environmental design that involves a dialogue between the authorities, population, representatives of big and small business, project developers, as well as a continuous monitoring, ensuring the territory's cultural identity and economic independence as the key to the territories' self-development [8].

The interconnection of social, economic and spatial development has been recently visible in strategic elaborations on urban territories development. A complex approach to the development strategy of any territory: a country, a region, a city or a municipal district must include a section on spatial development where it is important not only to consider typical needs for the development of environment parameters but also reveal unique aspects in the formation of the territory's spatial characteristics while verifying strategic aims and tasks. Project developers can problematize the need for interdisciplinary and cross-cultural dialogue between the key stakeholders of urban development. The position of a strategic project developer implies the ability to work with different scales: from a separate yard to urban territories and agglomeration, taking into account the interests of both the dwellers of separate city blocks and the city community as a whole. The second important aspect is a dual nature of the strategy developer position, that is both the view on the territory from the outside and from inside the territory on the region and the country. Predicting the goals, tasks and results of the city development, the strategy developer relates them to regional and national interests. The ability to reveal the *genius loci* and the distinctiveness of its territory development makes the third aspect [9].

Conclusion

The research allowed for the first time to set new value reference points for one of the most problematic phenomena among Russian industrial cities – the city of Togliatti. The disbalance of activities of the process participants, the lack of up-to-date competencies in development management and understanding of the place distinctiveness and its weak and strong points, as well as the use of such resource-intensive technologies for territory and urban planning and management as independent expert institutions of development are definitely in the forefront among the urban development problems. Having analyzed a number of legislative acts and initiatives of federal, regional and local character [10-14], the conclusion was made that there is a significant gap between the "vertical" possibilities and the local limitations of self-government, tax resources and rigid binding of all vitally important processes in this territory to the industrial factor. It results in a regular "wash-out" of best initiatives and human resources from the city and the region, intensifies the migration outflow, does not allow to form the basis for the continuity of interests and competences in the issues of urban development and management. Consequently, there is a latent conflict and a lack of understanding the need for changes and cooperation of all stakeholders involved in the process of functioning and development. It is difficult to overestimate the role of such competence centers as Togliatti Research Institute in developing and improving the tools for coordinated urban development in peripheral territories. Such centers are capable of carrying out an interdisciplinary, intersectoral dialogue with a practical output at all the stages: from monitoring and the analysis of the territory to the introduction and testing of advanced project methods.

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Wooden fortresses of the 16th-18th centuries. The Concept of historical renovation of the center of Samara and its media mythology

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Abstract
The object of research: wooden fortresses of the city of Samara that were built in close vicinity to each other 120 years apart – the first one in the end of the16th century (Prince Zasekin was the founder), the second one in the beginning of the 18th century (Peter the Great's era). The construction of the fortresses took place in the time of fixing Russia's state borders in the Middle Volga area. A special historic code of Samara territory development is one of the unique characteristics of the city: a new center emerged upwards the watershed along with every new period in the city development. This peculiarity of the spatial expansion first revealed itself during the erection of the second wooden fortress to function as the city center not on the place of the first fortress but in its vicinity. Nowadays only the foundation fragments of both fortresses remain in deep cultural soil. It is difficult to overestimate the possibilities for a new reading of the *genius loci* and restoration of the city's cultural and genetic code. It is not limited to a literal reconstruction of the fortresses and their territorial integrity. The project plan involves the development and further complex implementation of the historical and cultural strategy of the city development that is based on the creation of unique models of public spaces capable of joining the past and the present in a new spatial paradigm; assistance to assignment the status of an "object of historical and cultural heritage of federal importance" to the remaining fragments of the two fortresses; the development of an interactive platform for the promotion of the project and the attraction of public opinion to the problem of irretrievable loss of historical and cultural heritage, including potential investors for the renovation of the territory as a recreational complex.

Keywords: wooden fortress, renovation, heritage, media mythology

1. History of two wooden fortresses of Samara

On specific character of the territory: the Samara region is located in the Middle Volga area and is currently one of the major economically developed regions of Russia.
The modern territory of the Samara region has served as an outpost for the country twice in its history. In the 12th-13th centuries, it was the southern border of Volzhskaya Bulgaria state. Four centuries later, in the 16th-18th centuries, it became the eastern border of the Russian state. Moreover, the city-fortress of Samara served as the center of the state [1]. In 1550, the Kazan Khanate was jointed to Russia, which had a significant positive impact on the destiny of the peoples inhabiting the Middle Volga Area. It launched the land settlement process causing the need for protection against possible raids of nomadic tribes. In order to do so, the construction of a number of city-fortresses and block-up lines started. Thus, in the second half of the16th century, the fortresses of Ufa (1574), Samara (1586), Saratov (1590) appeared.
The first Samara fortress was built on the cape of the watershed of the Samara and the Volga rivers. It had the shape of a rectangle, almost a square, with the size of 213 x 245 m. It was surrounded by a

2.5–3.0 meter log stockade fence. There were eleven watch towers with hip roofs around the perimeter located 60–100 m apart from each other. The hexahedral towers were located in the corners of the fortress, whereas the tetrahedral towers were placed along the straight sections. The fortress was located on the Volga slope of the water shed so that its eastern wall with the watch towers went along the crest, whereas its inhabited part was hidden from the view of the potential enemy. The southern wall went along the steep bank of the Samara river, which served as a serious natural obstacle. The fortress bordered a forest from the northern side. Bogatyrskaya Sloboda (a type of an old Russian settlement) that became a home to the Volga Cossacks was probably founded at the same time as the fortress. The Cossacks headed by their ataman Nikita Boldyr served to the first governor of Samara province Georgy Zasekin [1]. In the 17th century, Samara's first wooden fortress was attacked by joint forces of Kalmyk and Nogai nomadic tribes that conducted raids on Russia's outlying districts. In 1639, they laid siege to Samara but the Russian army forced them to retreat to steppes. However, the danger of new attacks remained for thirty more years.

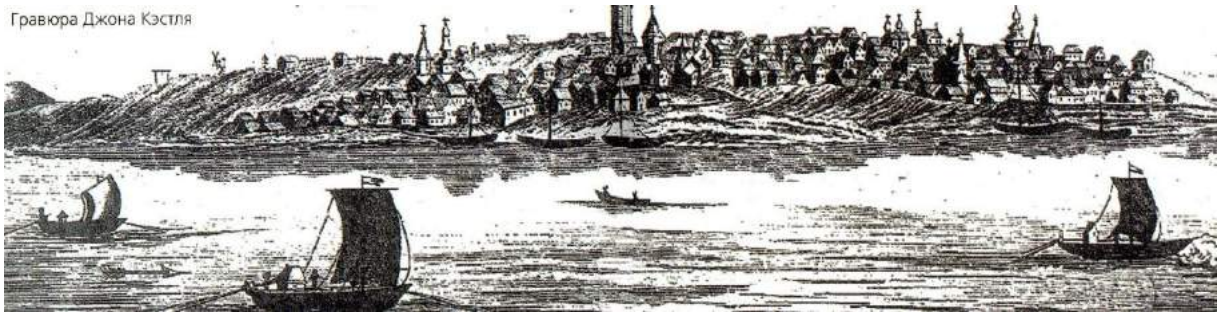

Fig. 1: Engraving of John Castle

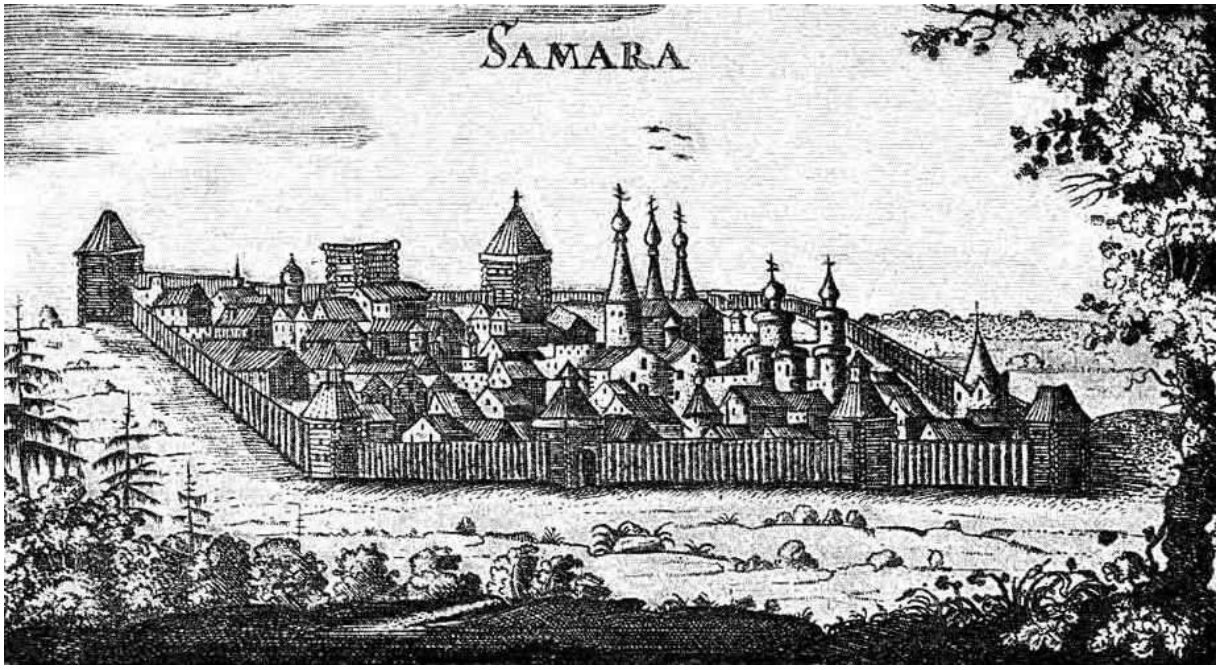

Fig. 2: Engraving of Adam Olearius

A unique characteristic of Samara's urban development is the phased relocation of central functions to the new territory with a shift along the crest of the relief. Nowadays the historic center of Samara has four squares that functioned as the city's administrative and cultural center in different periods of its development: Khlebnaya Square (1590 – 1850), Revolution Square (1850-1900), Kuibyshev Square 1900-1960), and Samarskaya Square (1960 – till present). It was revealed for the first time during construction of the second wooden fortress as the city center on a vacant place in proximity to the first fortress.

The second fortress was built in 1703 – 1706 on an absolutely vacant place two hundred meters to the north-east from the first one after a strong fire had burnt down the first fortress. The city-wide

fortifications had a linear structure that started with the fortress on the high bank of the Samara river and stretched along the north-east side of the city up to the Volga river. Their total length was 1320 meters [2]. The wooden fortress was the key element of the fortifications. It was built according to a European pattern, and therefore called a “Castle”. Peter Simon Pallas visited Samara during his trip around Russian provinces in 1769 and he wrote “Firstly, there was a wooden fortress in the city; but after it burnt in 1703, a proper earth fortress with defiles was built in 1704 on the eastern side between the Volga and the Samara rivers on a low ridge, which can still be seen” [3].
The fortress was a regular one, it was diamond-shaped and there were four big earth bastions in its corners. The facades of the front wall’s two earth ramparts faced the east. The bastions were joined by earth ramparts of 4.5 – 5 meters high. The opposite side of the “castle” faced the residential area. Its ramparts interlocked at the west bastion, which was located on the crossing of modern Krupskoy and Stepana Razina streets. The entrance gate was near the bastion, and apart from them there were two more gates, one of which was hidden. There was no moat in front of the “castle’s” west side. Inside the fortress, closer to the north bastion, there was an octagonal log tower with a hip board roof, which apparently served as a watch tower. The internal size of the “castle” was 383 m along the longitudinal axis and 202 m along the lateral axis. The total area of the fortress was 3.8 hectares. The fortress-“castle” represented a rather solid citadel of fortifications. Therefore, in the very beginning of the 18th century, an original system of fortifications was built in a new place instead of the burnt “down to the ground kremlin and forecourt”. This system combined the achievements of a European fortification practice with the age-old traditions of Russian art of wooden fortress architecture. In 1722, tsar Peter the Great visited the second fortress while traveling through Samara [4]. Further development of the city showed that its fortifications not only served for protection, but also determined the borders of Samara’s layout and development up to the end of the 18th century. In 1782, the first “geometric plan” of the city appeared, where the territory of the second fortress was fixed in the layout of the city blocks. It served as the only evidence for the historical existence of the two fortresses.

1.1 Archeological Excavations

Fig. 3: Area of Samara center with contours of Castle fortress of 1706, according to the data of K. Golovkin and archaeological excavation of 2013-2014 graphic reconstruction by S. Zubov and N. Lifanov, 2014

Fragments of the fortress wooden structure of the ramparts and other parts were found by archeologists in 2013. Archeological works were carried out in the territory of the second fortress (1706) cultural layer in 2013 and 2014. The excavation was made in the area of 128 sq m and consisted of four sectors. Log structures that are used during construction of fortifications take up half of the dig site. The bedding depth of the studied structures is approximately 3 m. Wooden 20–25 cm thick logs are arranged in rows of beams and filled with river sand. Apart from the rows of beams that are preserved for the height of 2 meters, a lower part of the wall was discovered. It is made of two parallel rows of horizontal logs filled with clean sand. A board flooring is located on the other side of the wall. The rows of logs are the part of the inside structure of the fortress rampart, the wall and the flooring made up the entrance to the fortress. The date of the fortress construction (the beginning of the 18th century) was confirmed by a laboratory analysis on carbohydrates. Based on the results of the archeological research in 2013 – 2014, it was established that the discovered wooden structures are the fragments of the south-west wall of the earth fortress built in 1706.

Fig. 4: General plan

Fig. 5: Excavations in 2013 – 2014. Fortresses of the beginning of the 18th century. Scientific research archeological laboratories of Samara State University and Samara State Academy of Social Sciences and Humanities

1.2 Architectural Research

Being the basis of the city, the fortresses certainly prove its greatness and antiquity. Nowadays hundreds of guests come to Samara in order to see the city. However, they do not hurry to the fortress walls and fortifications as there is simply none of them. The remaining fragments of both the first fortress built by Grigory Zasekin and the second one of the Peter the Great times are deep under the ground in the cultural layer. But can we change the existing situation and enable the tourists feel the atmosphere of Samara of the 16th century To reconstruct the fortresses as a symbol, as the sign of the place where Samara was born. To simulate the historic environment and to saturate the fortresses with tourist objects. To form a new environmental phenomenon when an architectural object becomes the subject of communication in a cultural environment.

The fragments of the urban environment of all the layers of the city development are to be preserved in the city's layout structure, silhouette, and image. Four urban development layers and consequently four preservation areas were singled out in Samara based on the historical and archeological research. They have to be represented by such important planning elements as the central square and the main street, where the issues of historical and cultural heritage must be given the top priority when making decisions regarding the development of these areas.

In 2004, a basic historical and cultural plan of Samara's historical center was developed in Samara State University of Architecture and Civil Engineering by architects, associate professors Svetlana Malysheva and Tatjana Vavilonskaya. The territory of the two wooden fortresses is declared to be the place for preservation of the cultural layer. In order to elaborate a complex implementation of the historical and cultural strategy of the city's development, Alexey Gribanov made the architectural project "Samara Fortress 1586" under the guidance of Svetlana Malysheva and Tatjana Vavilonskaya in 2005. In 2011, the issue of renovation of the first Samara fortress was worked out in details along with other 15 prospective areas in the materials for organization of a special economic zone of tourist-recreational type in the Samara region. The work was carried out by order of the Ministry of Sport, Tourism and outh Policy of the Samara Region. In 2013, the Strategy of Complex Development of Samara for the period up to 2025 was approved. It defines the "spatial development and the formation of a creative urban environment" as one of the key strategic areas. The project "Reconstruction of the Khlebnaya Square Area with Creation of "Samara Fortresses" Cultural and Ethnographical Center" became one of the pilot projects [5, 6].

Apart from research work, the key tasks of the project are the following:

- development of a presentation platform (a virtual interactive model of the object and a mobile exhibition module) for the project promotion and actualization of public attention to the problem of an irreparable loss of historical and cultural heritage;
- formation of conditions for attracting investments for the renovation of the recreational complex that involves harmonious interaction of all historical layers on the basis of conceptual approaches in the field of environmental design.

1.3 Concept of the Historic Place Renovation

Within the framework of the concept, it was offered to carry out a complex of work to improve the tourist attractiveness of the territory on the basis of revealing the historical “memory of the place”. The scenario of architectural and landscape arrangement of this area was defined in the initial stage [7, 8]. The scenario’s starting point is a historic distinctiveness of the place: the location of the two wooden fortresses in the 16th and the 18th centuries, which creates a possibility to materialize most ancient layers in the territory’s visual space. Fixation of the fortresses’ borders in the urban environment is considered to be important. The principle of creation of a unique public space model capable of joining the past and the future underlies the concept. The development of the project and the construction of the tourist, entertainment, cultural and educational center “Samara Fortresses” in the territory of city block No. 2 and adjacent Khlebnaya Square in the historical part of Samara must be carried with a thorough consideration of the fortresses’ peculiarities and scale.

The territory for the recreational complex “Samara Fortresses” was chosen for a number of reasons:

- City block No. 2, former “Valves Plant”, covers two-thirds of the territory with the cultural layer of the fortress built in 1586 in accordance with the area’s topographic characteristics and the extant engravings of the first Samara fortress.
- Its location in a walking distance from the cultural and historical center of the city (Kuibysheva, Leningradskaya, Frunze streets and others) and a good transport junction on Khlebnaya Square, as well as its proximity of the passenger river port, which makes the complex convenient to visit.

The total area of the tourist and recreational complex with the embankment of the Samara river is 9 hectares. The project implies a renovation of a fragment of the first fortress in the territory of the complex. It is also planned to reconstruct Samara’s first fortress. According to the plan, “Samara Fortresses” complex will house a restaurant, a tavern, a hotel, an underground parking, a bicycle rental and shopping and office centers. An exhibition center will be located in the neighboring building that used to be Sokolov’s mill. The project is not limited to the renovation of the fortress itself. It implies the development of the territory stretching from the fortress walls up to the Samara river. According to the project the tourist and recreational complex will involve the construction development of a part of the Samara river embankment with a yacht club and a boat station (Fig. 6, 7). Almost all the objects have to be newly built taking into consideration historical buildings of the 19th century located in this territory.

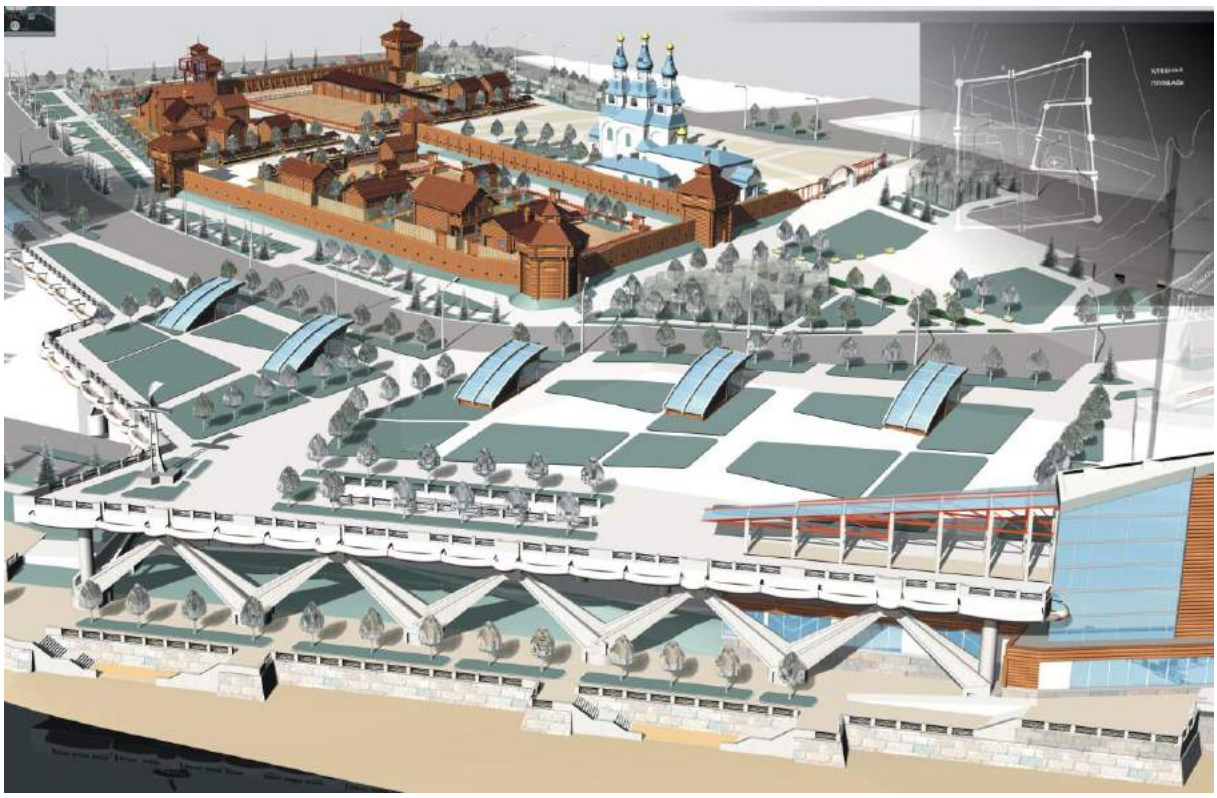

Fig. 6: General view of the project for renovation of Samara fortress of 1586 and waterfront area

Half of the second fortress's territory is currently occupied by 19 century buildings: the corn market building, fire department, and others, which are listed as preserved objects of historical and cultural heritage. Nowadays the public garden of Khlebnaya Square occupies the second half of the fortress's territory. That is where the archaeologists discovered the fragment of the south-west wall of the second fortress's earth rampart. According to the plan, a museum pavilion will be built above the excavation site where the ancient structures of the fortress will be exhibited.
Thanks to the project's implementation, Samara will enrich itself with a unique complex that will recreate the environment of Russian architecture of the 16th and 18th centuries. There is no doubt that the fortress and the adjacent territory will become the key elements of tourism infrastructure of Samara city center and will attract Russian and foreign tourists. The project is highly important for the region, as the construction of the first Samara fortress launched the progressive development of the region, which is currently one of the leading and most dynamically developing subjects of the Russian Federation with regard to social and economic aspects.
There is another factor that makes the implementation of the project important: the World Cup will be held in Samara in 2018. The tourist objects that will be part of the Samara fortresses cultural and recreational complex will undoubtedly be in demand during the games as well as other regional events in the future. The fortresses capable of joining the past and the future in a new spatial paradigm will become a landmark of the region's capital city, which the local residents and guests will appreciate and enjoy.

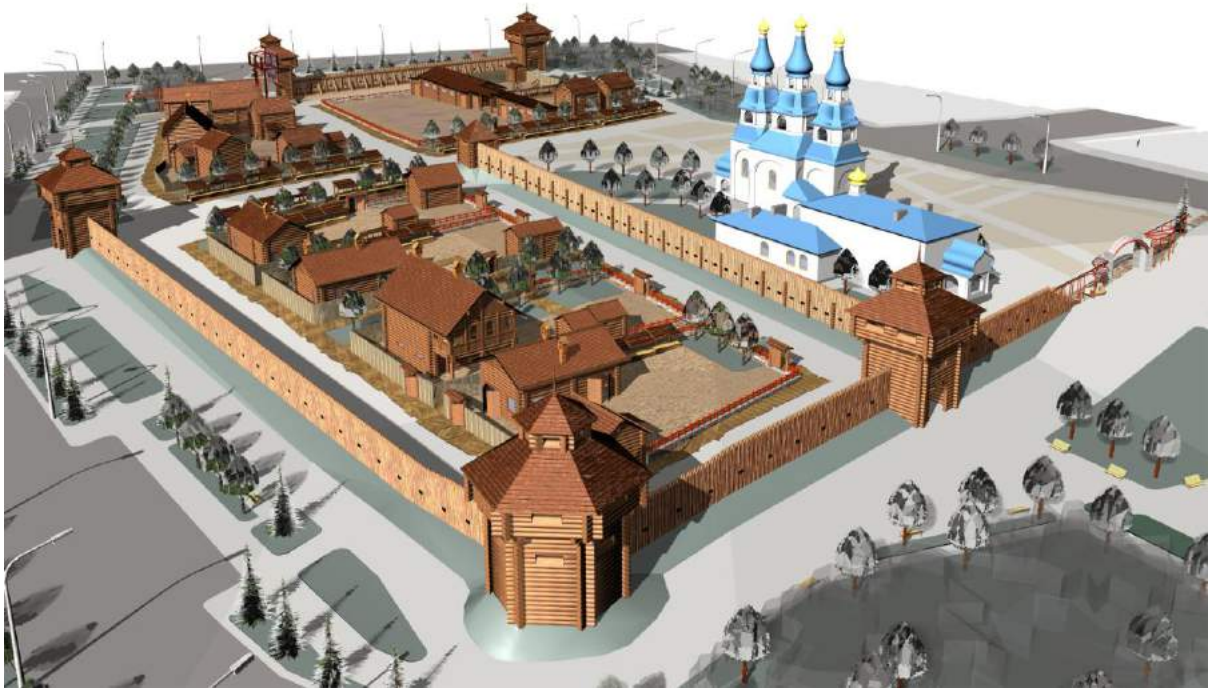

Fig. 7: General layout of the project for renovation of Samara fortress of 1586

2. Media Mythology

In the absence of true "witnesses of history", the possibilities to immerse into the historical context can be extended by various interactive, game and project tools for co-participation and co-involvement in the process of recreation of the time "tissue" and "spirit". Our group under the guidance of Elena Shlienkova, Associate Professor of Innovation Design Department, started developing an algorithm that includes:

- virtual routes in augmented reality mode around the territory of the fortresses and mobile applications;
- content platform for participatory design as a possibility for individual or network reconstruction of any sections or components of the fortress structures according to the basic model and the catalogue of different proto-textures, objects, and structural components linked to it;
- game model as an educational segment for studying local history.

Nowadays the problem of the limitedness of factual and archeological material for a maximum accurate reconstruction will be solved by the database openness to different forms of communication among everybody interested not only in the history of medieval Russia and wooden architecture. Our task is to create a concentration of research resources from various sources capable of shedding light onto the

culture of wooden fortress construction, the mutual influence of different concepts of the waterfront territory development and genetic codes of the first settlers.
Media Mythology is an excellent tool for immersion into a new reality and, therefore, can not have an exceptionally linear character. Depending on the tasks, a myth transforms the same context, creates several layers of interpretation of meanings and supertemporal illusions [9]. While creating a new myth about a city, another important characteristic of the open discourse is multidimensionality of empirical layers obtained as a result of intersection and approbation of several interactive platforms (virtual routes, a virtual construction set and a game) at the same time. Having a binding with specific tourist tracks, we get a "supertemporal tunnel" in the part where there is a physical emptiness due to the absence of the historical object itself. Despite the fact that even the most successful reconstruction cannot substitute for a direct, hand-on contact with authenticity, we compensate the emptiness with a new quality of fullness of the environment – a contact with the *genius loci*. This approach makes it possible to maintain weakening interest in the history, routes and energy of the place [10]. Every new mythological story will require specification of details and adjustment, as well as a constant presence in the public space and keeping the focus of attention. Media mythology is turning into a form of social activism, into media-museumification and shared responsibility for collective memory.

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Theory and praxis in the design of Naples "capital" in the second half of the eighteenth century

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Abstract
In the second half of the eighteenth century, architects become exponents of a close correlation between the factory and the city, a structural connection involving the parts in an inseparable complex. All the problems related to the construction of the buildings are placed in an urban context which abides by modern scientific principles. In facts, in the second half of the eighteenth century, next to the projects and the achievements, alongside the treatises and the theories, some critical ideas about the nature and management of the city emerge, arisen from the need for order and rationality intrinsic in the Enlightenment ideals. In the same cultural climate, October 3, 1781, Ferdinand IV in Naples emanates a decree which represents a key document for the understanding of the urban situation in the Neapolitan capital at the end of the eighteenth century. The new law was passed with the help of the architect Gaetano Barba, who inspired the text of the pragmatic, that regulated the Neapolitan urban abuse and in which the concepts of beauty, morphological regularity and variety get together with the new urban hygiene requirements and public safety.

Keywords: Naples, history of architecture, XVIII century.

1.Enlightenment themes in the management of the eighteenth-century city

With the transition from the vice-royalty to the independent kingdom, the matter of Naples "capital" finds an essential basis of comparison in the model of the European city. However, the situation of the city proves to be extremely complex and contradictory due to the lack of a clear line of progression and an organic intervention program.
In the second half of the eighteenth century, the process of unification of the architectural culture and the urban activity, which is quickly and simultaneously completed in all the main European capitals, takes on significant new forms: in fact, the rapid transformation of the structures requires continuous adaptation to the problems created by the contribution of new scientific, technological and operative means [1]. From the age of the Enlightenment until the Restoration era, the history of the city and the events of the architects are intertwined in a complex and inseparable way. In the second half of the eighteenth century, architects become exponents of a close correlation between the factory and the city, a structural connection involving the parts in an inseparable complex. All the problems related to the construction of the buildings are placed in an urban context which abides by modern scientific principles.
On the one hand, therefore, we are seeing an increasing specialization of the professional roles; on the other hand, the approach to the urban problem is no longer expressed in random and generic terms, but on the basis of a rational process of orderliness and method.
«La storia dell'urbanistica è portata, in termini globali, a registrare soprattutto quelle trasformazioni che si attuano per "salti" strutturali, per "rivoluzioni"» [2]. However, the essential actions hide a number of less obvious changes, but no necessarily less crucial.

In facts, in the second half of the eighteenth century, next to the projects and the achievements, alongside the treatises and the theories, some critical ideas about the nature and management of the city emerge, arisen from the need for order and rationality intrinsic in the Enlightenment ideals.
From Paris to London, to Naples, and Madrid, if you examine the common features of the new proposals, the enlightened will of rationalization of the city environment finds an unitary expression in the theme of the urban decoration, the aesthetic order and functional organization of the city.
The first challenge of Carlo of Bourbon after his arrival in Spain in 1759, more than twenty years after the government experience in Naples, was to turn Madrid into a model for the Iberian culture, a notoriously degraded urban area, in which the rising bourgeoisie, though, had stimulated new urbanization processes [3]. A series of ordinances, enacted in 1761 with the advice and the help of a team of Italian intellectuals, including the architect Francesco Sabatini (author of *Instruciones para el nuevo empedrado □limpieza de las calles de Madrid*), regulated the realization of the royal program of renewal of the Spanish capital, which included new sanitary standards and planned urban developments [4]. Therefore, the urban transformation promoted by the sovereign grew up from the need to conform the Madrid court to the modern structure of the main European capitals and to the theoretical principles of the enlightened thought [5]. So, on the one hand, new rules for the developing of the sewer network, the flooring and the street lighting were established; on the other hand new projects of reorganization of the urban accesses, with the building of monumental avenues and entrances, were created [6].
The idea of a new Madrid, in full adherence to the theme of the urban transformation of the main European cities and to the dictates of the *Enc□clop□die*, was embodied in the program of construction of new "functional" buildings, intended to the services, supports and administrations. The "neo-classical" contribution in the field of town planning is then materialized in a new critical attitude towards the urban reality, repelling its degradation, proposing a different and modern aesthetic function of the built environment and ensuring its functionality.
«Il gusto per l'abbellimento – Laugier writes - è diventato generale; e, per il progresso delle arti, c'è da augurarsi che esso perduri e progredisca, non limitandosi alle case private, ma estendendosi all'intera città. La maggior parte delle nostre città permangono nello stato di abbandono, di confusione e di disordine, nel quale le avevano relegate l'ignoranza e la rozzezza dei nostri antenati. Nuove case vengono adesso costruite, ma non si rinnova né la cattiva distribuzione delle strade, né la difforme disparità delle decorazioni, fatte a casaccio e seguendo il capriccio dei singoli. Le nostre città rimangono così quali erano: un ammasso di case, ammucchiate alla rinfusa, senza alcuna sistematicità, senza criteri economici e senza disegno». From the general principles of rationality and utility derive the needs and proposals for an unifying plan which is characterized by a modern organization of services and governed by specific building rules. «Al fine di prevenire tutte le furfanterie cui gli imprenditori sono avvezzi – Laugier proposes, noting the legislative shortcomings in construction – bisognerebbe che una buona volta essi non potessero più contare sull'impunità. Una legge che li condannasse a riparare a proprie spese a tutti i danni arrecati agli edifici per motivi dipendenti dall'esercizio della loro professione, una legge che ve li costringesse con la confisca dei beni e con la prigione, sarebbe la pi□necessaria e la pi□giusta delle leggi»[7].
Similar proposals are also made in England, in the second half of the century, by the architect John Gwynn. Against the amateurishness, common in the English environment, he requires professional skill from architects, cultural and aesthetic preparation from the public, authority and organization from the administration. In the essay *London and □estminster Improved* (1766), Gwynn openly express his dissatisfaction with the existing legislation in England related to urban planning, mostly based on limited extension measures, insufficient to meet the new requirements of renewal and functionality [8].
In the same cultural climate, October 3, 1781, Ferdinand IV in Naples emanates a decree which represents a key document for the understanding of the urban situation in the Neapolitan capital at the end of the eighteenth century. The new law was passed with the help of the architect Gaetano Barba, who inspired the text of the pragmatic, that regulated the Neapolitan urban abuse and in which the concepts of beauty, morphological regularity and variety get together with the new urban hygiene requirements and public safety [9].

15

INSTRUCCION

para el nuevo Empedrado, y Limpieza de las Calles de Madrid, en que se contiene substancialmente el Proyecto de Don Francisco Sabatini: aprobado uno, y otro por S. M. (que Dios guarde) por su Real Orden de catorce de Mayo de mil setecientos sesenta y uno, que vá à su continuacion.

PRIMERAMENTE todos los Dueños de Casas, no solamente los que las construyan de nuevo, ò reedifiquen (como estaba mandado) sino de las antiguas, y aunque no tengan necessidad de repararse, embaldosen el frente, y costados de ellas, que caen à las Calles publicas, con Baldosas de piedra Berroqueña de tres pies en quadro, con la entrada, y asiento correspondiente en la tierra para su firmeza, y con una muesca en cada costado, y agujero enmedio para levantarlas con facilidad, con alguna palanca, ò barreta, siempre que sea necessario para componer los Encañados, ò para otro fin.

II. Que las Comunidades Religiosas, Iglesias, Parroquias, y Ermitas executen lo mismo de cuenta de sus Rentas, ò Fabricas, en todo el ámbito de sus Conventos, è Iglesias comprehendidas en esta regla, las Comunidades de Franciscos Observantes, Descalzos, y Capuchinos, que no tienen Rentas, y lo deberàn hacer (como las demàs obras de sus Iglesias, y Conventos) de las Limosnas que recogiessen, y solo quedaràn exceptuados los Padres de San Cayetano, los Conventos de Monjas, y sus Iglesias, y los Hospitales publicos, Casas de Inclusa, Niños, y Niñas, en que se deberà executar esta obra de cuenta del Publico: à excepcion de que si dichos Hospitales, ò Conventos tuviessen en sus inmediaciones casas de sus Administra-

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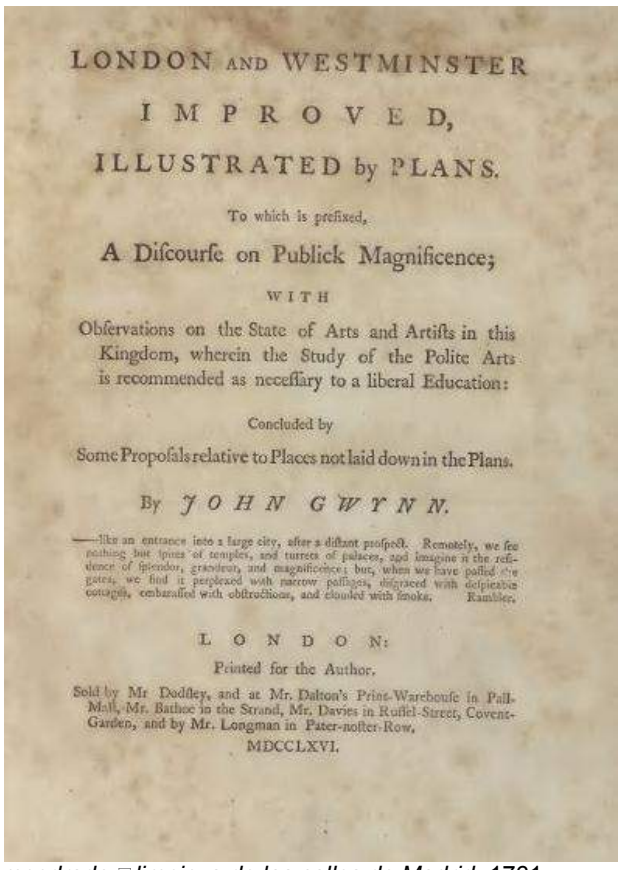

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IMPROVED,

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To which is prefixed,

A Discourse on Publick Magnificence;

WITH

Observations on the State of Arts and Artists in this Kingdom, wherein the Study of the Polite Arts is recommended as necessary to a liberal Education:

Concluded by

Some Proposals relative to Places not laid down in the Plans.

By JOHN GWYNN.

—like an entrance into a large city, after a distant prospect. Remotely, we see nothing but spires of temples, and turrets of palaces, and imagine it the residence of splendor, grandeur, and magnificence; but, when we have passed the gates, we find it perplexed with narrow passages, disgraced with despicable cottages, embarrassed with obstructions, and clouded with smoke. Rambler.

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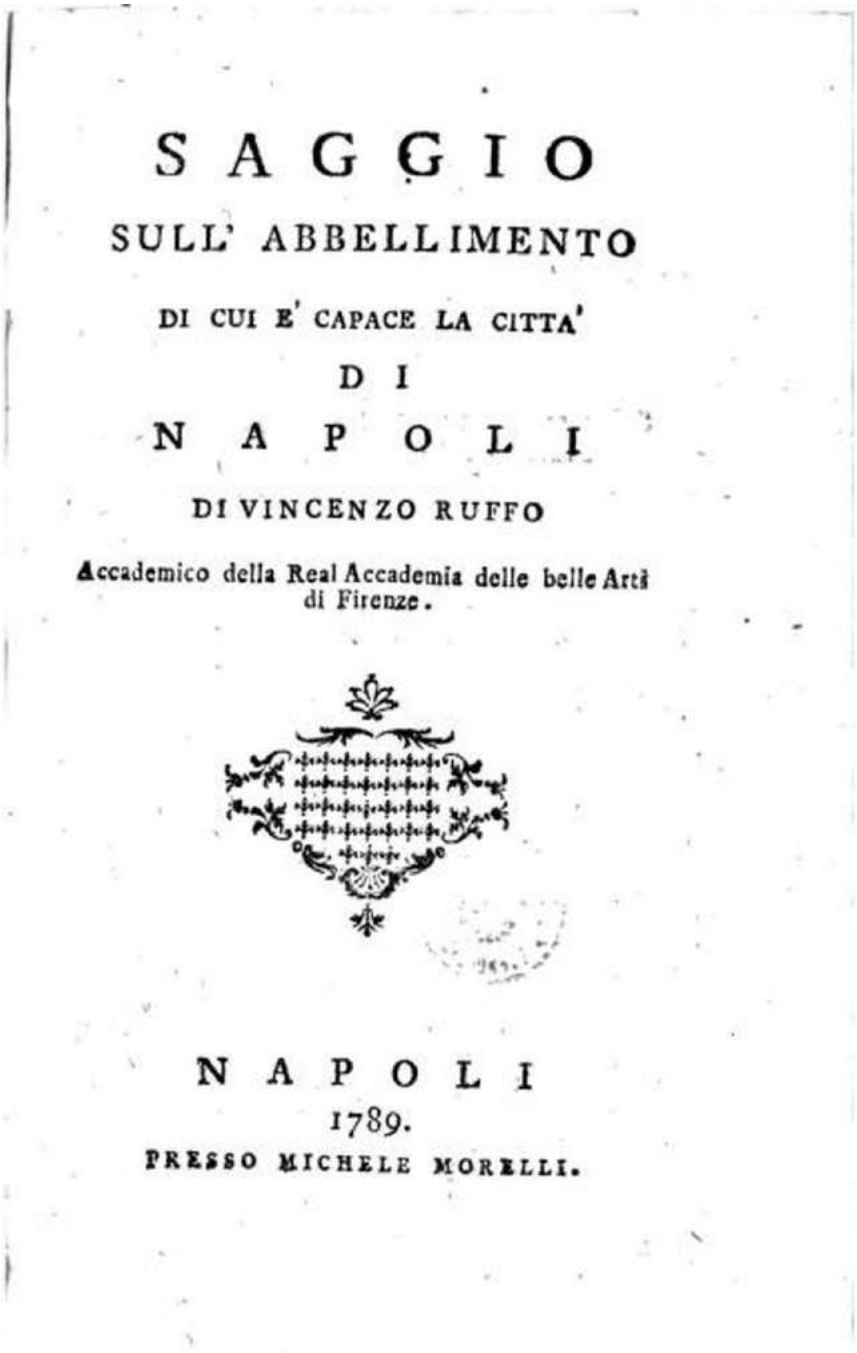
Sold by Mr Dodsley, and at Mr. Dalton's Print-Warehouse in Pall-Mall, Mr. Bathoe in the Strand, Mr. Davies in Russel-Street, Covent-Garden, and by Mr. Longman in Pater-noster-Row.

MDCCLXVI.

Fig.1: Francesco Sabatini, *Instruciones para el nuevo empedrado □limpieza de las calles de Madrid,* 1761
Fig. 2: John Gwynn, *London and □estminster Improved*, London 1766

2.The Royal Law of 1781 and the program for the embellishment of Naples

Conceived as a code for the regulation of the activity of the Fortification Court and, therefore, inspired mainly to technical criteria, the royal edict does not deal directly with the problem of the urban reconstruction of the city; nevertheless it is full of interesting aesthetic annotations. Starting from the analysis of the urban situation in Naples, Barba denounces the aesthetic disgrace of the city, identifying its causes in the non-compliance of the laws and in builders' greed. The proposal made by the architect consists in the control of the preparation and the reliability of the specialists and the application of a correct design praxis. For this purpose, the decree requires all architects and engineers to undergo an examination to verify their actual technical preparation. The decree also provides for the formation of a real professional register: only the members will be recognized as legal practitioner; violators will be deprived of their employment and the right to take the exam. The new law, furthermore, calling for the observance of the first Prammatica of 1564, stipulates that all builders, piperno's cutters, and carpenters must undergo an exam to enrol in the "role" and conduct their job. Architects are obliged to present the signed project, conjunct to the plant, with precise indications of the height of the building, number of floors, depth of the foundations and the thickness of the walls. It is also recommended to take into account aesthetic and formal values. Underground excavations become particularly interesting: they are expressly prohibited both in and outside the village because they were considered one of the main causes of instability and collapse of the buildings above. Other points of the edict concern the Court of Fortification, to which is assigned the task of inspecting all "ruinous or falling" buildings, shoring them up and, if not repaired within a year, forcing their owners to the sale or demolition. The purposes that the law aims are, therefore, many and varied: they are detectable in the prevention of frauds and in the security of the factories, and in the recognized direct responsibility of the builders, called to account for damages and, in some cases, deprived of the right to exercise the profession and punished with prison; crucial is the need to proceed with complete projects controlled by experienced technicians; essential are the rules relating to the construction of buildings, for the benefit of their conservation and durability.
Then, the royal edict seems inspired by a modern vision of the economy and the legislation related to the building activity and, above all, by its expression, the author interprets the needs of "redesign" of the city, embodied in *Rinnovazione de' progetti relativi all'abbellimento, e alla pulizia della città di Napoli* in 1779, and in *Saggio sull'abbellimento* written by Vincenzo Ruffo in 1789 [10].



SAGGIO

SULL' ABBELLIMENTO

DI CUI E' CAPACE LA CITTA'

DI

NAPOLI

DI VINCENZO RUFFO

Accademico della Real Accademia delle belle Arti di Firenze.

NAPOLI

1789.

PRESSO MICHELE MORELLI.

Fig. 3: Vincenzo Ruffo, *Saggio sull'abbellimento di cui capace la Città di Napoli*, Napoli 1789

Rinnovazione, published without date of issue and without editorial marks, is a «prezioso documento descrittivo della realtà napoletana settecentesca», in which the author «propone una serie di ipotesi risolutive ai problemi urbani, architettonici ed edilizi della capitale, intervenendo anche su questioni di "pulizia urbana" e di ordine pubblico» [11]. *Rinnovazione* has been attributed to Ruffo, but it is interesting to note that the considerations on the urban disorder and the lack of decorum in Naples, common to both the anonymous essay and the text of the law in 1781, are formulated with expressions of surprising conceptual and formal analogy. The considerations on the beauty of a city written in *Rinnovazione*: «La bellezza d'una Città rinomata, consistendo principalmente nelle strade, che la dividono, e nelle fabbriche, che ne variano la simetria, fa di bisogno, che tanto l'une che l'altre esponghino agli occhi del Pubblico quella proprietà, che le rende pi vaghe, e maggiormente vantaggiose. Per quanto si può vedere le fabbriche in Napoli, son per lo pi mal costruite sì per il disegno, che per la durata; onde non picciola parte minaccia dannose rovine, tanto per l'enorme altezza, che per i pesanti balconi» [12] are supported by the thoughts expressed in the opening of the text of 1781:«Rimasta delusa la vigilanza del Governo dalle occulte frodi, che si commettono nella struttura degli edifici di questa vasta Capitale, avvenuto che molte delle case di nuovo costrutte, o

riedificate, si veggano di poca fermezza e durata, altre rovinose e cadenti, ed alcune difettose e senza disegno, che deturpano quell'eleganza e simmetria, che conduce all'ornamento della Metropoli del Regno» [13]. Also the considerations related to the statics of buildings and the control of constructions, to be entrusted to experienced specialists, coincide in the two texts both in the analytical aspect and in the formulation of the hypothesis of intervention. «I Proprietarj delle case – says the anonymous author of *Rinnovazione* - siano obbligati a speditamente ristorar quelle, che minacciano rovina, o a venderle, quando le loro facoltà non siano sufficienti per tal opera, accioch venga tolto l'orrore di vedere in molti luoghi le lunghe travi, che ne riparano la caduta; e che, oltre all'offender la vista, danneggiano i muri delle case opposte, a cui sono appoggiate, non senza l'evidente pericolo, che la loro caduta non sia fatale agli Abitatori, e a Passanti». The *Prammatica* of 1781 says: «E siccome le puntellature o fatte, o che in avvenire si faranno in qualunque de' riferiti modi che richiederà il bisogno, non solo deturpano l'esteriore di questa Nostra tanto cospicua Capitale, ma come d'un temporaneo riparo non sono di bastevol sicurezza al pubblico, agli abitanti e alle case vicine, qualora la rifazione fosse lungamente differita, così ordiniamo che debbano i proprii padroni e possessore presto rifare tali rovinosi edifizii». To overcome the rampant malpractice among builders, *Rinnovazione* aims to establish a deputy performing the charge of "Edile", in order to examine and approve projects; Similarly, in the law of 1781, new regulations are established for the control of the constructions, «Sarà dunque sempre ben fatto con permissione degl'Indifferenti, che le fabbriche da farsi d'ora in poi siano regolarmente dirette; onde non sia lecito a Chi che sia di formarne la costruzione senza che prima ne sia esaminata l'architettura da un intelligente Deputato, che al tempo de' Romani attentissimi Invigilatori, che ogni fabbrica fosse stabile, e di buon disegno, si chiamava Edile, e che in Napoli pi che altrove, dovendo essere opportuno, cosa pi che necessaria d'eleggerlo. In tal guisa sarebbero soppressi con questa elezione tutti gli abusi, e tutti i pericolosi inconvenienti cagionati da Coloro, che per far elevare alte case pregiudicievoli al lume, che dovrebbero aver le strade, vogliono far bassa spesa; onde a tal disordine cooperano gl'Ingegneri, e i Fabricatori non suggetti mai per le loro mancanze alla minima punizione».«Che in ogni caso di qualunque nuova fabbrica, o di rifacimento di fabbrica vecchia – the law of 1781 ratifies – ciascuno possa valersi di Direttori o Capomaestri, che pi gli aggrada, ma che debbano assolutamente essere di quelli che sieno come sopra approvati. Ed il Direttore eletto, o che sia Ingegnere, o Architetto, o Tavolario, debba fare il progetto dell'opera per iscritto, da lui firmato, e se sarà considerevole e cospicuo l'edificio aggiugnervi anche la pianta; e nel progetto dovrà distintamente dichiarare a qual altezza voglia condurre l'edificio, di quanti piani comporsi, e quale debba essere la profondità e grossezza proporzionata de' fondamenti, e la grossezza altresì delle muraglie fuori terra; e badare quanto più si può all'eleganza esteriore, né servire all'ingordigia de' privati o al proprio interesse, per istare lungamente impiegato, con progettare strabocchevoli altezze con diversi ordini di appartamenti sopra deboli basi».

The text of the law has, of course, a more specifically technical and operational character, but the considerations underlying the formulation of the new legislation are inspired by the same concepts from which the neoclassical "redesign" program of Naples capital derives. Knowledge and praxis, theoretical and practical needs, which are reflected in the proposals expressed in the late eighteenth century, are based on the same idea of city, documenting a mutual exchange of experiences in the process of cultural formation of the Neapolitan reformatory movement.

Therefore, the inspirer of the royal law text, Gaetano Barba, always careful to the European cultural debate, deals with the urban problem of the capital with a legislative proposal which stands for an open denunciation of the rampant malpractice in the Neapolitan environment and he states the "technical" instruments to remedy this. The aesthetic elegance, the structural stability, the proper execution of the project are the parameters considered necessary to a valid urban "rehabilitation" and a modern urban functionality. The law of 1781 seems inspired by a modern vision of the legislation and the economy relative to the building activity and, therefore, it becomes interpreter of the city's renewal requirements.

Probably, the architect's knowledge on urban legislation derives from the experience gained as an engineer of the Fortification Court. The activity carried out by the Court, first, in 1777, as an extraordinary architect, and later, from 1779, as an ordinary architect, is documented by a number of reports - unfortunately currently lacking the originally attached plants - made on various occasions. These reports contain a series of notes which allow the identification of the specific cultural situation of Gaetano Barba, who, referring to the principles of the new urban theories tested and widespread in Europe during the eighteenth century, used to justify his urban choices firstly emphasizing the aspect of "public health", traffic, commerce, the expansion of the city, then highlighting the legal aspect, with specific references to the ancient laws of the Justinian code and to those of his contemporaries, recognising in the east of the city a new urban expansion area and following a policy of construction in the outskirts of the town. On other occasions he identifies stalls and workshops in the "cacciate in legno", which in many places of the city contributed to the disorder and the crowding of the streets, something that disfigures and does not decorate, moreover always exposed to the danger of fire and,

therefore, detrimental to public health and safety.
In 1789, the architect is responsible for the arrangement and the decoration of the new Marina Road, in the section corresponding to Piazza Mercato, in the context of a more general Bourbon redesign program of the capital, that led to the configuration, by Carlo Vanvitelli, of the new Riviera di Chiaia and, in the east of the city, to the new layout of Piazza Mercato by the architect Francesco Sicuro [14].
At first Gaetano Barba deals only with the restoration of an old fountain located in Riviera di St. Lucia and its transportation to Marina di Carmine, due to the need to put the work in a more suitable site than the original one, by now reduced to a sales square and cluttered with shacks.
The presence of shops, banks and markets selling food, who had already invaded the streets and the squares of the capital, made especially urgent the problem of the regulation and the control of commercial activities, necessary to provide for the hygiene deficiencies and to meet the urban decency [15]. In particular, the areas of Piazza Mercato and Riviera del Carmine, (eastern entrance of the city), needed an appropriate architectural order. The architect's proposal relies on an unitary conception of the city, related to the will to establish a representative path of the urban magnificence, which linked the eastern suburbs to Riviera di Chiaia [16]. But, thanks to the architect's insistence, the king preferred to commission him to realize the project of a new monumental fountain, with the representation of the Rape of Europe, to be located in the road which links the the port of Santa Maria a Parete with Piazza Mercato, at the time lacking of flowing water and an appropriate entrance. The fountain, created by the sculptor Angelo Viva, now located in Villa di Chiaja, had to beautify a tract of Riviera del Carmine, providing a useful supply of water to the zone.

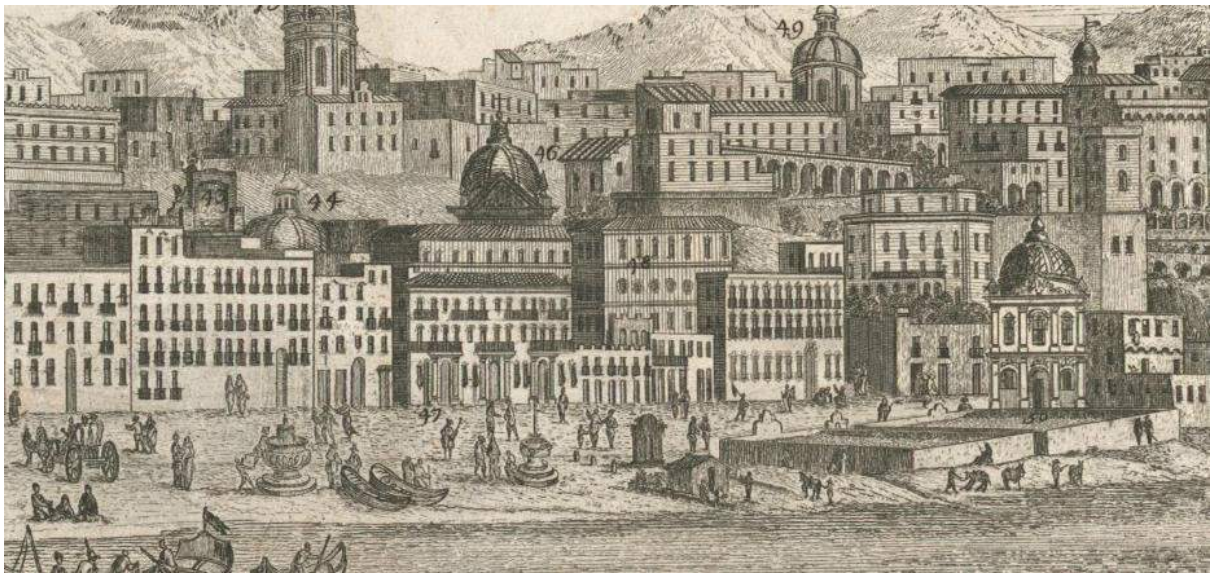


Fig. 4: Ignazio Sclopis, *Veduta di Napoli dalla parte di Chiaja*, 1764, detail.

Fig. 5: Carlo Vanvitelli, *Prospetto di una parte del recinto del Giardino verso la strada di Chiaia* (by 0. Cirillo, p. 88)

Fig. 6: Antonio Joli (1700- 1777), *Largo del Mercato*, Napoli.

A common theme appears to be the basis of the proposals by Gaetano Barba: the need to extend the concept of the monument from a single building to the whole urban organism conjunct to the access roads, by identifying the compositional theme of the requalification of the Marina in the road-square-community continuum, for the definition of a new image of the capital.
The reports which support the long history, completed only five years later, contain interesting notations on the principles governing the new configuration of the area, indicated in those same years by Ruffo as the cornerstone of a complex urban and territorial structure.
If, as a whole, the immediate impact of the new law on the Neapolitan urban reality did not achieve the desired results, it is still indicative of a cultural and aesthetic attitude that refers to the most advanced theories and it fits in the history of the European city as a product of the rationality and the Enlightenment thought. The "scientific" basis for an effective restoration of the city of Naples are based, therefore, on the acceptance of an corresponding to the new necessity of an European capital.

Fig. 7: Giovanni Carafa, Duca di Noja, *Mappa topografica della città di Napoli e de' suoi contorni,* 1775, detail of Piazza Mercato.

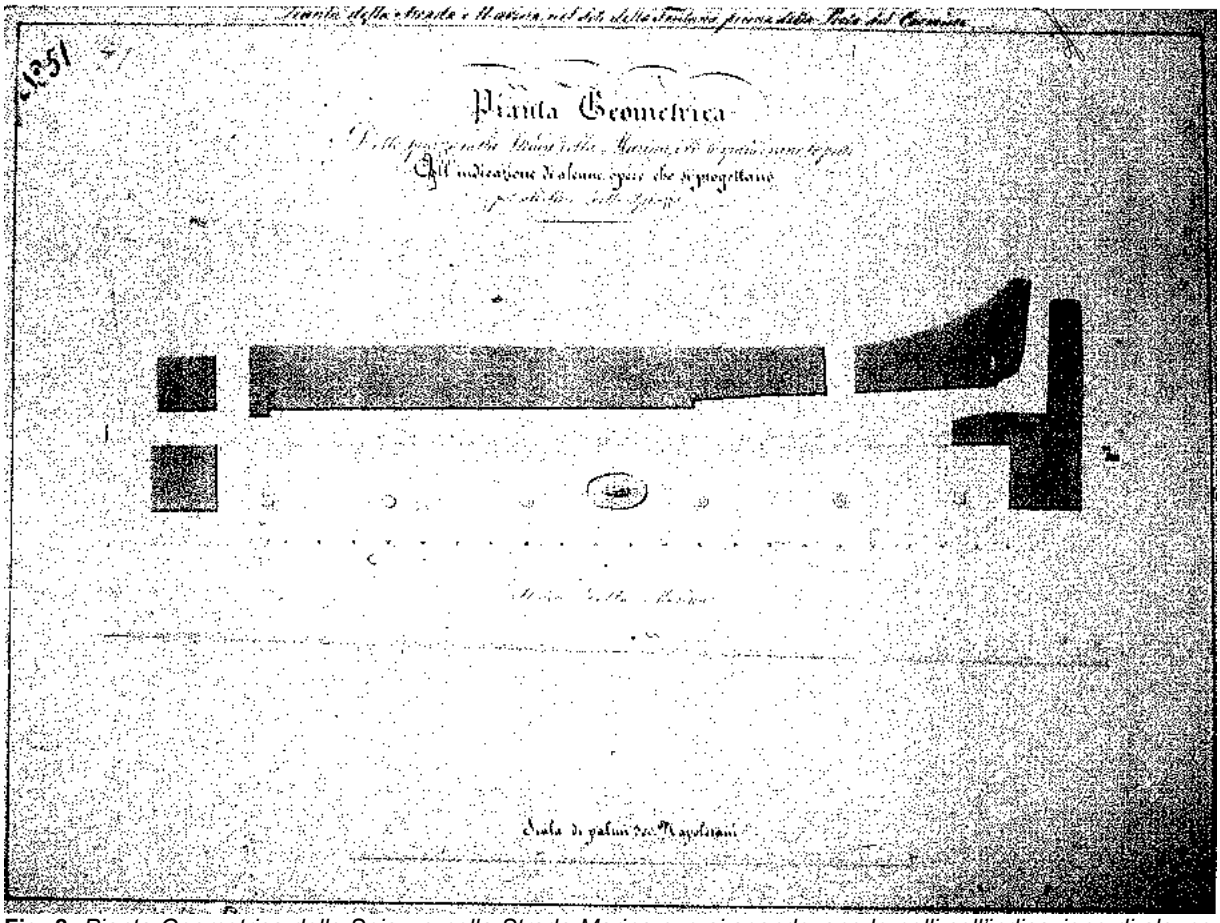


Fig. 8: *Pianta Geometrica dello Spiazzo nella Strada Marina ove si spandevano le pelli coll'indicazione di alcune opere che si progettano per abbellire detto Spiazzo,* Napoli, Archivio Storico Municipale, Fondo Iconografico, Cartella Mercato, n. 25.

Fig. 9: Napoli, Fontana con il gruppo del Ratto d'Europa.

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Piazza Municipio subway station: Archeological Discoveries influences Architectural Design

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Abstract
A case study in which we have dedicated the operative phase of our research is the construction site of Naples' subway, in the wider context of underground system connection, in which the city of Naples has been long engaged. The artistic and architectural quality of stations and squares into the Neapolitan Subway must not lose the main purpose, namely the networking of the entire system of large transport infrastructure of the territory. Specifically, the case study, it should be considered the design complexity and the long duration of the construction site, due to a gradual readjustment of the project, related to subsequent stratigraphic archaeological discoveries, so it is possible to say that "the construction site has made the project". The realization of the node interchange that gather in one station line 1 and line 6, resulted in an intervention area very broad, resulting in the largest urban archaeological excavation in decades. The architectural project, headed by Alvaro Siza and Souto de Moura Edward expresses a real journey through history, where two squares symmetrically equal, one underground and the other on the surface are connected by escalators and a lift. The design idea of the two architects was to create a "new" square underground, equal to extension to the higher one, taking advantage of the volumes of excavation required to develop the station shaft. The design concept is based on the revival of historical urban axis between the Town Hall and the Port, which determines - through two rows of trees - a striking visual axis, which is directed from the port on the overlying hill of San Martino; it correspond to an underground corridor that takes natural light and air from the skylight placed in the center of the longitudinal hall way.
The two architects integrating and combining the history of the site with a modern urban design have also addressed the issue of recovery of the history of city and the prior structure, which will combine the technology with the ancient Greek and Roman remains, a unique combination that will take the role as a museum center.
It has been tried not to overlook the combination Transformation/Conservation highlighting, as its final phase will retain identity and beauty as elements of promotion and development. Becomes increasingly evident the need to integrate into the urban construction site the presence of green researching a close connection between architecture and nature. Green becomes the tool of the urban construction site to reconnect the urban population to the natural landscape.

Keywords: Archeology, Construction site, Architectural Design, Green

1. Natural Elements and Constuction Site
Lesson learned from the above shown case study let us draw some conclusions. As in Piazza Municipio, each urban project should be based on a strong connection with the identity characteristics of the place. These characteristics derive both from natural environment and from historical built

context, especially because in the past the two elements were always united and architecture was strictly connected with the equilibrium of the natural environment.
Moreover in Piazza Municipio the building site phase has been decisive for defining the project. In fact the archaeological discoveries have gradually changed the project, also thanks to an attitude towards flexibility shown by the architects. They followed here a beauty principle which is not based on personal willpower and on the desire of asserting new architecture predominance, so the idea of "Beauty", which was a traditional aesthetic principle for architecture, returns in a different way. It is not a general universally defined and absolute value, because it is a value depending on historical period, specific tradition, geographic conditions, but in this case we would say that it is, on the contrary, based on humility towards History. And even when the construction site is in progress, as in Piazza Municipio, we can redesign in a more sustainable way the project. There are always more than one activity that are appropriated for a specifically shaped space, and the systematic approach implies a change of perspective with respect to the univocal functional idea. Each space is apt to more than a function, even to infinitive functions, as only there is a connection on the plane of organization schemes. So it is possible to redesign a part of a town in different phases of time.
We have first of all to adopt the following range of expedients: limitation of energy resources, exploitation of renewable resources which are linked to the place and to the typology of the construction, characterization of networks in relation with the available resources, introduction of advanced technologies, use of recyclable and recycled materials. But these strategies are not sufficient in order to let citizens participate and definitively accept a construction site as a necessary phase for obtaining a better place to live. Social involvement with respect to a project could help to create a new emotional geography and this goal has to been followed during working phase. In fact community involvement is firstly based on an emotional impact linked to perceptive phenomena and as evidence of possible social involvement we could mention medieval cathedrals constructions which gave pride of ownership to the citizens.
We could wonder whether or not there is a relationship between the way people consider a worksite and the way it is allowed to them to experiences what is happening inside the same worksite. Surely activities are influenced not only by the presence of a worksite, but also by its organization. The perceptive-psychological way of consider a working site is relevant, in fact it can be assumed that appropriate strategies could influence the mode a worksite is perceived. In our social environment it is possible to communicate a different way of perceiving the presence of a worksite, guiding socially behaviours, if there is opportunity for affording this presence with adaptive strategies. So our attention is focused only on some particular aspects of the working site, if we preview what is really been made in the site, and the proceeding of the woks are accessible to the perceiver.

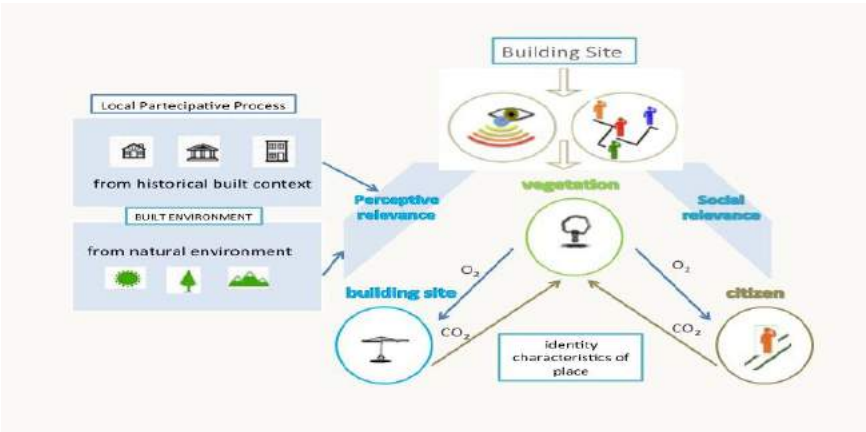

Fig. 1: Natural elements and Partecipation in construction site

In this direction the perceptive study of different worksite phases becomes in itself a qualified project and in a systematic way it is possible to delineate the different perceptive schemes of a place. Because of perceptive dynamics properties of relationships that appear to be important in this causal sequence are the degree of shared vision, shared compassion and shared positive mood. And the complexification of spaces implies too that an architect should think on different levels while designing. Moreover varying uses during time amplifies the space of relationship, reducing consumptions and it has a good consequence in a sustainable design, as for example the increased numbers of hours in which natural light and vegetation benefits are utilizable for a community. The development of

alternate future scenarios, also called “prospection” is a cognitive process with profound emotional features. Consequently we can introduce some natural temporary elements, specially vegetation, inside a working site. Because of noise, increasing of bad air quality, traffic and a lot of other factors, it is not easy let people experience a natural aspect inside a working site, but a lot of experiments are going on nowadays. Integration of the social and environmental problems inside urban and metropolitan areas has proved to be an increasingly common and pressing theme.
Finally the reason we consider the introduction of natural elements during working phase very important is because of the attitude of these elements to let people be involved by them into emotional sphere. Even a little space which can be considered as a microscopic landscape inside a town can create a much more forthcoming attitude towards construction site.

2. Municipio Station case study: a new concept of Constuction Site

Over the last few years the concept of the city has returned to the focal point of national policy and it is possible to recognize a new design vitality which embraces not only the physical city, but especially the field of urban development strategies and policies.
As part of the urban transformation, the specific theme of the urban site includes the set up of substantial changes to the city itself and shows its hidden points. In the case of foundation excavations or chasms that open in urban cores for the realization of metropolitan lines, it is put on a light hidden city, which totally transforms the spatial perception of the context in which it is placed.
If we think of the city of Naples and all the excavation work that the invading and invaded in the course of past eras to recover from the underlying clay pits the building material, we could assimilate the city itself in its entirety to a large construction site in history, a city that is built on itself.
Today the question of the management of sites is extremely delicate rendering, given the congestion and saturation of the cities; problem which mainly affects the perceptual impact in the presence of historical centers.
At times when the territory, especially the urban one, is transformed, it always triggers a difficult situation for those who inhabit it. The discomfort of urban sites, the fear of changes, scepticism and disorientation are the most immediate effects. It is therefore necessary to mitigate the results of mutations - where possible- trying to "harmonizing" the process of implementation of a required conversion, the outcome of which is assumed positive for the area, trying to create a communication channel that gives citizens the tools to understand and to participate. Often, in fact, distrust and mistrust resulting from the lack of correct information and the absence of a climate of positive emotional involvement. The construction site has become a major element of the urban landscape transformation process, as an act of change and upheaval of the soil, that allows the "new work of architecture" to fit naturally into the system that hosts it.
Usually we tend to manage the project as a whole in which it is separated from the urban landscape and social change variables; in particular the landscape is managed as a backdrop, rather than as a functioning ecosystem. This means recognizing the interconnections between natural resources, human, physical. The sustainable ecosystem is thus the center of the project, which is intended as a landscape whose transformation and management aims to minimize the impact on the environment and maximize the economic and social return over the long term.
comunità locali con i processi naturali.
The architectural debate has repeatedly focused on the validity of the strategic choices and the economic feasibility, technical, administrative and environmental effects of the proposed transformation project.
It 'just the implementation phase of the project, namely the construction site, which, although limited in time, has a significant effect on the urban system with which it interacts.
Often the continuation of the processing activities of the urban construction sites, transforming the places where they insist, in spaces that do not lose their sense of the experience, becoming just crossing points.
In this sense, we must try to give quality to these places, making points of attraction for socializing, spaces for communication and experimentation.
It follows that the same construction site infrastructure can assume the role of "environmental infrastructure", such as to connect territories with a greater presence of naturalness and sociability, in which you can integrate the processes of development of the local communities with the natural processes.
Tackling the case study of the metropolitan construction site of construction of the Municipio Station in Naples, it has been possible to enter more into the heart of the issue and in particular the possible congruence of sustainable urban yard confronting more actively on the case study chosen.
Naples is a city rich of infrastructure and, at the same time, congested beyond measure by road traffic. To answer this paradox, the city administration has pursued an integrated planning process between transport and urban planning, with the aim of reducing congestion of private traffic, which constitutes a

major obstacle to economic development and quality of cities, to enhance the urban environment and to bring it to a higher level of civil and economic progress. The transport system becomes a powerful tool of urban transformation through the improvement of accessibility to all urban places and the different city functions.
The project concerns the construction of Municipio Station, interchange between the underground line 1 and the metro line 6, with a simultaneous redevelopment and reconfiguration of the entire node. The project included a new arrangement of the monumental square, based on a careful study of urban relationships that exists between it, the port and the St. Elmo hill. To underline the design choice that involved the construction of an underground square, with natural lighting from above, in which parts of the walling of the Viceregal era of the New Castle, which has been found during excavations century, have made visible archaeological carried out simultaneously with the construction of infrastructure works. These excavations have allowed us to find the port basin built at the end of the fourth century A.C. in the inlet between the present Municipio square and Bovio square, with three boats of the first century A.D. in excellent condition, thereby filling some gaps in knowledge on the evolution of the city and in particular the progress of the coastline and the areas immediately behind it. The numerous findings discovered during the campaign of archaeological excavations carried out will then be preserved and exhibited in the town museum, to be set up presumably in Castel Nuovo.

2.2 Naples: Piazza Municipio metro station construction site
Since 2001 have followed the openings of so-called "art stations" along the route of Line 1 of the metro, designed by internationally renowned architects and enriched by a total of more than a hundred works by contemporary artists and a number of archeological finds during the excavations, which have transformed the places of daily pass into real museums, linked in a special way to the history and geography of the place where they are located.
Naples has therefore engaged for many years in an urban area and far-reaching project, which is dramatically changing the structure of the city; Therefore, when compared to the European scene, it is presented in a not insignificant position both from the historical point of view and from that of planning.
Already in 1872 Lamont □oung drew up the first draft of a Neapolitan subway extended to the area flegrea. The designer's idea was to use the materials excavated to build the subway creating a new neighborhood and realizing a long channel about 2 km.
The entire project was approved by the Technical Council and the City Council only in 1888 (after 14 years), but unfortunately was never realized. After more than a century, the metropolitan area of Naples, with the necessary revisions, additions and corrections, compared to the initial draft □oung, then saw the light. In addition to □oung's visionary project, we must not forget the projects of Cumana line, built in 1889 and Direttissima Pozzuoli-Gianturco (the first metro line in Italy), 1925. Memorable also remains the aesthetic value profuse in railway architecture, just think of the late-eclectic singularity of Mergellina station inaugurated in 1927.
However, the artistic and architectural quality of stations and squares of the Neapolitan Metro must not lose sight of the true purpose of the project in its entirety, which aims to the networking of the entire system of major infrastructures of local transport.

Fig. 2: Municipio Station: Archeology in construction site

Whereas the timing of the development of metropolitan networks are measured in decades, if it concludes that the reflections on the economic impacts of urban systems often focus on the impact

you have on the productive fabric, in terms of employment levels and development related to construction activities. Even the necessary cost-benefit analyzes, focused on quantifying the savings in travel time, reduction of energy consumption and pollution, are often deficient because they do not regard as essential expenses, start-up and operating costs of metropolitan networks and not try to test alternative ways of management and integration better suited to the economic, financial and structural matters of the city.
The architectural design of the station and the square was entrusted to the hands of two Pritzker prizes: Alvaro Siza and Souto de Moura Edward. A real journey in history, where he identified two squares symmetrically equal, one underground and the other on the surface connected by escalators and a lift of the reach up to 45 people. This was from the outset the design idea of the two Portuguese architects, to create a "new" underground square, equal to the extension to the higher one, taking advantage of the excavation volumes still required to develop the station shaft. This square underground becomes functional at the pedestrian connection on one side with the port, the other to the monumental part of the city.
The design concept is based on the revival of historical urban axis between the Town Hall and the Port, axis determines, through two rows of trees in the middle with a long slot in the pavement of the square, a striking visual axis, which the port is routed on the impending hill of San Martino; underground pay a hallway, equipped on one side with moving walkways, which takes natural light and air precisely from the break lengthwise, placed in the center of the corridor. The two Portuguese architects with their project had the task of integrating these remains with the station so as to combine the history of the site with a modern urban design. It follows that the Municipio Station deals with the difficult subject of the city's history recovery, the architectural and archaeological finds pre-existing. The underground excavation also be seen as a unique opportunity to bring together old and new, a system that will combine the technology with the ancient Roman and Greek ruins, where even the walls will become part of the station's coverage. A unique combination that will be museum center, and where travelers can admire the archaeological remains within the long corridors of glass and metal.
Through meetings with Souto de Moura designer it was possible to talk about the complexity of the project linked especially to what was discovered during excavations in the basement which has led to constant change and project updates. The designer has emphasized that the project during the subsequent and ongoing archaeological discoveries have revealed uninterrupted incentive. It 'was also found that, due to the numerous layers and the complexity of the findings in situ, what is striking is not so much the "amount of time" spent but rather the perception, of almost physical nature, the complexity of the "internal time": the multiplicity of those different times that the material remains, intertwined among themselves, describe, recall and testify.
The designer has repeatedly cited the beauty of the city and as its greatest wealth is represented by the vitality and energy of its inhabitants.
Also through a short interview to the designer Alvaro Siza, the following key concepts have emerged:

• Perceptual feeling is identified by historical reading stratigraphy of the place

• Looks like attractor of investment, tourism, preserving its character of the place; genius loci are clearly visible especially observing the visual axes that have as their focal point the station itself.

• The preservation and enhancement of the landscape / management are given precisely the historical consolidation stratigraphy of the site, including the various transformations that have occurred.

In conclusion, in relation to the case study of Piazza Municipio, was not let the binomial Transformation / Conservation, concerning the question of the defense of the landscape and its transformation, and how its final phase will retain identity and beauty as enhancement factors and development.
It has also tried to contribute positively, producing quality indicators appropriate to the specific case and transferable to other contexts, to make them places for communication and experimentation.
Focusing primarily on the level of an assessment of the service potential that the construction phase has to offer to the urban system, where in brief, the added value will be to have contributed to the growth of the community's social capital. Secondly there were some valid approach criteria, such as to deal with the environmental / ecological aspect; the space of the transformation site, if well designed, can help reduce the urban ecosystem alterations.
The need for change in operating practices favoured the Joint comparison of past technical implementation and testing of new application methodologies. The identification, interaction and management of these phases related to the activity of a construction site in an urban area can be summarized by defining the combination of resource management and "green".

It has made evident the need to integrate into the urban construction site the presence of the green by seeking an increasingly close connection between architecture and nature. Green becomes the urban construction site tool to reconnect the urban population to the natural landscape.
It has come to the realization that within the urban construction site are:

• Use local raw materials through an accurate census of the available resources

• Pick up the building traditions of the area.

Through this study it also opens the possibility of further research developments to identify appropriate guidelines, routed optimally to urban transformation projects in the presence of a site, such as upgrading the existing urban fabric. All this, through a process of sustainable development based on environmental criteria, social, and economic treaties.

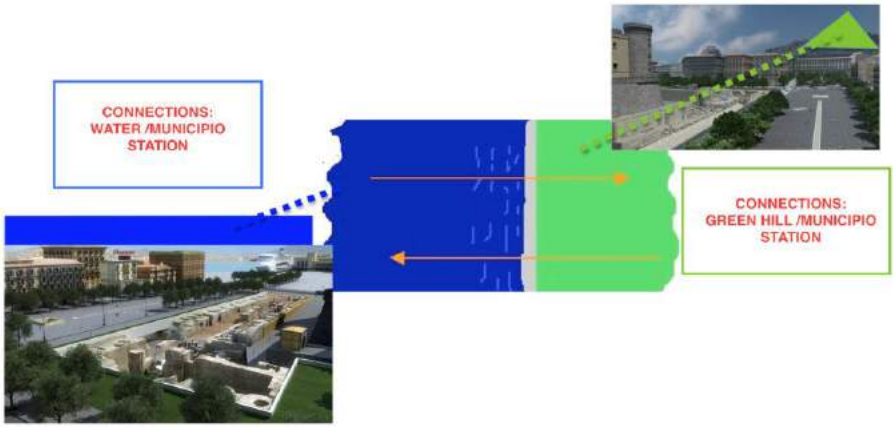

Fig. 3: Connections Municipio station

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The hidden villa. Virtual modeling in survey of Villa Farnesina in Rome.

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Abstract
Villa Farnesina in Rome, commissioned by Agostino Chigi in the early sixteenth century, owes its fame above all to the frescoes due to the pictorial mastery of Baldassare Peruzzi, Raphael and Sebastiano del Piombo. But the villa, one of the main works of the same Baldassare Peruzzi in Rome, is the result of a constructive program that has lasted over time, until the twentieth century, both in relation to personal circumstances of the client and his heirs and because of the successive changes of ownership. Since the end of 2013, thanks to the availability of the Accademia dei Lincei that owns it, has started a research activity aimed at the critical rereading of the building and its context. The survey was conducted through the integration of multiple mensorie techniques with the fundamental help of laser scanning used in all interior and exterior environments. Later, based on of metric measurements it was decided to create a series of virtual models of the villa useful to understand the evolution of the various construction phases mainly observed. The aim, in addition to the virtually reconstruction of the main phases of the architectural complex, considering at the same time the building and the decorative elements, is to provide an integrated data base and an interactive information system. This paper reports on some results of the research that is coming to its conclusion.

Keywords: Villa Farnesina, Baldassarre Peruzzi, survey, hypertextual model

1. Introduction
Villa Farnesina (Fig. 1), at the foot of the Janiculum Hill in Rome, was built by the Agostino Chigi, banker and patron of the arts. It became known by its current name after Cardinal Alessandro Farnese bought it in 1579 and it owes its fame above all to the frescoes due to the pictorial mastery of Baldassare Peruzzi, Raphael and Sebastiano del Piombo. The Villa, in its full configuration - around 1515 - included, in addition to the main building, a second building (designed by Raphael) that housed the stables in Via della Lungara and, on top of a cave on the Tiber, a third small building place of delight. The three buildings were integrated into a garden with different features, extending from the path of Lungara to the Tiber. The overall plan of the Villa is nowaday radically transformed. The construction of the Tiber embankments - which took place in the 80s of XIX century - with the realization of the riverside has led to a reduction of the gardens. Also the building of the Stables, severely ruined, was demolished in 1808; in its place, in the first half of the twentieth century it was made an Auditorium. As a result, of the sumptuous villa built by Agostino Chigi in the first two decades of the sixteenth century today remains only the main building surrounded by a garden greatly reduced.

Fig. 1: Location of Villa Farnesina and view of the north façade from the “secret garden”.

2. Survey activities

In December 2013 we undertook a research activity in agreement with the Academy of the Lincei, the owner of the building. The research, based on a new survey with advanced technology, was aimed to identify the main construction phases of the building by analyzing the structural and functional aspects. The survey included both the existing building and gardens. It was performed based on the concept of “open system survey” [3] in which measurements and graphic restitution can be implemented over a period of time; likewise, the ensuing knowledge can be improved by adding bibliographical, documentary and archival data. This creates a usable, manageable system that can accept more data from other specialist studies.

Another principle behind the survey was that it had to be verifiable and repeatable. The survey activities were carried out through the use of laser scanner Leica C10 and HDS3000 (Fig. 2). First was prepared a draft sensing digital faithfully carried out for the purpose, after several site inspections useful to examine the conditions of light (natural and artificial) and the practicality of the spaces for the best positioning of the instruments.

For the metric control of the cloud unions resulting from successive scans there were acquired numerous direct measurements and also have been used a lot of two-dimensional white/black targets. The use of targets allowed to facilitate the activities of union of point clouds and ensure better control of the final result. Each scan was in fact done so that you could always see at least three targets referable to the next and previous scans. The overall activity was facilitated by the limited size of the architectonical place and by the possibility to directly measure many elements perfectly recognizable in laser scans. After carefully examining existing iconographic documentation and performing detailed inspections we elaborated a documentation, survey and infographic restitution project as well as a general program.

Fig. 2: View of the merger of the points clouds of the north façade with the Loggia of Amore e Psiche.

Data acquisition involved the whole building (interiors and exteriors) and its surroundings; a systematic photographic study was also executed in each room and on each façade.The laser scansions of the more important rooms and exteriors were supplemented with photographic images taken by the same instrument so as to directly record the RGB colour inside each “cloud” since this method provides reliable photographic documentation of the decorations.
After checking each scansion and their coupling (at first partial and then all together), each room was systematically photographed to document the details and create a topo-photographic archive. Based on the surveys, we then analysed each part of the building, examined existing scientific literature and used virtual 3D modelling to identify the main changes that occurred over the years (Fig.3).
As a result, we virtually established the main building stages of the complex organism, starting with its initial design.

Fig. 3: . Interiors developed from the twentieth-century 3D model: left, the Loggia of Amore e Psiche; right, the current entrance to the Villa.

3. The Villa of Agostino Chigi

A study of the building [1] shows that Agostino Chigi built the Villa as a representative office befitting his new status at the Papal Court. In 1505 he bought a vineyard along Via della Lungara, outside Porta Settimiana; the vineyard was located between the southern stretch of Via della Lungara (to the west) and the Tiber (to the east). The land to the south bordered other gardens where Alessandro Farnese had built a spacious residence. A few years later Agostino also bought the property to the north belonging to Mario Cuccini. The project was commissioned to Baldassarre Peruzzi fellow citizen of Agostino.
Agostino Chigi influenced and controlled two main stages of the construction of the Villa: the first, between 1505 and 1518, and the second up to 1520 (the year of Agostino death). But the Villa had later other transformations. Comparing the survey with the state of the original building (1511) we observe that: it changed the relationship between the building and the environment; it changed the vertical connections that served the various levels; already with the second construction stage had been modified the planimetric articulation of the first floor (in the famous Perspectives room) as well as the connecting staircase with the underlying floor and with the upper ones. Also in the mid-seventeenth century the arches of the Loggia of Galatea have been closed and all interior surfaces of the walls, not yet decorated, covered with frescoes, while the realization of numerous interventions of consolidation (especially in the XIX and XX centuries) induced changes not visible (such as replacing floors) and visible (such as the division of the ancient living room on the main level and of the subjected local, according to the indications of the architect Sarti). Finally it has been amended several times the total volume with the construction of the altana above the eastern wing and the subsequent reduction of its extension. The 3D model, made by the survey data, allows to compare the Villa appearance in 1511 with the present one (Figg. 4-5).

4. The Villa of Baldassarre Peruzzi

The survey and virtual modelling made it possible to carefully assess Peruzzi’s design criteria during this assignment and verify compatibility between its size and structure. At the end of the first building stage in 1511, the Villa was still not very big, but it must have been extremely beautiful not only due to the features of the building, but above all to the layout of its gardens. The main building in the Villa (with a roof) had a basement and four floors above ground (two main floors and two mezzanines).

The building had a U-shaped plan open towards the north. The kitchen and storerooms were in the basement while the raised floor was used primarily as a reception area. The ground floor had two communicating loggias: the first (Amore e Psiche) (Fig. 6) faced the north entrance and gardens, while the second (Galatea) faced east towards the Tiber. To the south, a large parlour with a fireplace was located in a corner between the two loggias from which it could be accessed; from the parlour it was possible to reach a reserved part of the “secret garden”, the two rooms used as pantries (facing south) and the big staircase leading to the upper floors. Agostino Chigi’s office with a big antechamber, accessed through the Loggia of Amore e Psiche, was on the same floor (in the northern part of the west wing of the building). There must have been steps between the antechamber and the rooms used as pantries (facing south); the steps led to the basement (with the kitchens) and stretched under the main staircase between the raised floor and the first floor. Finally, the office of Chigi’s clerk, Cornelio Benigni, was located in the east wing of the building to the north of the Loggia of Galatea. Both loggias were open; the one to the north towards the gardens, and one to the east towards the Tiber.
The first mezzanine between the first and second floor still exists; it is divided into three non-communicating parts (at slightly different levels). The three parts are located above Chigi’s study and antechamber, the two rooms used as pantries, and the clerk’s office. In practice the first mezzanine does not extend to the two Loggias and large parlour because their ceilings were higher than the ceilings in the other rooms. The first floor was reserved for the family while the second mezzanine was most probably used by the servants. In some of the old views of the city of Rome the Villa has another floor on the east wing (facing the Tiber). This floor has five windows towards the river just above the Loggia of Galatea, almost certainly finished after 1520. The façades of the building were decorated with fake statues. On the north façade, between the two wings of the building, there was a terrace that could be used as a stage for plays. The gardens stretching between Via della Lungara and the Tiber were carefully cultivated with herbs and plants recently imported into Europe from the faraway Americas, discovered just fifteen years earlier.

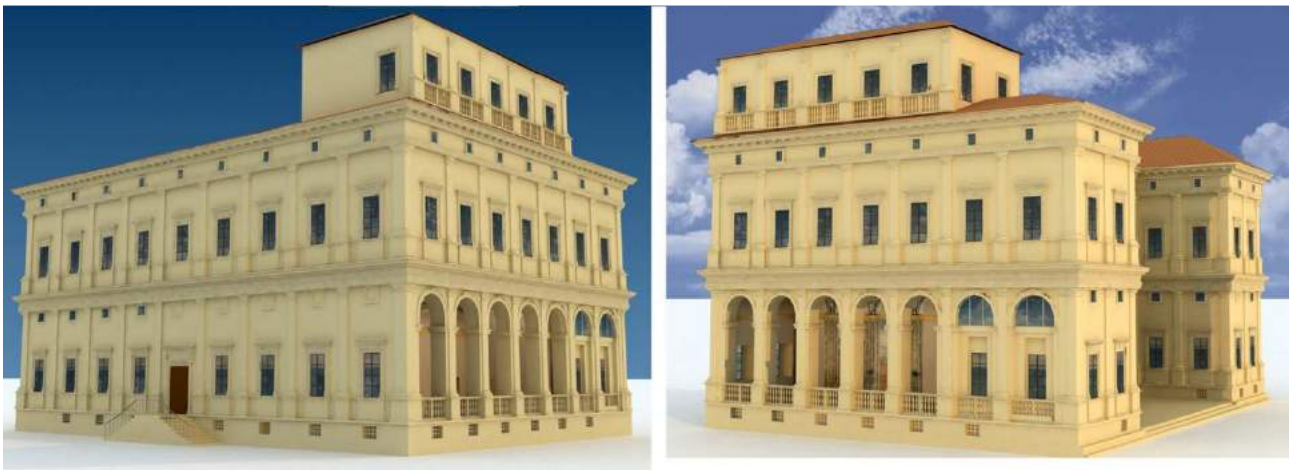

Fig. 4: A 3D reconstruction of the Villa in 1511: left, the south façade; right, the east façade of the Loggia of Galatea and the theatre situated between the two wings.

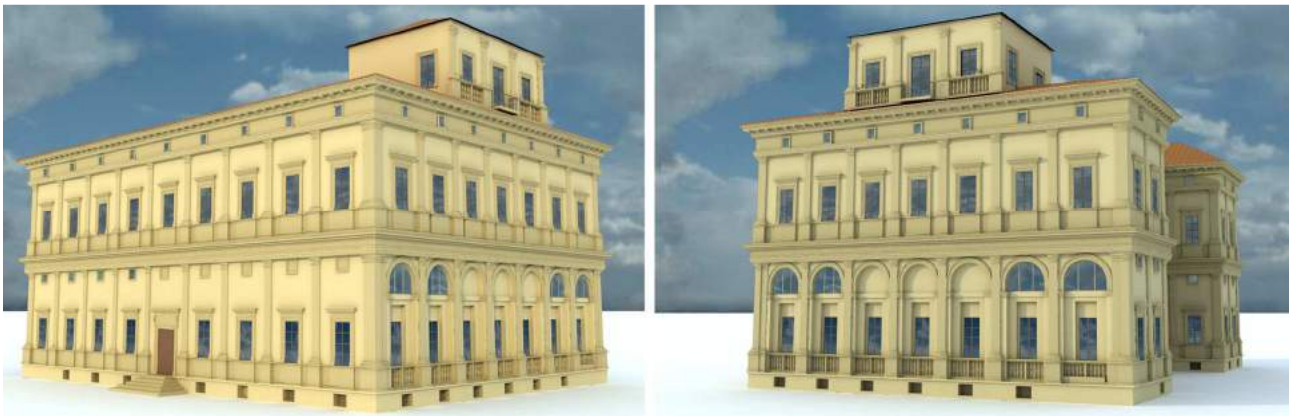

Fig. 5: A 3D reconstruction of the twentieth-century Villa: left, the south façade; right, the north-east façade with the Loggia of Amore e Psiche.

Fig. 6: Night view of the 3D model of the Loggia of Amore e Psiche on the north façade.

5. Analysis of the groundfloor

In 1511 the Loggia of Amore e Psiche, with its vault allegedly frescoed later by Rafael and his collaborators, was the main entrance [1]. After studying the layout of the raised floor (Fig. 7) we realised – as mentioned earlier - that the Hall of the Frieze to the west could be accessed through the Loggia of Amore e Psiche. From the Hall of the Frieze it was possible to either turn northwards and access Agostino Chigi's study or turn south towards a passageway (and from there to a staircase leading down to the kitchens in the basement) and the two service rooms through which it was possible to access the parlour. The main staircase now leading from the first mezzanine to the first floor was located between these two rooms and the wall next to the Hall of the Frieze and the Loggia of Amore e Psiche. Agostino's study was therefore located in the west wing of the building in an important position facing north so that his windows gave onto the entrance to the Villa as well as onto the north gardens and Via della Lungara.

Between the two walls separating Agostino's study from the Hall of the Frieze there was a staircase leading to all the floors. Ancient iconographies document the existence of the two walls as well as remains of the steps (in the above-ground floors). However, over the years they have been almost completely demolished and replaced by floors. Peruzzi's design gave Agostino exclusive use of most of the building (two rooms on each floor). A staircase (albeit modified during the first half of the last century) still leads from the Hall of the Frieze down to the basement.

In the same plan Cornelio Benigni's study is shown on the opposite side (eastwards), in a symmetrical position to Agostino Chigi's study, and north of the Loggia of Galatea. There is also a mezzanine above Cornelio Benigni's study; here too, there was an internal staircase between the two floors (later modified). The staircase in the basement underneath leading from the kitchens directly to the Loggia of Galatea was also later broken into two parts, although the wall structure is still visible. Finally, the rooms on the first mezzanine above the two south-facing rooms used as pantries could be accessed in a rather unusual way: from the first flight of the main staircase.

6. Conclusions

The study of the building and its 3D models allowed us to reliably reconstruct the probable configuration of the building (including its measurements) at the end of the first construction phase. The study has revealed Peruzzi's outstanding expertise in not only brilliantly controlling the spatial layout of the building, but also creating a private area for exclusive use by Agostino Chigi in what was a predominantly public space, thereby revealing his skilful use of geometry and perception in the fresco of the vault of the Loggia of Galatea. Peruzzi's successful images in this vault undoubtedly pre-empt the figurative style that a few years later was used in the Hall of Perspectives.

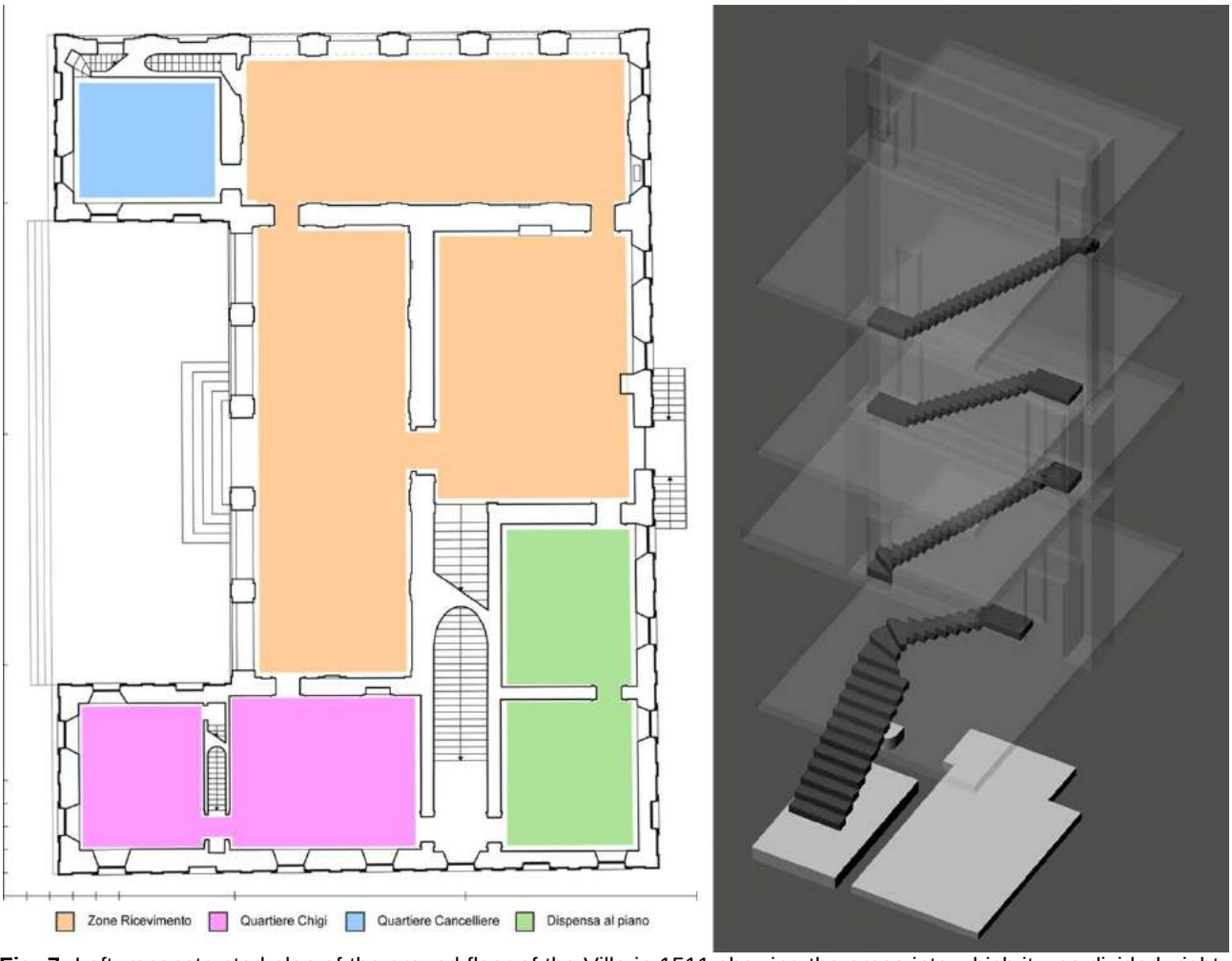

Fig. 7: Left, reconstructed plan of the ground floor of the Villa in 1511 showing the areas into which it was divided; right, diagram showing a reconstruction of Agostino Chigi's personal staircase.

Several authors have inputted into this study. As a mere evaluative element the authors are listed as follows: Cesare Cundari (*Introduction*, *Conclusions*); Giovanni Maria Bagordo (*The Villa of Agostino Chigi);* Maria Rosaria Cundari (*Survey activities*); Gian Carlo Cundari (*Analysis of the groundfloor*); Giuseppe Antuono (*The Villa of Baldassarre Peruzzi).*
The study was participated by all the authors of this contribution as well as by Prof. Andrea Giordano of the University of Padua (with special emphasis on the perspective-figurative decorations of the Hall of Perspectives), the architect Beatrix Jaczko and the p. i. Salvatore De Stefano.

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Nisida and its architectures

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Abstract
This contribution is part of a larger study, conducted for several years now by the authors about the island of Nisida and its architectures by virtue of a memorandum of understanding signed between the Department of Architecture and Industrial Design of the Second University of Naples and the Department of Juvenile Justice of the Ministry of Justice of the Italian State (March 2014). The study here proposed constitutes a state of progress about the current knowledge of the architectures present on the island and in particular the cylindrical tower (and the originating paths to access) and of the factory buildings that constitute the Institute for Juvenile Justice (IPM) that is on the island.
By comparing the data taken from the historical iconographic sources with those derived from the architectural and structural relief operations of the masonries, it has been possible to advance a number of hypotheses on the modifications of the cylindrical tower (placed on the highest point of the island and undisputed star of the image Nisida in the centuries) and of the buildings that belong to Juvenile Detention Centre of Nisida (IPM).
The examined historical sources are mostly: the Mario Cartaro view (1584), the project for the expansion of the port of Nisida with the Count of Monterey signature (1635), the cartography of Giovanni Carafa duke of Noja (1775), the architectural surveys for the extension of the "House of Imprisonment of Nisida" (1890 and 1896) and the "House of re-education for Juvenile Nisida" (fascist age).

Keywords: Nisida, defensive architecture, architectural and environmental survey

1. Defensive architecture: the tower (Ornella Zerlenga)
The island of Nisida is located in an enchanting natural landscape of rare beauty in Phlegrean coast (fig. 1). Nisida has an ancient history: geo-morphological (eruptive cycle of the Campi Flegrei); mythical (the adventures of Ulysses); archaeological (summer Brutus'residence); defensive (until World War II). The defensive role of Nisida is demonstrated by its presence in the most important maps of the time. In the Angevin period, on top of the island a cylindrical watchtower was built. On its facility, in the sixteenth century, works began with the aim of the construction of ramparts tower, as noble residence of the Piccolomini and maritime surveillance (Monterey Project, 1635). In Bourbons age, two forts in Porto Paone were built, used until the Second World War. Today, the access to the island of Nisida is prohibited because inside there is a juvenile penitentiary. The current surveys of defensive architecture, recently discovered, are occasion of documentation for the enhancement of the existent.
The architectural survey campaign of the bastion tower, starts with a Memorandum of Understanding aimed at promoting research activities on the island of Nisida and signed in March 2014 between the Department of Architecture and Industrial Design 'Luigi Vanvitelli' of the Second University of Naples,

and the Department of Juvenile Justice of the Ministry of Justice of the Italian State. The survey project is ongoing also on the basis of the most recent and unpublished excavations, conducted in the inner courtyard of the tower. Specific objective of the architectural survey was the geometrical knowledge, spatial and structural of remnants of the existing tower, for the interpretation of the historical and iconographic sources (Figure 2).

Fig. 1: Nisida from Coroglio (photo by Tonia Salomè, 2016).

Fig. 2: Remains of the cylindrical tower (photo by Daniele Petagna, 2016).

The decision to implant a coastal defense tower (but also a Roman villa and/or a medieval monastery, as quoted by the sources) and its latest transformation of use in prison, depends on the natural features of the plateau on which stands the tower itself. This place is the highest point on the island and, therefore, suitable to accommodate the above functions not only for the visual control of the Gulf of Pozzuoli, but also for its panorama and healthiness. In addition, the presence of uneven path and overlooking the sea, return the site like naturally suited to defense and segregation.
Currently, on top of the island there are the remains of the imposing cylindrical tower, whose already uncertain historical path is also boosted by the discovery of traces of a very large wall in *opus reticulatum*. In this sense - with the aim to investigate the multiple specificities - in defining both of the path of knowledge, both of the architectural survey of what today remains of the cylindrical tower, a meaningful role have played not only the analysis of the spatial configuration of the remaining areas, but also the examination of the wall mass, the used materials and construction technologies. On this basis, the research team conducted an architectural survey project divided into several phases: analysis of iconographic sources (maps, views, photographs); comparison with previous architectural surveys; inspections; architectural and structural survey of existing environments as well as those discovered and / or came to light during the inspections and / or recent excavation.
The analysis of the iconographic sources started from the cartography of the City of Naples in scale 1: 4,000 (June 2005). In this, on top of the island (about 110 meters above sea level) the remains of the tower, the buildings that make up the current Penal Institute for Juvenile Justice and the access paths, current and historical, are visible (Figure 3 a, b). This situation was compared with: the first

topographic maps of the island of Nisida signed by Giovanni Carafa duke of Noja (1775, "Topographical Map of the City of Naples and its Surroundings"); the project for the "re-education Home for Juvenile Nisida" of the fascist era; the zenithal views taken from Google Earth (photo shoot "historical images": 12/31/1943 and 2004-2014). At the sources with cartographic scale, information derived from survey and project drawings of the tower with architectural scale have been added, between which in particular the relief in scale 1: 200 of the "House of Imprisonment of Nisida" (1890 and subsequent updates to 1896) as well as some postcards and historic photographs of the tower including that taken from one of the first publications on Nisida, signed by Antonella Ferri Missano, dating from around 1950 (Figure 4).

Fig. 3a: 1890 survey, superimposed at the remains of the tower on aerial photo by Google Earth, 2016 (by Ornella Zerlenga).

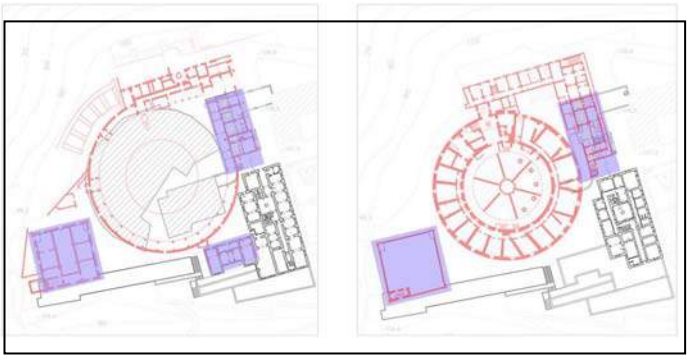

Fig. 3b: Juvenile Detention Centre of Nisida, 2016, and "House of Imprisonment of Nisida", 1890 and subsequent updates to 1896 (survey by Francesco Vasta, 2016).

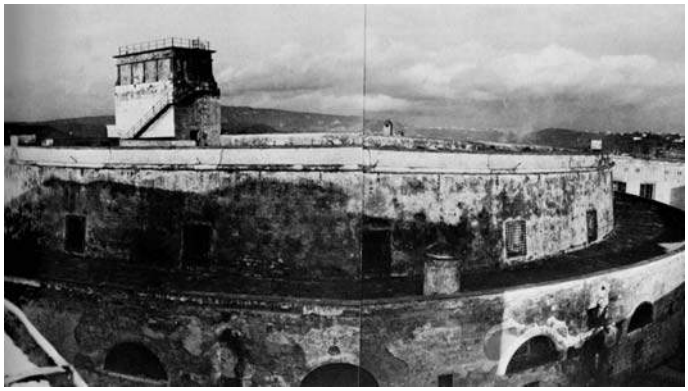

Fig. 4: Cylindrical tower around 1950 (by Antonella Ferri Missano).

Starting back in time, from current to the most ancient iconographic sources, like the previously mentioned enhancement project promoted by the Count of Monterey in 1635 (Figure 5), and the view of the tower in 1584 of Mario Cartaro (and its copy of Francisco Villamena, 1652; Figure 6), the modifications undergone by the tower appear to be significant, not only for the destination use (from coastal defense tower to prison) but especially in the overall installation.
Actually the tower is demolished to almost half of its original planimetric development, while in height it presents the only level of the scarp with a small building that stands on it. The access is via a spiral staircase, inside the scarp, that dismounts in the only surviving room of the upper floor; from this, with a staircase made by a single stright ramp, descends to the plan contained in the volume of the scarp. At this level, the direct survey operations have highlighted the existence of twelve indoor environments, configured in a radial structure and superimposible at the survey of 1890 with some minor differences (Figure 3 a,b). The first two environments, the only ones to present a planimetric development to semicircular course such as to assume an original destination as pillbox for the housing of artillery pieces from fire, retain the traces, on the outer walls, of the punishment cells and show wolf mouths towards the internal and openings to the outside. The next room contains the encumbrance of the spiral staircase, and provides the access to the remaining nine rooms, connected by a ring-like corridor. The upper compartment, the only survivor as reported in the second floor plan of 1896, presents, along the longitudinal direction, two access gates, of which, the one opened inward, enters to circular courtyard of the former prison tower, currently under investigation both as excavation both as architectural survey.

Fig. 5: Nisida, project for the port, 1635 (Archivo General de Simancas; by Vito Cardone).

Working backward in the analysis of what remains of the original tower, in pictured dated around 1950 (Figure 6) the existence of the only scarp (integrated in the circular development), the volume containing the spiral staircase (with a cant demolished in 2014) and of an annular body leaning against the scarp, are found. As can be seen from the design drawings for the "House of Detention of Nisida" of 1890-96, this volume corresponds to the "Laboratories". From reading the legend attached to the four plants it is clear that the prison has several elevation levels, that, on the ground floor, are primarily "laboratories" and, on the first floor, "punishment cells" and "dormitory". Both levels are obtained in the volume of the scarp. On the second floor, corresponding to the first floor of the tower, as shown in the Monterey draft of 1635, other "dormitories for convicts" are located, while the third floor (designed to cope at the prison users) also welcomes other "dormitories for condemned" but also a "school "and a "chapel ". This situation, documented in some photo of the island dated between

1931 and 1933 (Figure 7), will change in 1935 when the last two levels were demolished as a result of the new institution of the Judicial Reformatory (instead of the abolished Institute called 'life imprisonment") and the annexed construction on the island of the "agricultural colony" (1934-36).
This new attitude of the tower began in 1824 with the Cuciniello project to "reduce the castle in life imprisonment". Until then, the cylindrical tower should conserve the spatial form visible in the drawing of the iconographic source of 1635. From this, appears clear that the tower consisted of a high scarp with curb and numerous oblong windows, besides an only crenellated upper floor, with aligned windows at the underlying. Inside the large bastion tower (today the maximum diameter of the scarp is approximately 80 meters) stood a towering tower with two rows of windows and crowning with corbels and battlements. According to the seventeenth project design, the tower should welcome a lantern to indicate the island (Figure 5).
The access to the bastion tower was via a tree-lined path uphill, that departed from the dock landing the island and climbed up to the top of the island, where the defensive structure stood. The access to tower was via an outside staircase, detached from the scarp, and from which a drawbridge soared. By comparing this information with that deductible from the first map of Nisida, that is the map of Giovanni Carafa Duke of Noja in 1775 (Figure 8), the mentioned scale can be located at the end of the path . Basing on what was reconstructed, it is conceivable that this path to access at the bastion tower, was active until the realization of the "agricultural colony", when a new driveway was open.

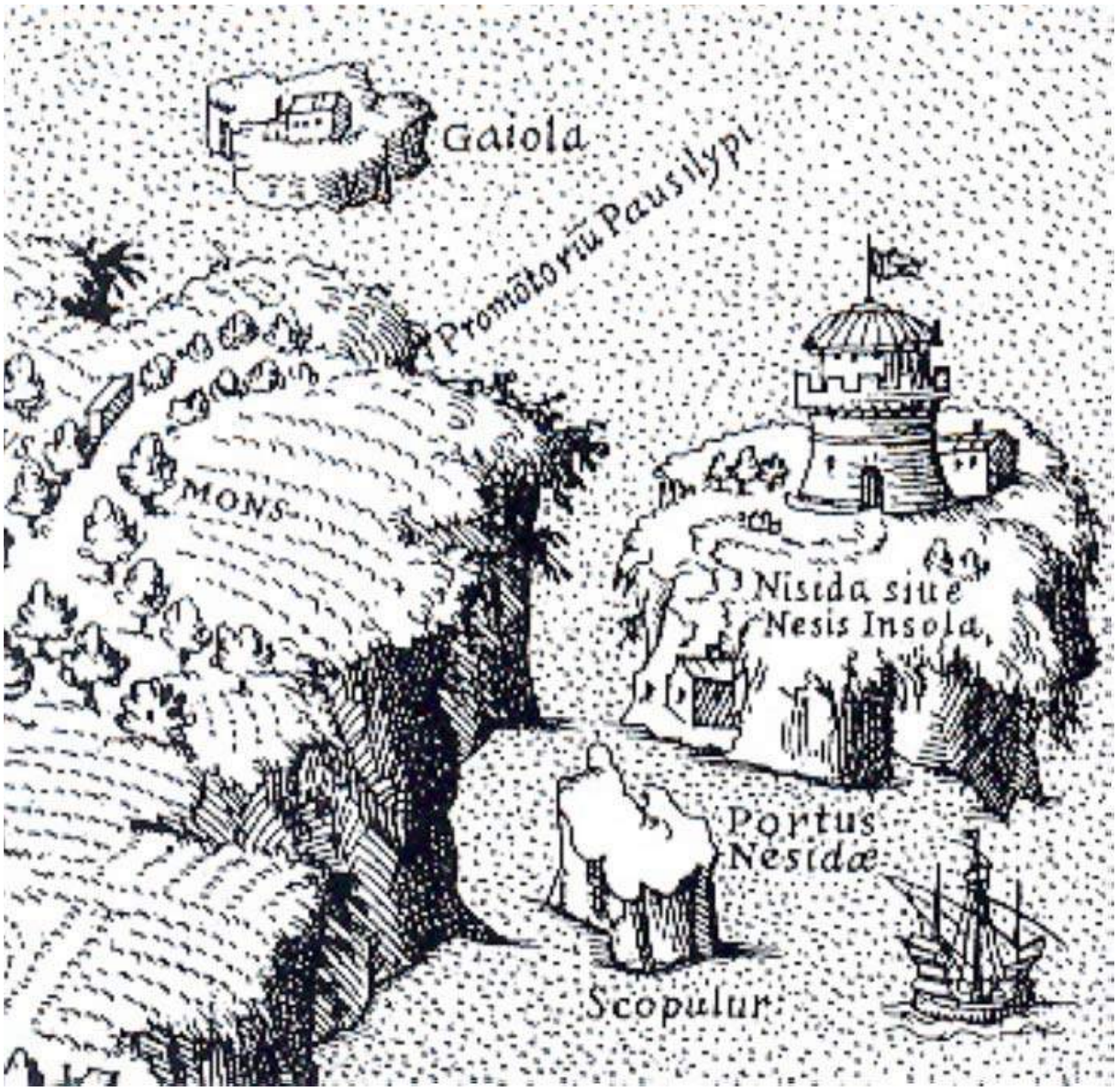

Fig. 6: Nisida and the cylindrical tower in the view of Francisco Villamena, 1652.

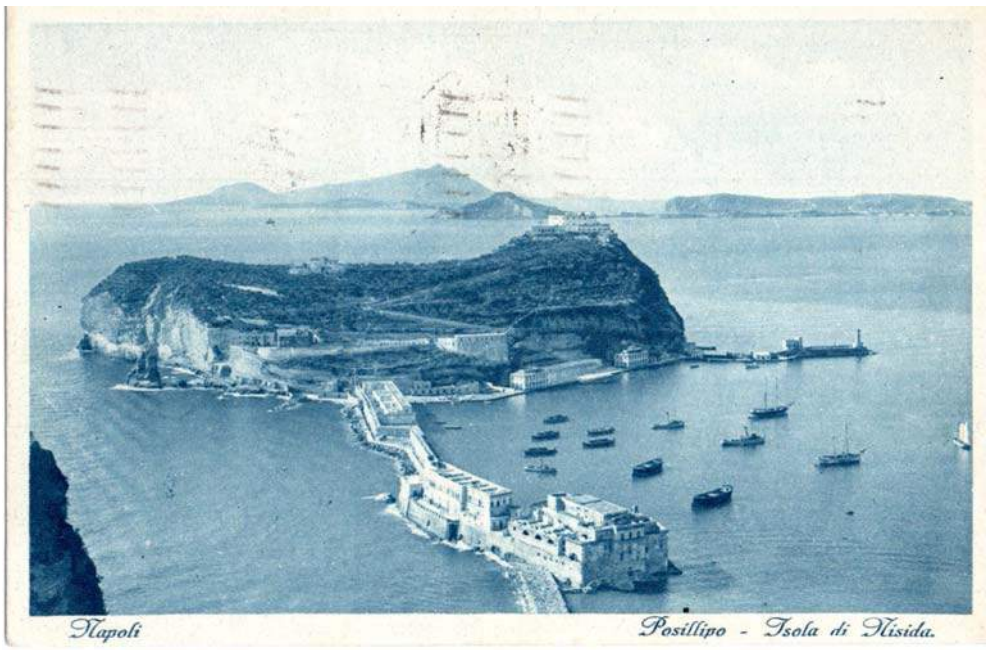

Fig. 7: The new configuration of the cylindrical tower (1933; by Michele Lettiero).

The survey studies conducted on the tower have also included the identification traces of the original access path that, even on the basis of cartography, was traced and detected, thus bringing to light some situations worthy of note as a newsstand votive, a cistern and a stairway that passes over the path (Figure 9).
Currently the survey studies conducted on the tower include also the examination of the remains of the former inner courtyard, whose elevation configuration presents many doubts about the interpretation of the traces found until today: tanks, tunnels, masonry textures of various dating, including the already mentioned traits in *opus reticulatum*. Aim of the investigation is the response to a still obscure point, that is the passage from the tower documented in 1652 by Villamena, copy of that indicated by Cartaro in 1584, to the cylindrical tower of 1635, of which some material traces remain today, although very tampered.

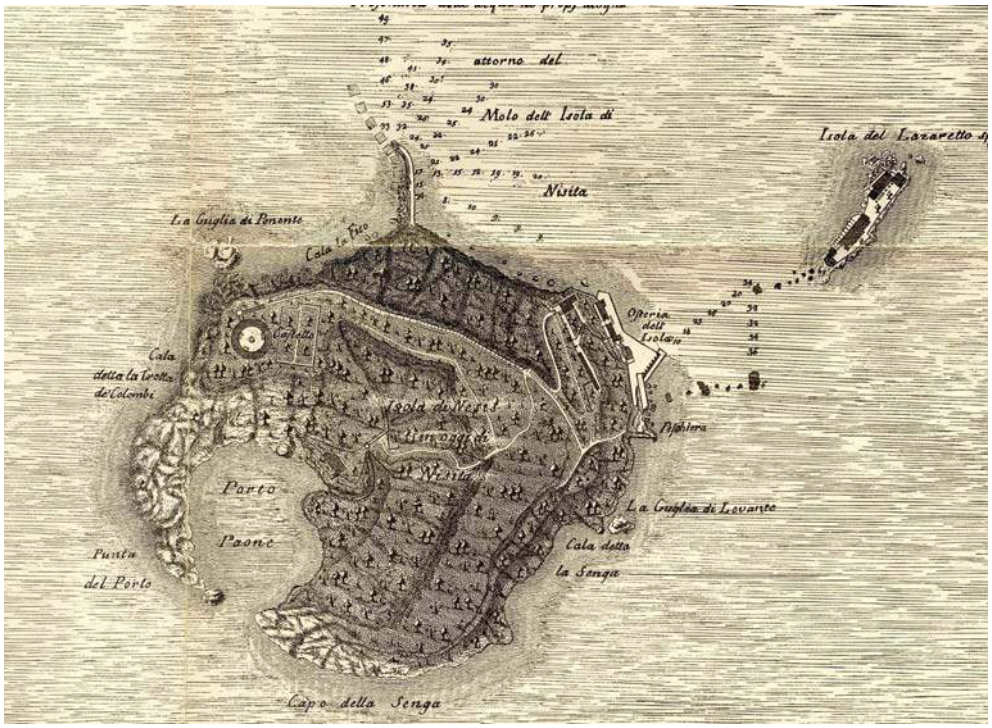

Fig. 8: The access to the bastion tower, “Caste” (Map of Giovanni Carafa Duke of Noja, 1775).

Fig. 9: Staircase that passes over the original path of access to the tower (photo by Michele Lettiero, 2016).

2. Hypothesis of structural characterization by identifying the masonry textures (Claudia Cennamo)

Incredible landscapes, intricate paths and mysterious architectures make Nisida undoubtedly a vast area of inquiry. But the documentation could not be considered complete if we omitted to consider some specific evidences that the island provides, as few tangibles, one with the architectures and eloquent as these, but certainly worthy of attention apart: the fascinating masonry textures found during the inspections.

Along the paths, the paths... imposing banks of tuff, carried out from on-site quarries, cut into blocks of varying thickness, whose implementation reveals the age of the structure, witness an ancient history.

From the stones manufacturing, from the segments link, from the masonry thickness, from the construction techniques, it is possible to identify the historical period and help, as well, at the determination of successive layers, fundamental to a consistent relief.

The cuts, the signs, the same morphology of the ashlars, contain so much information that they can be compared with those contained in a detailed history book.

In the following digital restitution, performed by Michele Lettiero in February 2016 of an excerpt of the masonry wall found along the route Northern Bourbon, blocks of 20-24 cm high are highlighted, leading to a dating of the wall dating from roughly the early decades of the nineteenth century.

The upper blocks follow the inclined pattern of the path, characterizing a railing for the upper level (today no longer detectable), while the lower part of the wall is arranged in parallel rows to an ideal horizontal plane.

The function of the wall is very likely of containment, and few of decorated plaster traces testify the ancient majesty of the construction.

Among the many testimonies found, the structure of the circular tower, former prison Bourbon, and later, as indicated by historians, residence of the Piccolomini family, has particular importance.

The story of the Tower is complex and it is witnessed by the abundant cartography. But the accurate examination of the structure has recently revealed new details that open the way to different assumptions: the masonries standing remained after the partial demolition carried out during the Fascist era, and still currently inspected, are morphologically inadequate to an earlier dating to 1600.

Michele Lettiero (2016) provides a digital reconstruction of the different wall structure in the aforementioned historical periods.

Nevertheless, the island cartography reports a circular shape in the same plan position where, from the earliest testimonies, the tower was and still is located.

Probably the current structure is more recent, and is born "around" to a pre-existing circular turret, whose shape is the one that appears in the maps until 1600, and subsequently disappears, being (quite unknowingly) replaced by cartographers with the circular-crown known plant.

It can be assumed that the ancient turret was destroyed, along with numerous structures whose the testimony have been lost, during the adverse events that occurred in the Campania region in the seventeenth century, in particular referring to the earthquake associated with the tremendous eruption of Vesuvius in 1631.

Subsequently, the further misfortunes of those years, including the epidemic of 1656, made it necessary and appropriate the building of a hospital (lazaretto) in Nisida, with a church to celebrate

the dead. The chosen structure was the fortified tower of Palazzo Piccolomini, while on the rubble of the former military garrison, ie the turret so often represented in ancient plans, was erected the chapel for the sick and the dead of the hospital: the form of concentric rings and the structure fortified, would not have had better function than that of protecting a "valuable" building inside, as a sanctuary.
As definition of a brief review on the amount of information that the direct observation of the masonry provides the studious, the graphic rendering of Daniele Petagna (2016) can be considered, that clearly shows the quality of the masonry in the rear wall of the tower, in stark contrast to the semi-circular portion demolished during the fascist era.

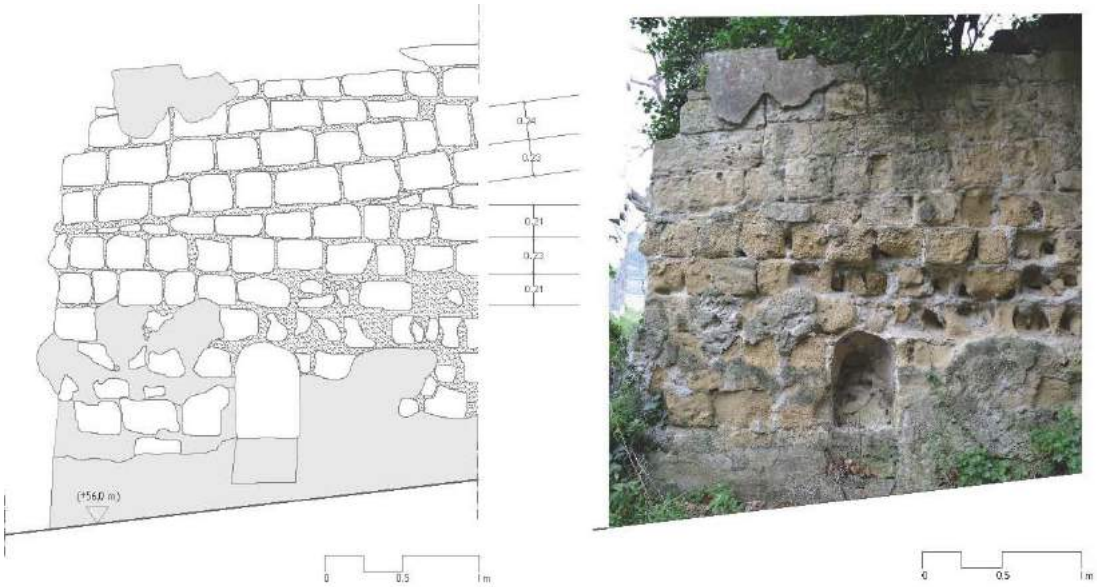

Fig. 9: Photography of the wall along the Bourbon path (survey by Michele Lettiero, 2016).

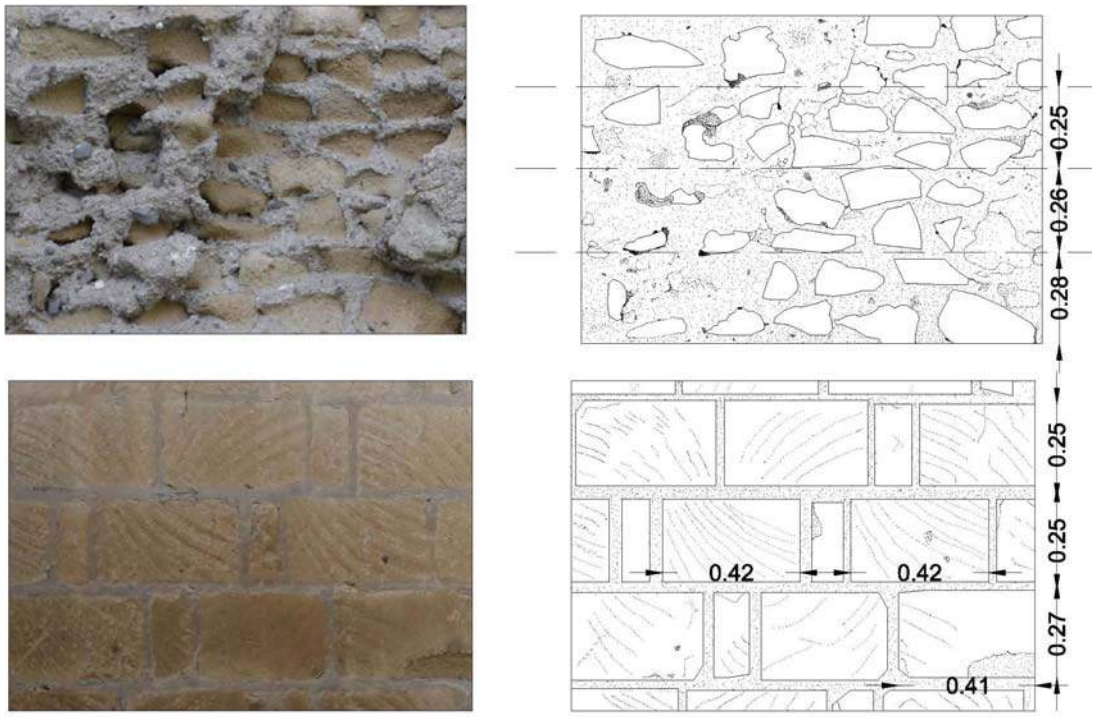

Fig. 1□: a) masonry built at shipyards with rustic stones, splits and little splits, equalizing at every inch (dating: end of '400 and beginning' 700); b) blocks of the equal size marked by the signs of the rotary fan on the faces: the first self-propelled machinery for the extraction of tufa arrives in Campania around 1957 (a-b: survey by Daniele Petagna, 2016).

Fig. 11: Photograph of the masonry on the rear side of the tower (survey by Daniele Petagna, 2016).

On the façade there is a furrow in the tuff stones, indicating the presence of some ramps, too short to be an outside staircase with risers regularly clamped in the masonry, and with signs, although eroded by time, too shallow to function as a jointed beam. It follows that the scale had to have a square plan with intermediate landings, with short ramps and partially self-supporting, which connected the wall in Figure 11 with a setting facing to it. These environments were therefore both covered, and the visible wall was not designed with the actual function, namely as a border wall, but it was, in all probability, an internal partition. Hypothesis, this, that would seem to try even than previously envisaged.

Notes

We thank Dr. Gianluca Guida, Director of the Juvenile Penal Institute of Nisida for allowing the access to the architectures and for support in the retrieval of historical sources.
The survey project about defensive architecture in Nisida, started in March 2014and still in progress, has been scientifically coordinated by Ornella Zerlenga and conducted in team with Salvatore Petrillo, Domenico Pignata, Michele Lettiero, Daniele Petagna, Francesco Vasta, Vincenzo Cirillo and with the disciplinary correlation of Claudia Cennamo, for the structural aspects, and the scientific advice of Vito Cardone, noted scholar of the history of Nisida (Figure 12).

Fig. 12: In the tower (Vincenzo Cirillo, Michele Lettiero, Francesco Vasta, Claudia Cennamo, Ornella Zerlenga, 2016).

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Le Vie dei Mercanti XIV International Forum
WORLD HERITAGE AND DEGRADATION
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Philosophical house

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Abstract
"We would say that Capri has been the victim of an exceptional injury, caused by the same predilection whose fate would have it covered: the issue being that the place is well loved, and that, just like all the people to whom suffer the same fate, it is at risk of becoming hopelessly conventional and mannered".
Capri is only a small rock made of dizzying sheer cliffs and one of the tips of it, Punta Massullo, the project was born of a reversible space, a home for intellectuals philosophical, not for a single developer, a space not fully defined, but a constantly evolving environment.
The project is part of a landscape of enclosed spaces where life moves outdoors, tables are laden under the sky, nature, domesticated, contributes to the wealth of space. Cultures kept climbing and bricked walls of the boxes become festoons of flowers and festive to celebrate the richness of the place.
The house is elongated in the ratio of 1: 4, oriented on a north-west, south-east, following the topography of the place, enclosed on three sides by walls and on the fourth by the rock that slopes down towards the sea. The inside of the box is only visible from above, rejecting the idea of the facade appears as a monolith from the sea, only in some places reveals its nature of casing cement, an essential envelope, wrinkled, abstract, almost impassable.

Keywords: Punta Massullo, philosophical house.

Philosophical house
"One would say that Capri has been the victim of an exceptional injury, caused by the same predilection whose fate would have it covered: the injury to be loved too, and that, just like all the people to whom it happens the same fate, it risk of becoming hopelessly conventional and mannered". [1]
Capri is only a small rock made of dizzying sheer cliffs and one of the tips of it, Punta Massullo, the project was born of a reversible space, a home for intellectuals philosophical, not for a single developer, a space not fully defined, but a constantly evolving environment.
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The courtyard is accessed via a steep driveway, not easy to follow.
Arriving at the share of natural Punta Massullo the viewer finds himself in front of a slot cut into the wall against the sea, a long window and crushed on the horizon, a blue thread Mobile, a way to frame

in a special way the landscape and for sighting like a telescope. The visitor can decide whether to continue the path to overlook or choose between the other two options: get sucked in from the antrum positioned centrally symmetric with respect to the composition, or to climb up the ramp leading to the cells overlying hanging on the metal lattice set at an altitude of 2.5 meters and crushing with a strong sense of gravity visitors below.
The underground path carved into the rock and alludes to the long and tortuous that then leads to salvation, a path that goes down into the rock as the steep paths of the island, in the shadows of gorges and caves, until you get a reserved space and valuable, a room of thought to retreat with a few close friends and from which to look out and getting covered in blinding light reverberated from the sea. The ramp, however, leads allusion to the sky, a ramp that spins and makes contact with the upper world, which exceeds the twilight netting and vegetation climbing and comes in full contact with the sky and the sun.
The wall, rough, original element and the memory of ancient signs, meter space, abstract, lost communication function space inside, almost completely silent and in parts suspended. It circumscribes the inner courtyard giving protection and privacy.
Concrete walls rough, unpolished, with a vibration ivory shape the volume and shape to the irregularities of the rock, in order to integrate with the surrounding natural landscape.
Three lacerations to the long side constitute the only openings to the outside, besides the great subtracting material in the tip, on the short side.
The long slots on each side, by way 'of slits, come up over the ridge of the wall, they reveal a lack of coverage and the presence of a spatial component vacuous inside.
The base is the portion archaeological space forerunner vacated and unchanged. The basement floor is a virtually empty mind from which emerge growths of vegetation and rock and that is the plan for the courtyard.
The court is the more introverted private intimate space, a vacuum materializes. It is a building in the open that incorporates inside fragments of the surrounding space, trees, rocks, wind, birds, makes metaphysical home, escapes the everyday to put it on a higher spiritual plane, in philosophical and mystical relationship with nature.
The clash between the idea of weight and lightness is evoked by the large grid of metal tubes welded and painted white, a three-dimensional grid of 5 x 5 meters suspended from a height of 2.5 meters above ground basement. Inside there are modular units and flexible according to the needs of users and routes ramp that allow everyone to reach any function at any altitude. And suspended above the base left unchanged with its harshness. The geometry and regularity of the metal structure is in jeopardy and in contradiction cells arranged asymmetrically and seemingly random. It is a tribute to the modernity, lightness suspended above the unchanged nature, not an act of irreversible alteration of the landscape.

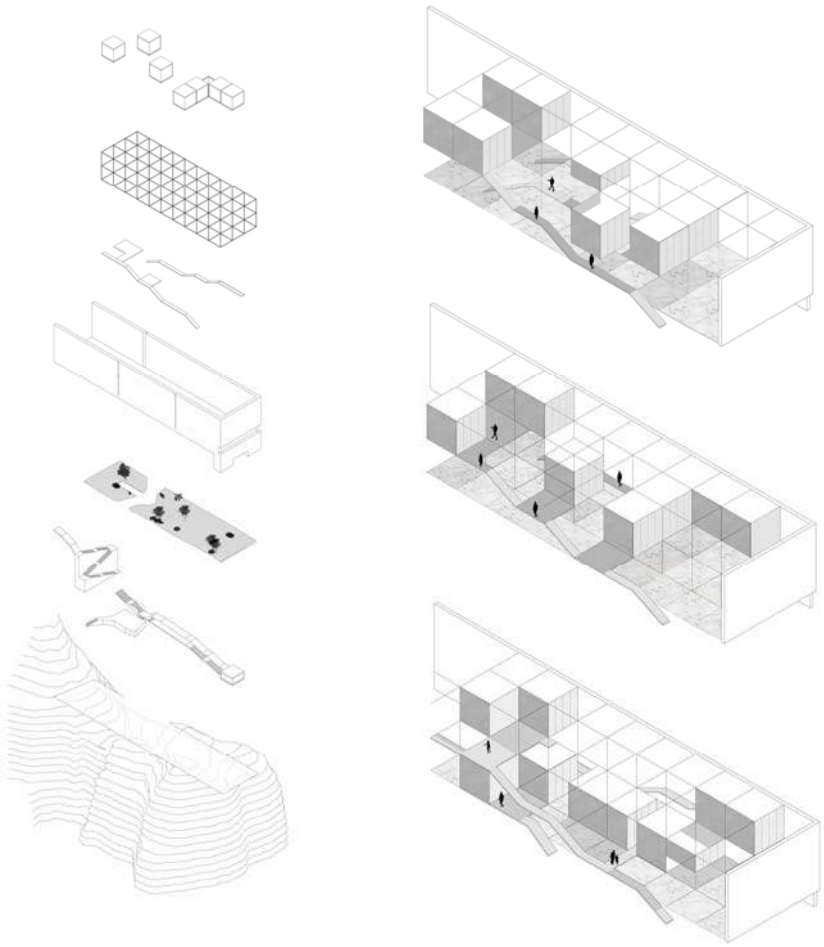

Fig. 1: axonometric view

Fig. 2: mountain view

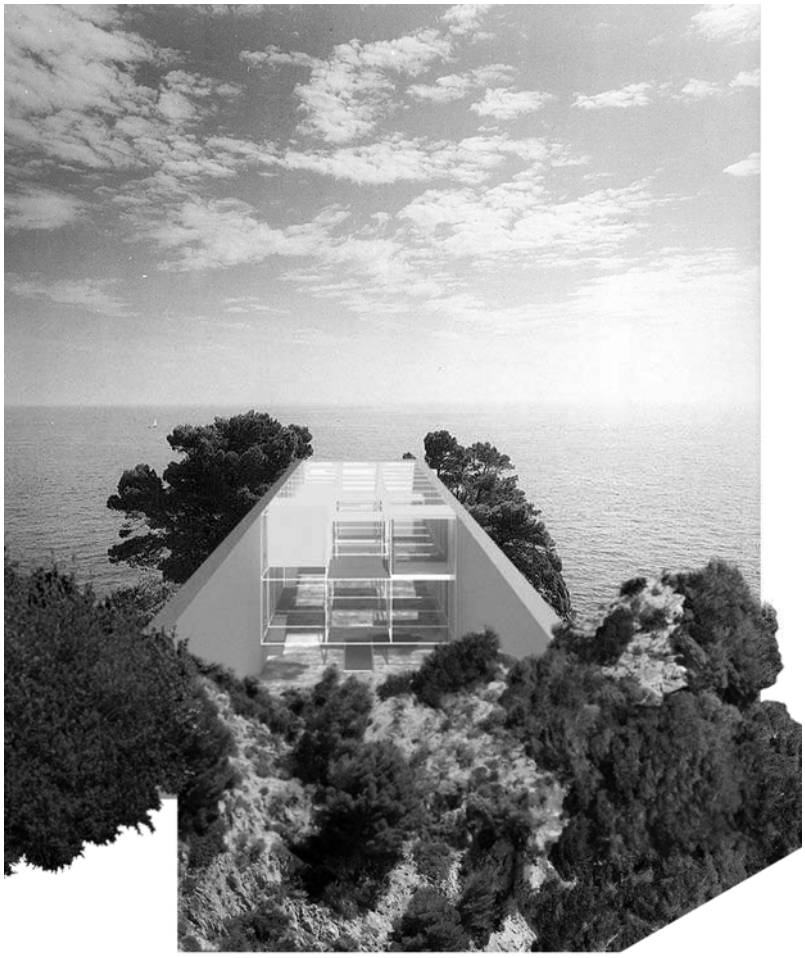

Fig. 3: sea view

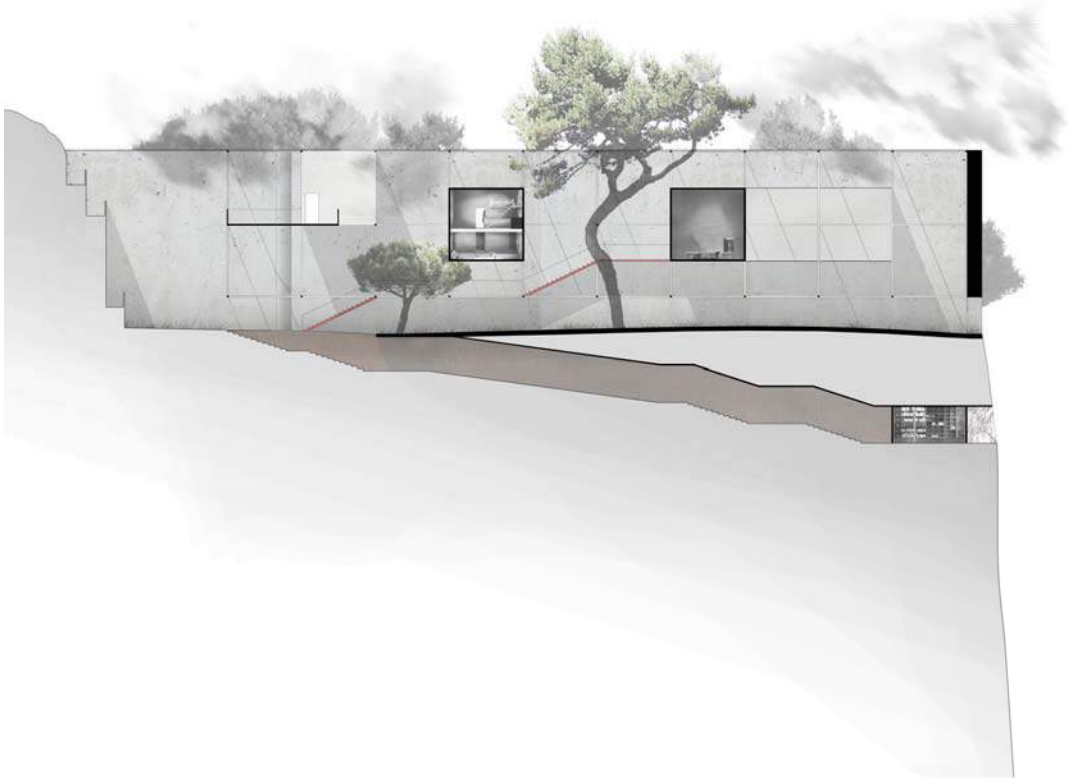

Fig. 4: section

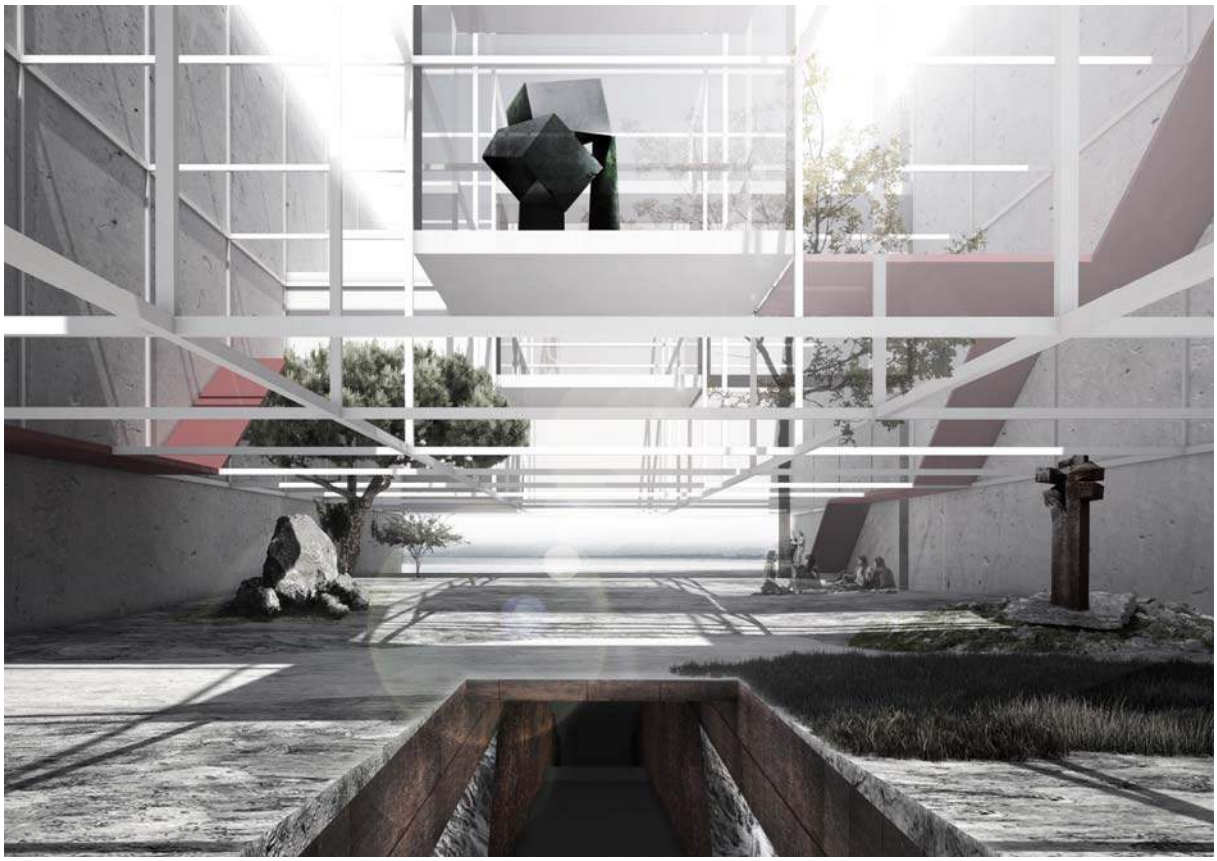

Fig. 5: interior view.

MASSULLO 2.0 workshop
Tutor: Prof. Arch. Gianluca Cioffi with Francesco Pio Arcella e Gilda Emanuele
Students: Antonio del Giudice, Claudio Ercolei, Emilio Razzino, Salvatore Rea, Luigi Scognamiglio, Sharon Anna Somma, Antonio Soreca e Yorgos Spanodimitriou

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WORLD HERITAGE AND DEGRADATION
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Digital design development

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Abstract
The design has evolved over hundreds of years by encoding the bases of representation for all partners involved in the process of defining the architectural body. Since ancient times, the architecture was entrusted to the design for the representation of the data needed for the project and for the realization of all its elements, in particular, however, in the last 50 years has evolved due to technological developments in the field of digital science, with the introduction of CAD, that has changed the way in which the drawing is made.
Highly complex forms of projects could see the light only thanks to the new design and modeling software, which allowed the development of landforms otherwise drawable and therefore not achievable. Obviously this has also brought new modes of representation of the architectural project. Today make it clear to a layman as the project of a building fits into the environment is much simpler and accessible to all thanks to animation programs that allow, through contextualization procedures, to place the building project into reality that will have to accommodate.

Keywords: Digital design, representation, project.

Digital design development
The design has evolved over hundreds of years by encoding the bases of representation for all partners involved in the process of defining the architectural body. Since ancient times, the architecture was entrusted to the design for the representation of the data needed for the project and for the realization of all its elements, in particular, however, in the last 50 years has evolved due to technological developments in the field of digital science, with the introduction of CAD, that has changed the way in which the drawing is made.
At first, the CAD was used for the 2D representation of the geometries using elements such as lines, arcs, symbols and more. In support of the 2D representation it was introduced 3D CAD for creating simple geometric elements. Then we moved to the parametric design programs, it is therefore spent talking with NURBS modeling, animation, rendering, then virtual reality, the inherent potential in the new software that allow the assessment of kinematic aspects within architectural projects. Today we speak of "augmented reality" All these new techniques of representation, if it can be defined, have had great development in the last fifteen years, old, leading to a profound change in the ways of representing architecture. Therefore, obvious that, as was previously the case, they are simultaneously also changed the ways of making architecture. Some buildings designed in recent years, built or not, have seen the light almost exclusively thanks to the new tools of this is called digital age. Just think of the countless projects of the last twenty years of architects such as Frank Gehry, Peter Eisenman, Zaha Hadid, Coop Himmelblau, to name a few.
Highly complex forms of their projects could see the light only thanks to the new design and modeling software, which allowed the development of landforms otherwise drawable and therefore not achievable. Obviously this has also brought new modes of representation of the architectural project. Today make it clear to a layman as the project of a building fits into the environment is much simpler

and accessible to all thanks to animation programs that allow, through contextualization procedures, to place the building project into reality that will have to accommodate.
The same Zaha Hadid says, "From the beginning I thought the architecture in a different form. I knew what I wanted to do and what I had to draw, but I could not do it the conventional way, because with conventional methods could not represent him. The traditional instruments of the representation they had no help. So I began to search for a new way to design, to try to see things from a different point of view. Then, with time, those drawings, those perspectives and those pictures have turned into my real tools of representation, something more than the mere processing of sketches. I think that every effort for an architect to be the organization of the plant, knowing how to get inside, handle and move it. The fluidity of the plant, its fragmentation, the perfectly calculated risk, are ideas taken from Malevich and Suprematism, which lead to new forms of exploitation and the creation of space. There are many other indications derived from the teachings of the supremacists, such as the idea of lightness, the tension to break away from the soil which produced engineering development and made possible the crystal curtains of Mies van der Rohe in Chicago and New □ork [...] There are other aspects of architecture that people forget. Architecture must infuse pleasure, the pleasure you feel when you're in a beautiful place or in a nice house, regardless of size. What usually people do not understand the concept of luxury is that it has nothing to do with the price. Copacabana Beach, for example, has a beautiful sand and go do not pay anything□This should make the architecture: to offer the idea of luxury on a grand scale ". [1]
"Looking at the Hadid designs depicting the Vitra station, you notice the close relationship that binds them to their architecture. And not just for the reason that the computer-aided design allows an accurate representation of the complexity of moving shapes. But also because the plants, to prospects and prospects to traditional, static and formally defined, replacing elaborate drawings of darting shapes and overlapping planes taken from unusual and antinaturalistic glimpses, almost independent works, which resemble to the avant-garde paintings from the early Novecento ". [2]
"The computer gives you a chance to accomplish things that you cannot do directly from mind to hand," says Peter Eisenman, who added: "you still need to think, to see in three dimensions, since architecture in the era of the media, of 'image, has to give answers effective spatiality, corporeality to space. We produce the models constantly after having conceptualized the computer. And' therefore a continuous process of refinement ". [3]
Frank Gehry says "My sketches are like gestures: how to build them□ I succeeded thanks to the computer, otherwise I would not even try ". [4]
After completion of the Vitra Design Museum, Gehry realizes that his sculptural architecture can no longer be developed with traditional drawing methods without a processor of shapes and images. "In these years," recalls Gehry, "I started having technical problems: we could not make drawings for large projects, it had to commission additional studies. When Jim Glymph came to work with us in 1989, I pointed out that in the study drew curves like those of the Vitra Museum using descriptive geometry and said, 'Now I want to deal with more complex shapes. He said, 'No problem, we will use the computers'. "
Glymph, an expert in vector programs and computerized processing, can give Gehry exactly what he needed; In fact, after analyzing numerous computer graphic software, Glymph identifies Catia, a software that Dessault Syst□mes had devised for the French aerospace industry, and decided to develop it, by funding Massimo Colomban's CEO Permasteelisa, changing its code, making it a suitable tool to the architectural project. From that moment changed so Gehry to design, free to imagine for its architecture any form, confident that the power of the computer it would calculate every aspect of creation. Catia, in fact, allows to manage with relative ease extremely complex surfaces and to develop near real-time analysis of structural feasibility and costs.
The first application example of the new software is the Vila Olimpica of Barcelona. This work represents the final transition from an architecture designed and planned in two dimensions in an architecture designed in 3D, designed to be completely managed through the use of computers. Mildred Friedman, in his essay "Gehry. Architecture □Development ", he got to see that the brake on the implementation of some important architectures of the previous years was due to the need to entrust the structural calculations to external qualified personnel to the study. An obstacle that often generated misunderstandings between the designer and structural engineer and that made it rise the expected costs of the building. [5]
Ben Van Berkel in an interview by Emiliano Gandolfi, clarifies, in reference to the project for the Mercedes-Benz Museum, such as the innovative technology in terms of automation of the design process was essential, "we had the need to develop new tools to manage the design process. In some respects the final design and implementation proceeded in parallel. The client had the foresight to put in one place in Stuttgart all the different companies involved in the design, but often change a detail was going to change the entire structure. And this need is imperative to have appropriate tools to synchronize the work of all in a single model. In total there were more than fifty teams from lighting design to all engineering aspects. The solution was taken an innovative technology of daily dynamics

of the whole 3D model correction. Through the use of three-coordinated software, we were able to upgrade the entire system to the slightest change, and in an interactive way".
The Mercedes museum is not only the expression of the design process of a protagonist of contemporary architecture, but it turns out to be a manifesto for a new course of digital design. Ben van Berkel proceeds from a diagram, able to express the needs of the project, and adopt it as a vector of the entire design process: from the organization of space, the design of the structure up to the creation of details and finishes. It is a path that from the representation of architecture builds a real model, self-sustaining and to generate services, volumes and openings. In sharp contrast to those who use digital architecture as an aesthetic research, UN Studio the computer continues to be a means to manage, through imagination, a mathematical model, without starting from formal solutions preconceived. [6]
The diagrammatic models frequently used to depict issues functional location and to express graphically the vertical and horizontal connections, are used here as real models of control of the project idea.
The most significant change is happening in the field of architectural design it is represented by the arrival on the market of programs BIM (Building Information Modeling), which allow to manage through the use of a single software the entire process of creating and model management of information of a building. Nowadays these systems are used predominantly for the management of large works, since the same to allow several operators, places even at great distances from each other, to operate on the same project simultaneously. In fact the advantages that the BIM systems would undoubtedly lead indubitable in a reality like that today, characterized by increasing complexity of the design, in which the correspondence of an increasingly large number of diverse skills is also extended to works of limited size.
Inside a BIM a fundamental role is played by the part of digital modeling. Here the three-dimensional model of the project is no longer represented by a simple vector file, as was the case until a few years ago in the classic CAD software, but it becomes a real database in which all information is gathered: those of character graphic those of textual or tabular character.
Evidently part of the digital model building remains crucial, but the latter in BIM is achieved by means of CAAD (Computer Aided Architectural Design) parameter, which do not only provide geometric information, but also contain extended attributes to mechanical and physical properties - materials, finishes -, to the commercial aspects - cost producers, availability -, to information on times and maintenance costs, and much more. In this sense, the implementation of the digital business model is no longer a drag in the strict sense of the term. To draw a wall, for example, is not simply drawing two parallel lines placed at a distance equal to the thickness of the wall itself, but the real wall is constructed in a virtual manner and own, equipped with all the attributes that characterize it such as the number of layers, the materials of which it is composed, the colors and the quantities of the same values, which allow you to assess the volumes and surfaces and masses, so immediately, the related costs, maintenance needs and more.
The geometric characteristics of the project, typical of two-dimensional representation, then go to take on a predominantly technical and communicative character, being in fact determined by the vertical and horizontal sections carried out on the digital model. Being also the parametric BIM, when creating the above sections, they are also eliminated all the problems in the two-dimensional CAD relative to the scale of representation. Each element of the digital model, in fact, has to collect all the information about the project. Consequently, in a completely automatic way, depending on the scale at which you want to represent a particular item, this will be returned with a suitable amount of details to the representation. A plant, a section, may then be printed in scale 1: 100 for the presentation of the project to the bodies responsible for approval of the same with a proper level of detail, so as to avoid an excess of information. The same plant, the same section can then be printed in major scales (1:50, 1:20, 1:10,...) for delivery to the workers appointed to the project, with an extremely higher level of detail. In this case, however, the digital model will not require any addition as it already contains all the necessary information.
In this way, at least as it regards the traditional representation, is the distinction between the phases of design and execution described above, since the project, in each moment of its process, has to be completely defined.
In this context, project design and take on new connotations. The computer is not configured more as a backup instrument of the working table on which separately prepare drawings, texts and tables that, once assembled, go to compose a set of descriptive documents of an architectural project. Through BIM, the computer is used instead to generate a single representation, a single parametric digital model containing all the documentation necessary to the whole project description.
Using these software based on interoperability, although it is still limited, at least in our country, it seems to be defined as an activity hardly avoidable in a more or less immediate future. The design then, as history has always taught, takes on new connotations intended to change the way of doing architecture, while the architecture creates new ways to make representation. So in some way it can

be said that the design with its new representation mode pushes the project to innovate and back the project is modified under the influence of new representations.
A great architect, Alvaro Siza, in an interview with the Journal Architecture (no. 86, June July 2010) states "nell'iter design drawing is a time when you can discover new openings, new solutions to specific problems. Alvar Aalto, in a small beautiful text, describes how the project can enter into crisis at certain times, and it is precisely then that feels the need to draw, out of the impasse. However, sometimes the drawing is autonomous. I design for pleasure, to relax. In a business as tough as it is that of the architect is easy to enter in crisis and it is then that the design is in distress ".[7]
Inevitably, the increased complexity of the projects also led to the need to ensure a more effective and complete control over the design phase and throughout the ideational-building process. That's because they take greater account of technical generation of models based on more general modeling environments (so-called "environments BIM"), or integrated environments that can handle all stages that characterize the life cycle of a project by realize, from the design stage through the implementation phase, up to the use and maintenance. In addition BIM modelers represent an interesting opportunity for dialogue and professional interaction at the same time inevitably introduce new modes of representation.
The peculiarity of BIM lies in the possibility of allowing the realization of an n-dimensional model that allows the connection of a series of data through some specific and preset rules. The complexity of an organism, which is architectural or territorial consists not only of specific textural character, geometric and technological but of a series of elements that make complex system. Consider, then, in a body discretization into classes of objects that leads to the realization of a series of data that can be linked together following the logic of the rules that govern the design and construction processes.
A simple modification of a single element of the entire project in the environment model BIM involves the possibility to control the variations which could result on the other elements, that is the n-dimensions of the project. The systematization of a data network connected together through a series of codified rules, therefore, allows an organization more qualitative infinite amount of complex information that the project is able to create. BIM becomes part of systematic management of information making it possible not only logical rigor and managerial need to order such a large amount of data, but also the possibility of creating a smoother interaction between the different specialist skills used in the entire design- building process.
In this sense, the BIM is acting as a system of integrated management of knowledge, through an instrument to respond to the systemic complexity, so much a part of the architectural and environmental organizations.
The objective is therefore to ensure the integrated development of team working, managing to encourage in particular the possibility of more direct communication, involvement and integration in the same project from different specialist skills more easily.
Especially in a period characterized by a deep economic crisis that involves many industrialized countries, the progressive reduction of the necessary resources to start interventions of modification of our habitat, plays a central role the environmental study and territorial and therefore the different stages of the process design- building are invested with even greater responsibilities than in the past decade. This raises the need to manage an increasingly complex reality with organizational models and structures to ensure the management of the tangible and intangible aspects. This complexity should therefore be investigated and ruled through synchronic control instruments of the different technical, economic, managerial, which make up the ideational-building process.
Systematization of data complexity contributes, over time, the error reduction, time, risk and cost, leading to a proportional increase in the quality. [8]
The current trend is to be dealing in a structured way with the different parties involved in the evolutionary process of the architectural complex.
The BIM can be defined as the process of development, growth and analysis of multi-dimensional virtual models generated digitally by means of software.
The role of BIM in the construction industry (through its actors are these architects, engineers, constructors, customers) is to support communication, cooperation, simulation and optimal improvement of a project along the full cycle of life ' built work.
BIM is the representation of a different data model of a building related to the different disciplines that define it.
It represents a different data model for the construction of a building, the data are numerous and refer to each specific component of the construction. A three-dimensional geometric model used in graphic simulations cannot be defined BIM as this also contains information about the geography, geometry, material properties, the technical elements, the phases of implementation and the eventual maintenance operations.
The Building Smart Alliance is an international company that regulates the BIM and certifying the software fit for purpose and that meet the ISO 16739 standards IFC (Industry Foundation Classes). On the website "smart building" there is a list of certified software IFC; among the most important and

efficient employees worldwide are Autodesk, ArchiCAD, Midas, SAP 2000 Solibri, BENTLE□, Graphisoft.
Italy is lagging behind in the use of instruments designed to streamline procedures and to make efficient building for the construction of "intelligent buildings". Exuberant costs, emergency maintenance, inefficiency complicate the management of real estate assets in Italy, also because of poor computerization of performance monitoring systems and use of buildings in an integrated way: from design to disposal, from the management to the redevelopment. It is not just a software for the design, but a real collaborative work process supported by digital technologies and involves the whole chain of the construction industry, with positive effects on the labor market.
To understand the potential of BIM, just think that the British government adopted a model for building projects also more than 5 million pounds (then of great size), from 2016, with an industrial plan outlined in any detail on the obligations and the standards to be adopted. This business plan allows you to make the planned redevelopment targeted and more effective and open new specializations in the workplace. [9]

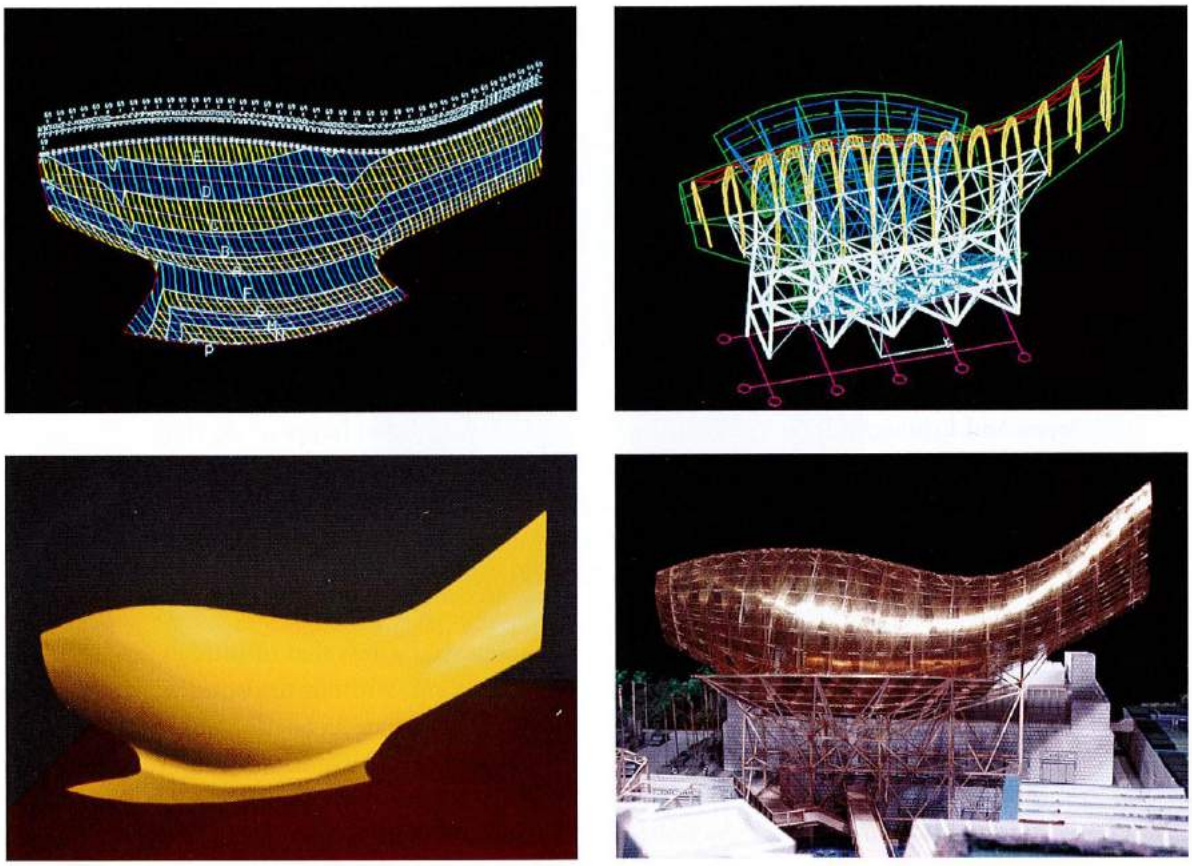

Fig. 1: Computer and built models for Gehry´s fish sculpture 1992 Barcelona

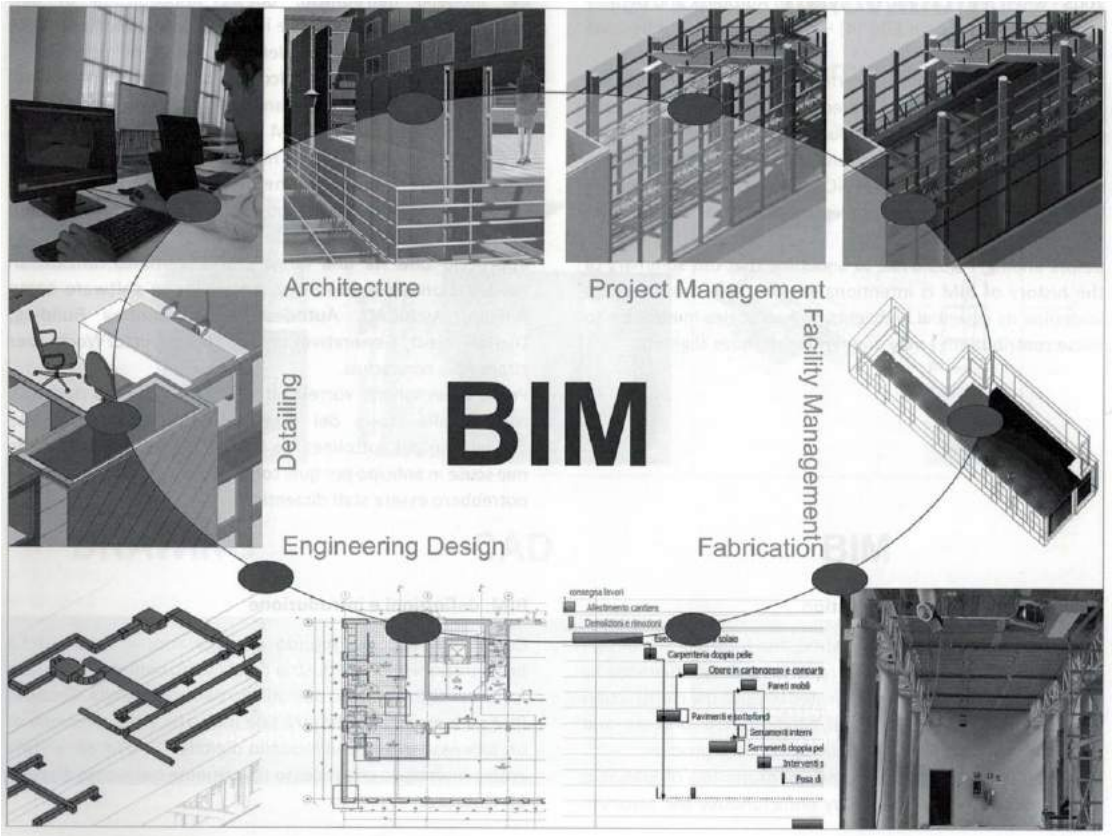

Fig. 2: BIM as Building information modelling (OSELLO, Anna. *Il futuro del disegno con il BIM per ingegneri e architetti.* Palermo: Dario Flaccovio Editore, 2012*)*

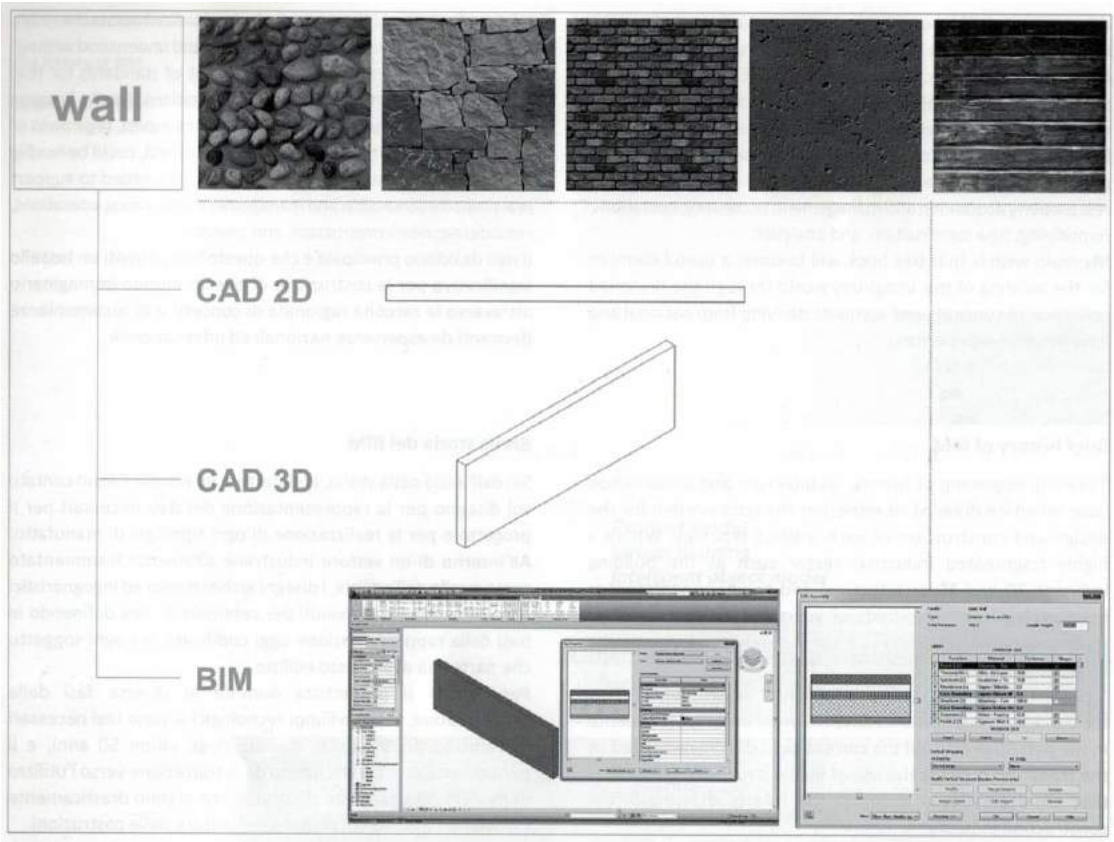

Fig. 3: Conceptual scheme of the possible representation of a wall with CAD 2D, CAD 3D or BIM model (OSELLO, Anna. *Il futuro del disegno con il BIM per ingegneri e architetti.* Palermo: Dario Flaccovio Editore, 2012*)*

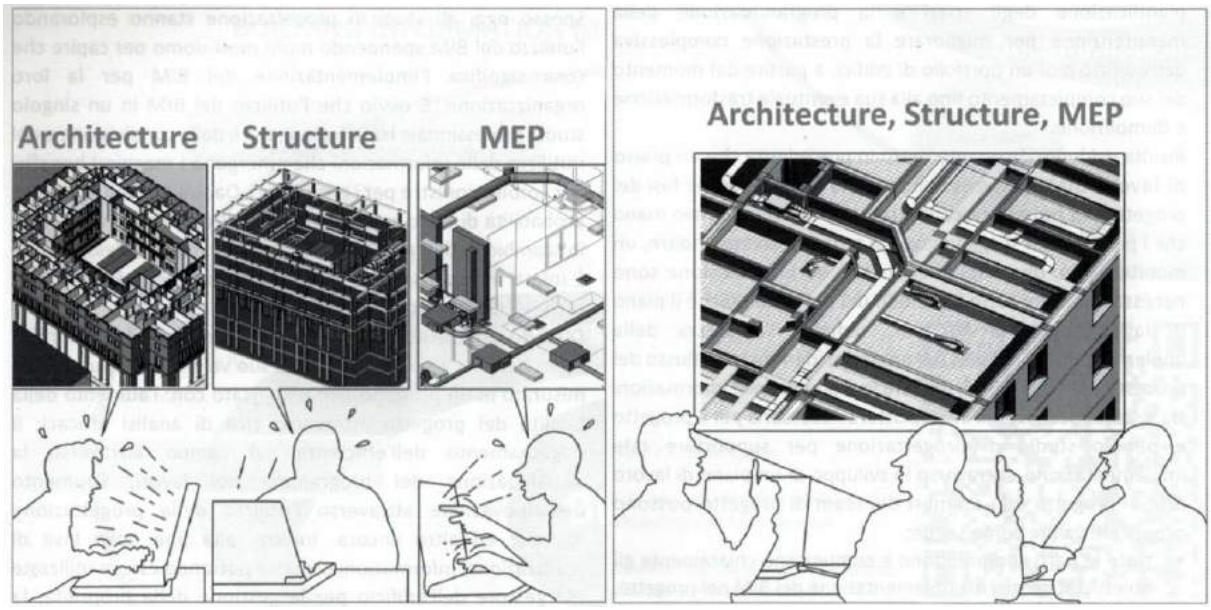

Fig. 4: Interoperable system (OSELLO, Anna. *Il futuro del disegno con il BIM per ingegneri e architetti.* Palermo: Dario Flaccovio Editore, 2012*)*

Fig. 5: The countries where the use of the BIM is at an advanced stage (OSELLO, Anna. *Il futuro del disegno con il BIM per ingegneri e architetti.* Palermo: Dario Flaccovio Editore, 2012*)*

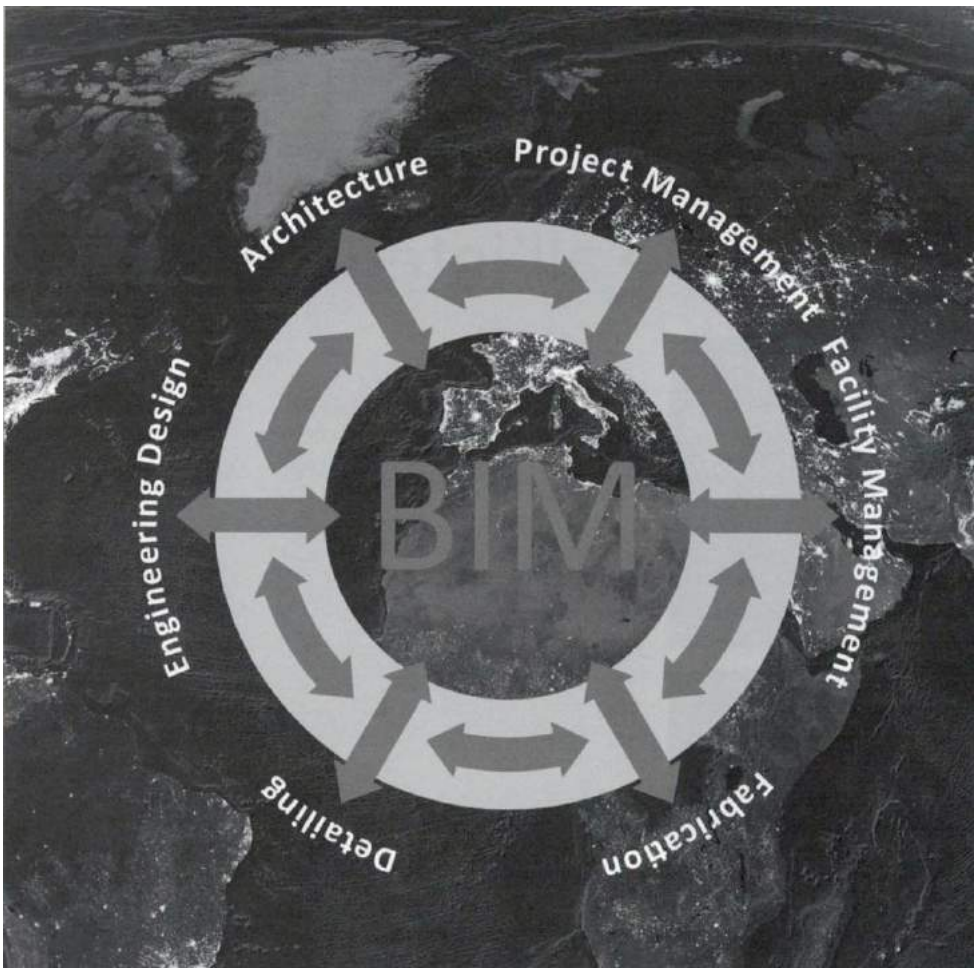

Fig. 6: The imaginary world in the future with BIM and interoperability (OSELLO, Anna. *Il futuro del disegno con il BIM per ingegneri e architetti.* Palermo: Dario Flaccovio Editore, 2012*)*

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WORLD HERITAGE AND DEGRADATION
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Planning the historic palimpsest. A workshop about the Pompeii area

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Abstract
The landscape urbanism projects described by this paper are the results of the teaching laboratory in Urban Planning at the Department of Architecture of the Second University of Naples. The workshop was conducted using also some analytical cartographic technologies and aerial survey of Benecon (Regional Competence Centre for Cultural Ecology Economy) and was part of the research project named Campus Pompeii, funded by the European Community.
The fulcrums of the projects are some areas between Pompeii and Vesuvius volcano: a bipolar landscape. The materials of the project are: urban and illegal sprawl, brownfields, the waste of the metabolism of one of the most dense urbanization of Europe (with a peak of about 12.000 inhabitants/square km of the town of Portici), the risk of Vesuvius, mobility infrastructure in use or abandoned, the waterfront, the network of archeological areas.
The project area is defined by the Development's Territorial System "F3 – Miglio D'Oro-Torrese-Stabiese" of the Regional Territorial Plan, that incorporates the municipalities of Pompei, Boscoreale, Boscotrecase, Castellammare di Stabia, Ercolano, Portici, San Giorgio a Cremano, Torre Annunziata, Torre del Greco, Trecase. This area includes some of most relevant italian archeological sites, such as the Unesco sites of Pompei and Ercolano, as well as the protected area of the Vesuvius Park and the basin of the river Sarno.

Keywords: Landscape, Risk, Drosscapes, Ecological Urbanism

1. Risk and Urbanism
The landscape between the slopes of Vesuvius and the plain surrounding the volcano is a result of multiple events, which over the centuries have changed the "palimpsest" and rethought the way of living and relationship with places. A transformation that has two fundamental points: the eruption of 79 d.c. and the impetuous and disorderly transformation of soils occurred in the second fifty years of the XX sec. Both forms of sudden and disruptive change, which generated waste, *frische*, drosscapes stratified and consolidated rapidly. All in a tangle of infrastructure that has accelerated the mixture of city and countryside, agriculture and terrain vague , illegal building and archaeological sites.
So this land is a palimpsest, as Corboz wrote [1]: a territory rich in textures, signs, "wounds", that the project must be able to understand and calibrate in a new vision of the future.
Superimpose the map of the texture of the residual green (the map of identity) and the one of drosscapes (diseases), for example, brings out the mosaic of the projects for new urban public spaces, agricultural parks, equipment platforms, infrastructural systems (green and blue) became a vision from which to start, providing an urban project of the metropolitan level [2], in which the ecological paradigm is central.
The study area is subject to various types of risks with which to contend, adapt and re-formulating (recombinant) the paradigm through the tools of the landscape and ecological urbanism [3].
The main risk is related to the presence of the active volcano of Vesuvius. It is a risk only partially predictable and which should be managed through the National Emergency Plan, which defines two area of risk: the "red zone" (that is, the area most at risk to be evacuated as a precaution in case of new event) and the "yellow area" (the area outside the red zone, but exposed to significant fallout of

volcanic ash and pyroclastic materials). The project areas are almost entirely in the red zone, that is, in an area where it is prohibited the construction of new residences and it is necessary to reclassify the road network to be used as an escape route in case of a catastrophic event .

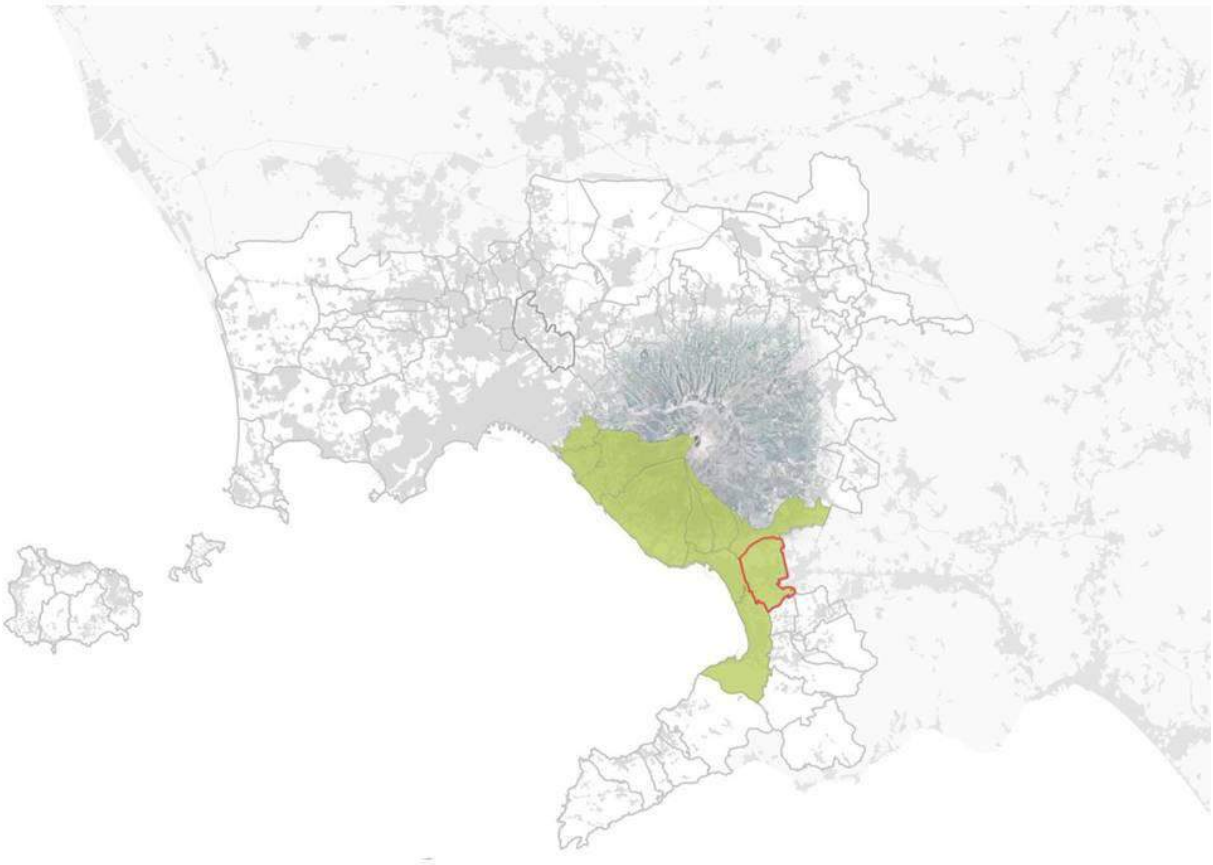

Fig. 1: Naples Metropolitan Area and (in green) the study area.

Fig. 2: Metropolitan Area of Naples: Ecological Corridors.

Fig. 3: Pompeii and the waterfront: analytical sketch.

2. The Context

The projects presented here are the results of an experimental research conducted in the Urban Planning Laboratory of the Department of Architecture of the Second University of Naples, who was assisted, among other things, by analytical technologies and laser aerial survey of the Benecon (Regional Center for Cultural Ecology Economy), as part of the Research Project Campus Pompeii co-funded with the Operational Programme ERDF funds Regione Campania 2007/2013.

From these premises, pilot-projects proposed interpret, starting from the analysis of places, dynamics and logic of the established territory, suggesting hybridizations with the volcanic emergency, with urban waste, agricultural identity, but also with the magnificence of archaeological sudden and unexpected perspectives scenes. Among the other treats of a territory stretching from 1281 meters above sea level of the Vesuvius, up to the waterfront of the torrese-stabiese coast.

Through experiments on these sites, urban planning can re-find its own way, reducing the global approach to a patchwork of imaginable (and feasible) things, the norm in strategy, the constraint to new idea of renewal.

As part of a study on the implementation of eco-tourism for the area of Pompeii, urban planning can play the role of background and reference to the necessary territorial changes, but also (and especially) for the protection of beautiful landscapes of this land, but also as imaginary futuristic tank and programming tools [4].

The regional urban plan that provides standards and rules for the territory of the whole Campania region is the Piano Territoriale Regionale (Ptr), a plan that contains, above all, scenarios, frames and a strategic approach. To reduce conditions of uncertainty, about territorial knowledge and interpretation of the actions of different institutional operators or of other operators, Regional and Territorial Plan (Ptr) defines territorial and urban planning conditions by Development's Territorial Systems. These are 49 sectors of regional territory each one with a specific identity in term of economics, cultural, heritage and possible development strategies. The Development's Territorial System which refers to Pompeii, as well as to other archaeological areas of the site (Ercolano, Oplontis, Stabia), is so called “F3 - Miglio d'oro - Torrese stabiese” this Sts belongs to the type F: “Coastal systems of environmental, cultural and landscaping dominant”.

At a provincial scale the referring plan is Piano Territoriale di Coordinamento (Ptc) that only adopted (but not yet approved) by the Città Metropolitana di Napoli.

At the municipal level urban planning needs to be adapted and updated. Nearly all urban plans of the ten municipalities content in the F3 DTS are dated and contain strategies no longer in line with the most recent economic, cultural and social mutations. Especially evident is the lack of coordination between the different zoning rules of the plans of each municipality. The final strategies proposed by this research also suggest and give urban and territorial indications to the municipalities in the definition of new strategies and scenarios for their territory.

Fig. 4: One of the project areas near archeological site of Pompeii.

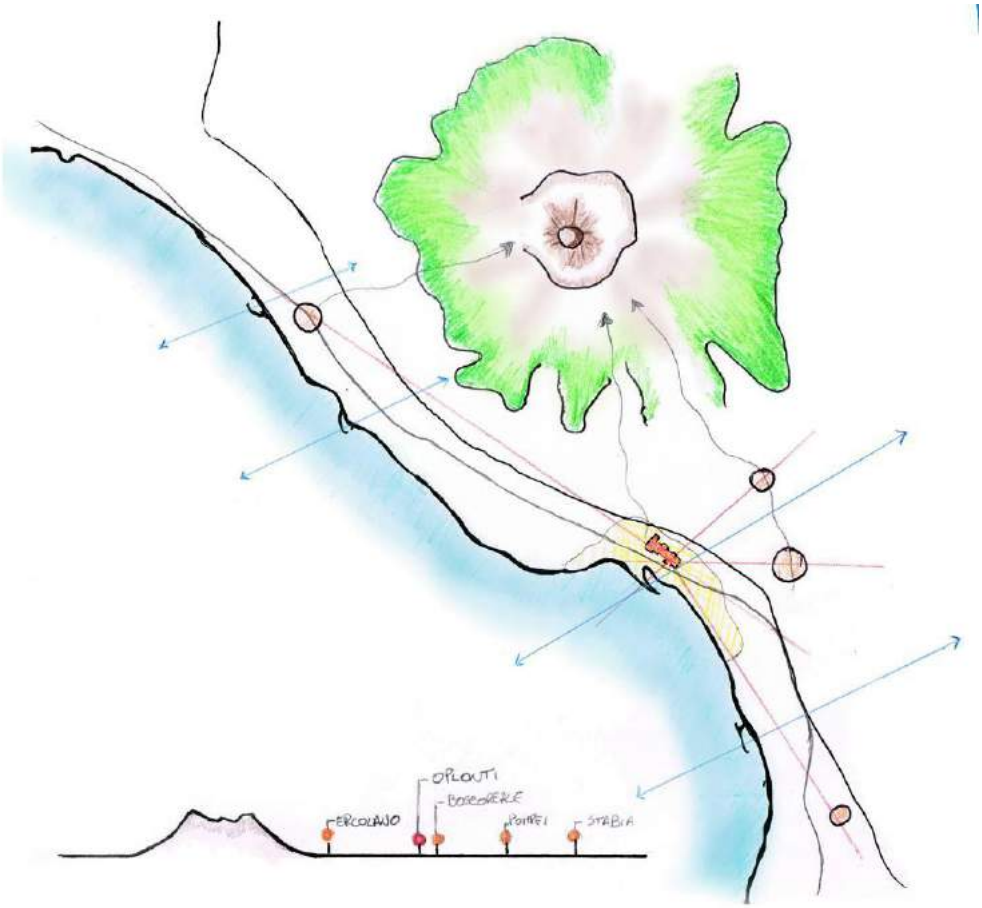

Fig. 5: Pompeii and Vesuvius: a Vision.

3. The Projects

The proposed projects start from a careful analysis of a large territory that gravitates around the ancient ruins of Pompeii, up to the slopes of Vesuvius, to the coastline and the archeological site of Oplontis. It is a complex area, crossed by major infrastructure bundles (Motorway A3, Circumvesuviana railway, Trenitalia railway) and innervated by a equally complex network of mobility.
The mounting of analytical materials and project suggested here, superimposed on the technical rules of urban planning and landscape existing plot, it appears as a *rappel à l'ordre* for a territory with less and less available time and space shrinking and eroded .
Pompeii and Vesuvius, are therefore the fulcrum of this “bipolar” landscape. The themes for the project are waste of the metabolism of one of the densest in Europe urbanization (with the peak of about 12 thousand inhabitants/square km of the town of Portici), infrastructural axes in use, or abandoned or simply designed (as the new railway park of Vesuvius), parts of waterfront subtracted to any kind of fruition , the network of archeology (on which to base the future, identity and economy of these territory), industrial areas abandoned alongside other still active (such as those related to boating), the urban sprawl and, mostly, volcanic and hydrogeological risks. A montage of useful materials to define operating practices to this new urban paradigm, knowledge and project [5,6].
The proposed projects (called “gateways”, understood as new access to the territory) integrate public and private spaces, green areas and agriculture, walkability and sustainable mobility, new “project of ground” and recovery of historic stratifications and land palimpsest. The aim of these "urban reconnections" is also to preserve and rebuild ecological corridors [7] connected to the regional ecological network, as identified by the Regional Plan and the Provincial Territorial Plan. The various plans-projects are connected with each other creating a patchwork of proposals that propose a new vision of the future and development of the entire area.

Fig. 6: Pompeii: the project “South Gateway”.

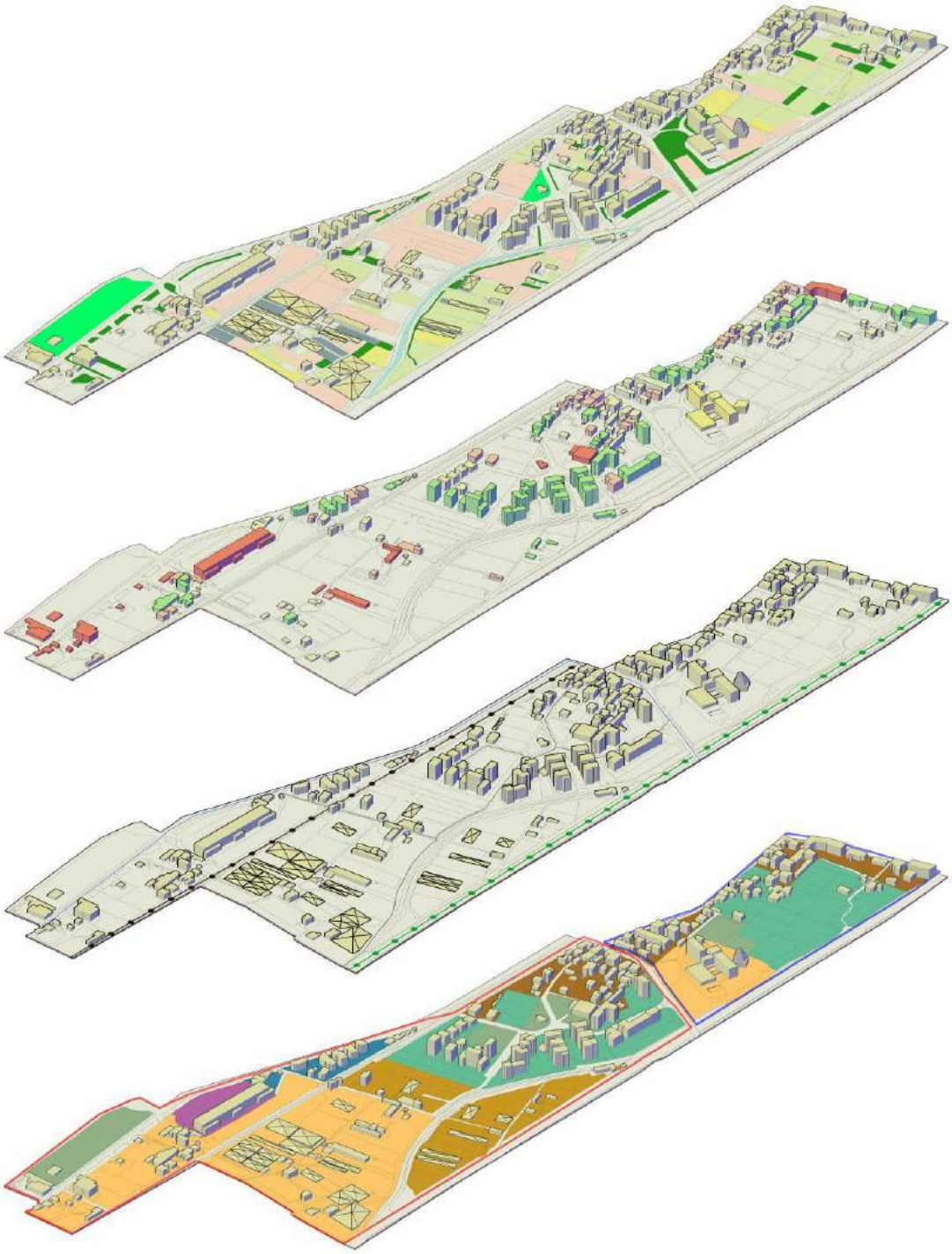

Fig. 7: Pompeii, the project “South Gateway”:Typological Analysis.

Fig. 8: Pompeii, the “South Gateway”:Green Patchwork.

Fig. 9: Pompeii: the project “South Gateway”.

Fig. 10: Pompeii: the project “South Gateway” (section on the railway)

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Urban Revitalizazion: Amphitheatre Campano Area and Castellum Aquae, Santa Maria Capua Vetere

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Abstract
The project area is located in Santa Maria Capua Vetere, near the oldest part of the city and the Ancient Appia Way.The project involves the remediationt of two adjacent lots at two of the major artistc heritages of cultural interest in the town: the Amphitheatre Campano, which is the second - largest after the Colosseum and the Castellum Aquae, an essential component of existing aqueduct in the Roman period. The first lot is located near Campano Amphitheatre and it introduces the park and it consists of two main parts: the first, that of the covered parking and the the second one hosting a variety of services such as restaurants, toilets and an hygeum area turned into a museum. The second lot analyzed is properly the archaeological site of Castellum Aquae and it consists in the creation of a roof. The design intent allows to give a precise aesthetic quality to the two batches ensuring the protection and enhancement of the archaeological excavations in the site. The work ensures a total integration into the existing environment, helping to ensure the sense of belonging and local roots and evoking a strong technical and urban modernity.

Keywords: Riqualification, City planning, amphitheater

Section
The project involves the remediation of two lots included in an environmental and architectural context of particular historical interest. The study area is located in the city center, close to the oldest part of the city of Santa Maria Capua Vetere and the Ancient Appia Way. The two lots are located near two strong cultural areas of the city: the Amphitheatre Campano and the Castellum Aquae.
The first lot has a triangular shape with two sides accessible by road and the third adjacent Amphitheatre Campano. The building used to the shows of gladiators, is the second -largest among these types of monuments in Ancient Italy, after the Colosseum. It presented the four canonical orders of the bleachers, accessible through internal and external stairs, set as many levels of interconnecting tunnels. The facade is dictated by eighty arcades made of limestone blocks of equal amplitude. The underground comprise innumerable brick pillars and massive barrel and cross vaulting lit from skylights let into the arena itself, and it create a more vivid impression of the day-to-day life [1]
Figg. 1-2
The project grew out of the lot subdivision in a triangular net and a superposition of a base path. Later, they were performed subtraction operations and extrusion of some bodies of the area, obtaining the final shape and the access points. Fig. 3
The design intent allows to give a precise aesthetic quality to the park and at the same time ensures an addition to the existing environment harmoniously. The park consists of two main parts: the first, that of the covered parking and the the second one hosting a variety of services such as restaurants, toilets and an hygeum area turned into a museum. Fig. 4
The morphology of the landscape has multiple levels ranging from -3.70 meters to 8.70 meters; to obviate this problem the dunes have been realized with a structure designed reinforced earth, it consists of a layer of vegetable soil surface hooked to the ground filling. Fig. 5

The park is marked by different approaches: the southern access, where there is the ramp that takes you to the highest part of the park, situated above the museum; the northern approach is characterized by a system of seating steps that allow to reach the lowest level and the museum entrance; east access is shielded by a steel structure corten pierced, projecting a fascinating interplay of light and shadow on a body of water. Figg. 6-7
Proceeding towards the central part of the park there are two artificial lakes separated by a walkway, and joints in the main building can reach the museum across a ramp. Fig. 8
The second lot analyzed is properly the archaeological site of Castellum Aquae. The structure has been identified as a tower with the piezometer function, below which is a tank whose job was to distribute water to the city. The construction was part of the great aqueduct, the Julia water, donated by Ottaviano Augusto; the water would enter the city by intersecting the city walls at half of the Porta Albana. Fig. 9
The object is to protect and enhance the good by creating a roof that is not invasive, but at the same time respecting the principle of reversibility. Fig. 10
The site is accessible from both sides of the road and the roof is composed of a base frame embedded in the perimeter of the surface. It presents a link using steel cruciform pillars between the floor and perforated corten steel roof, covered with polycarbonate panels for protection from the atmospheric agents . Figg. 11-12
The section shows the perfect frame interaction with the original site, without spoiling the pre-existence, but making the most of the good in question. The coverage angle allows the collection of rainwater in the cables conveying pillars to reach the sewage system. Fig. 13
Through the shape of the roof, the site is illuminated by sunlight filtering through the latter. The obtained lighting is kind of diffuse, producing stimulating atmosphere to the eyes of visitors. At night, however, through a system of point lights placed along the beams, it provides a relaxed setting.
Figg. 14-15
The park and the remediation of Castellum Acque, expressing the sense of belonging and local roots; places able to understand the history, tradition and culture, and at the same time to evoke a strong technical and urban modernity.

This is my degree thesis inside of degree course in Architecture, Interior Design and for Autonomy Department of Architecture and Industrial Design "L. Vanvitelli," SUN.
Supervisor: Prof. Arch. Carmine Gambardella
Co-Supervisor: Prof. Arch Gianluca Cioffi

Fig. 1: Urban Organization.

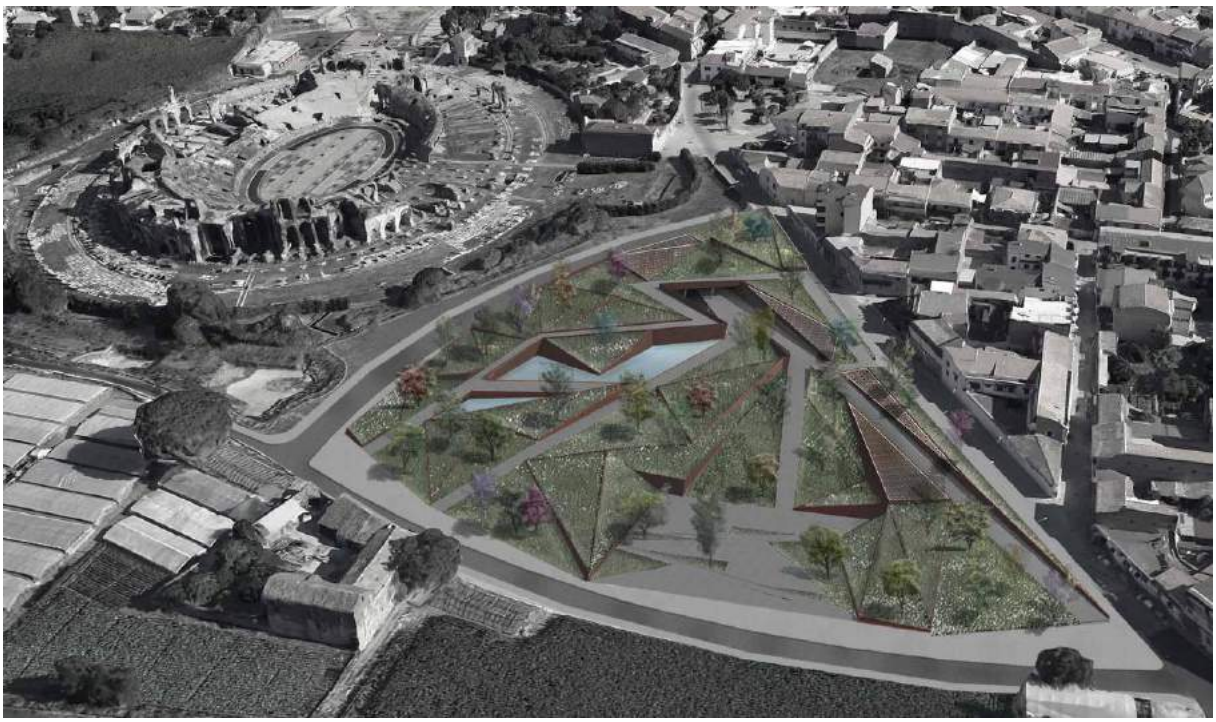

Fig. 2: Exterior view.

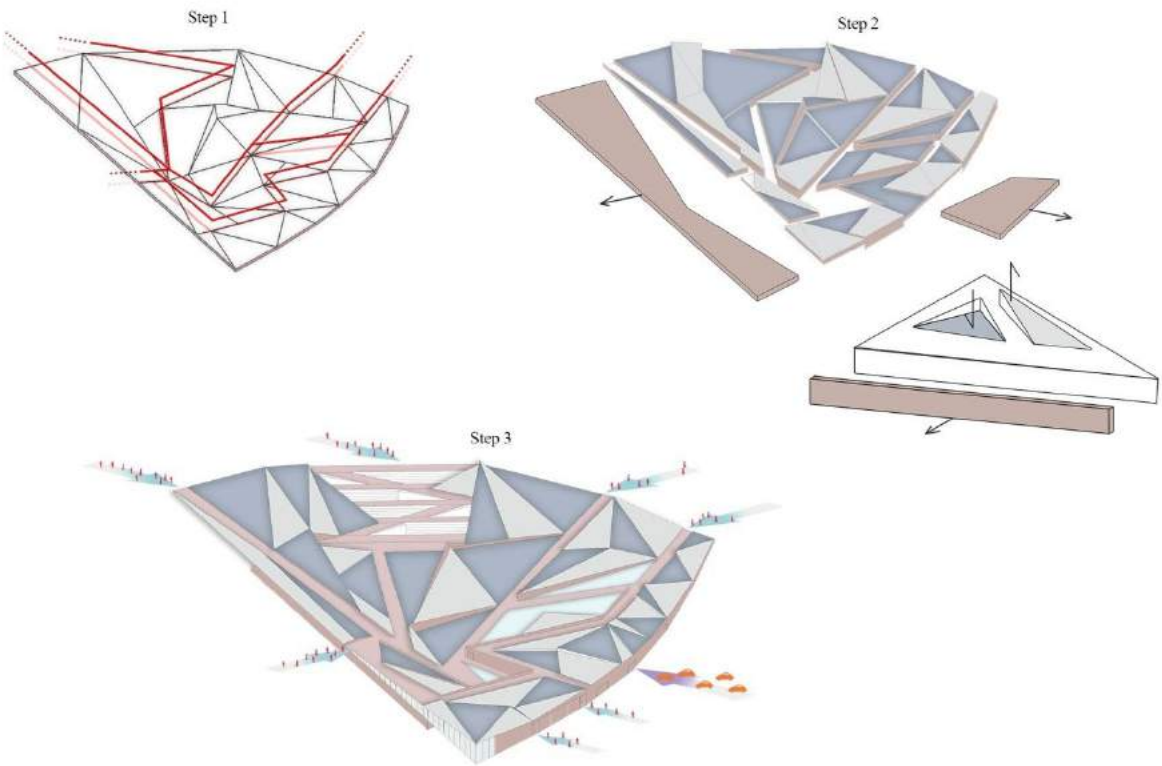

Fig. 3: Concept.

Fig. 4: Plan.

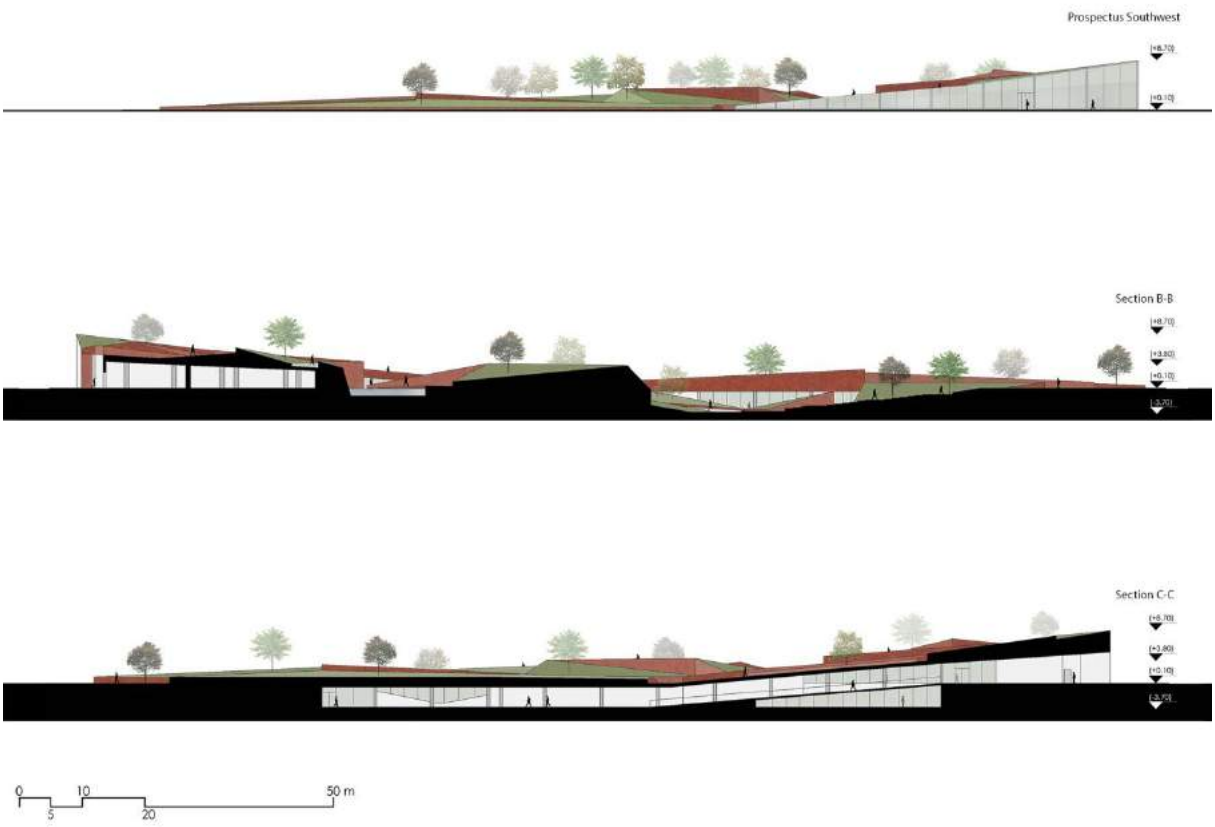

Fig. 5: Section.

Fig. 6: Northen access view.

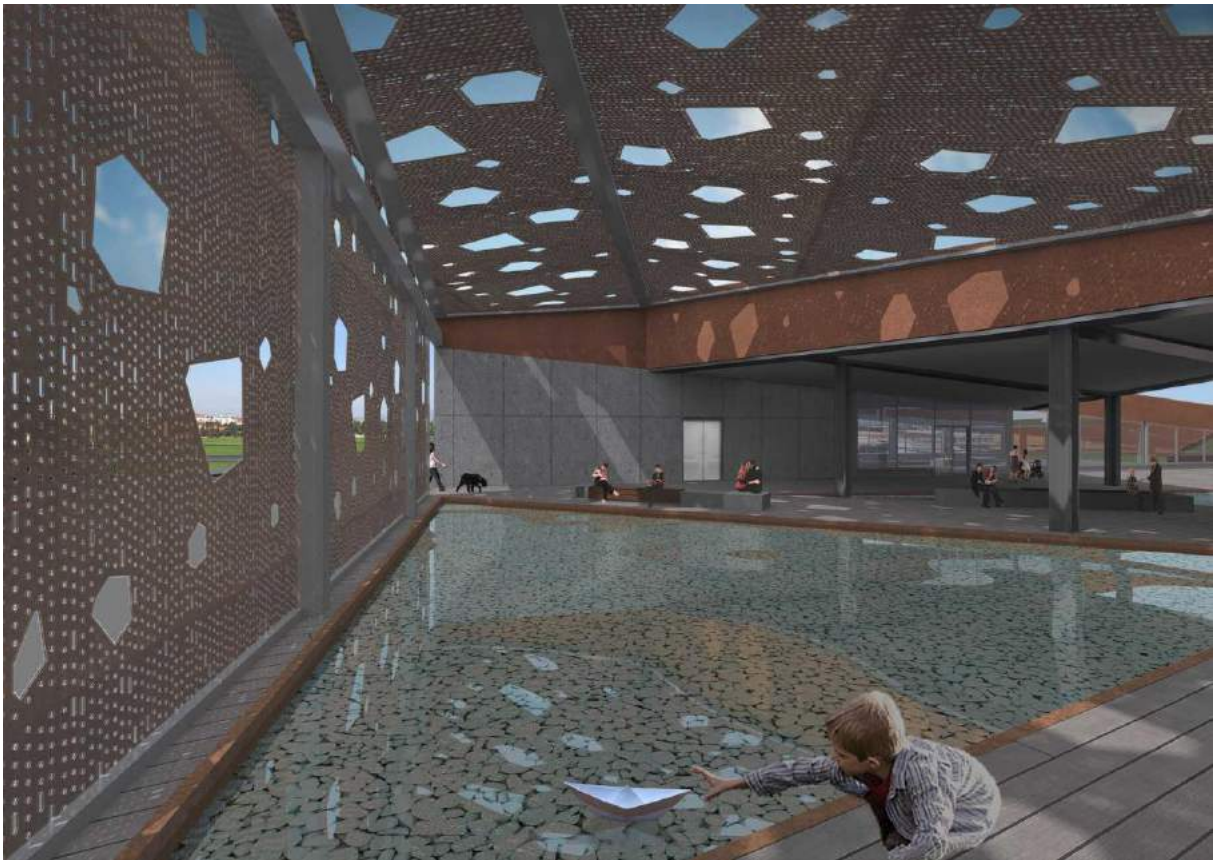

Fig. 7: Easthern access view.

Fig. 8: Interior view of the park.

Fig. 9: Urban organization of the Castellum Acquae.

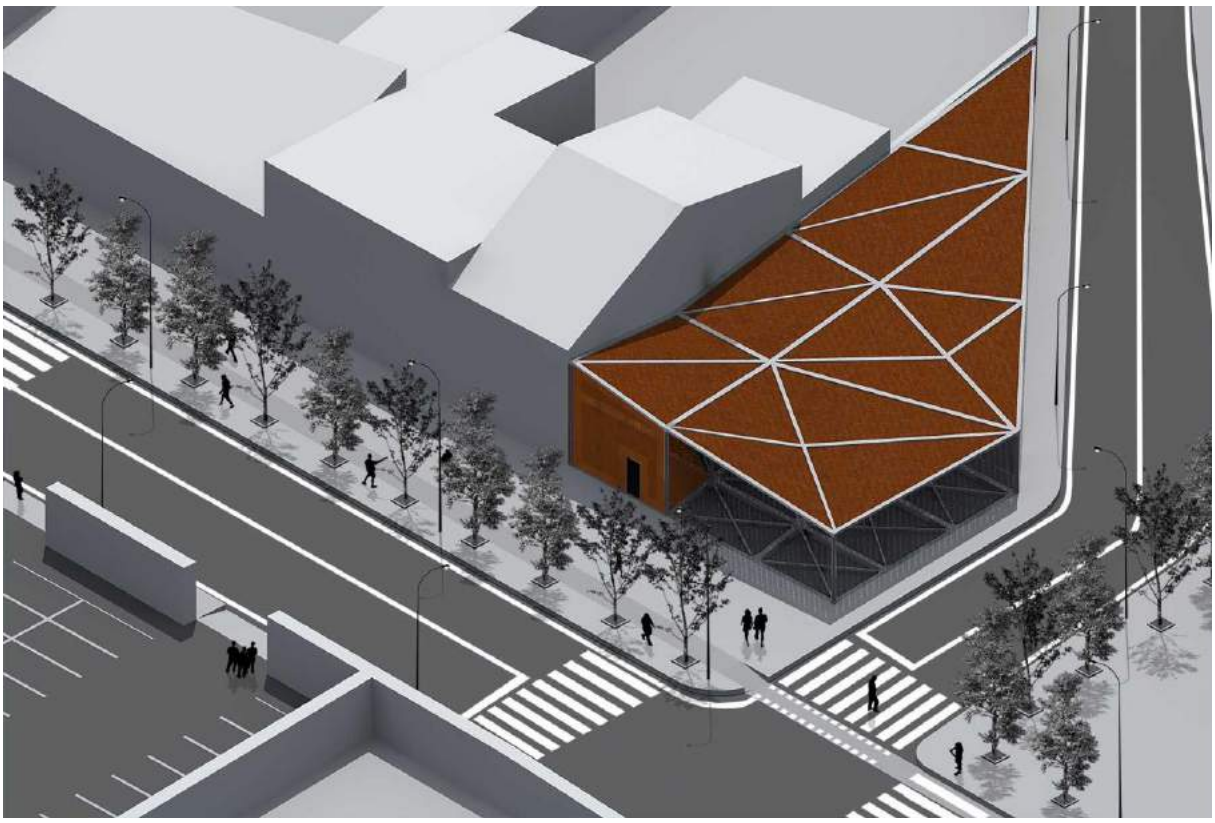

Fig. 10: Exterior view.

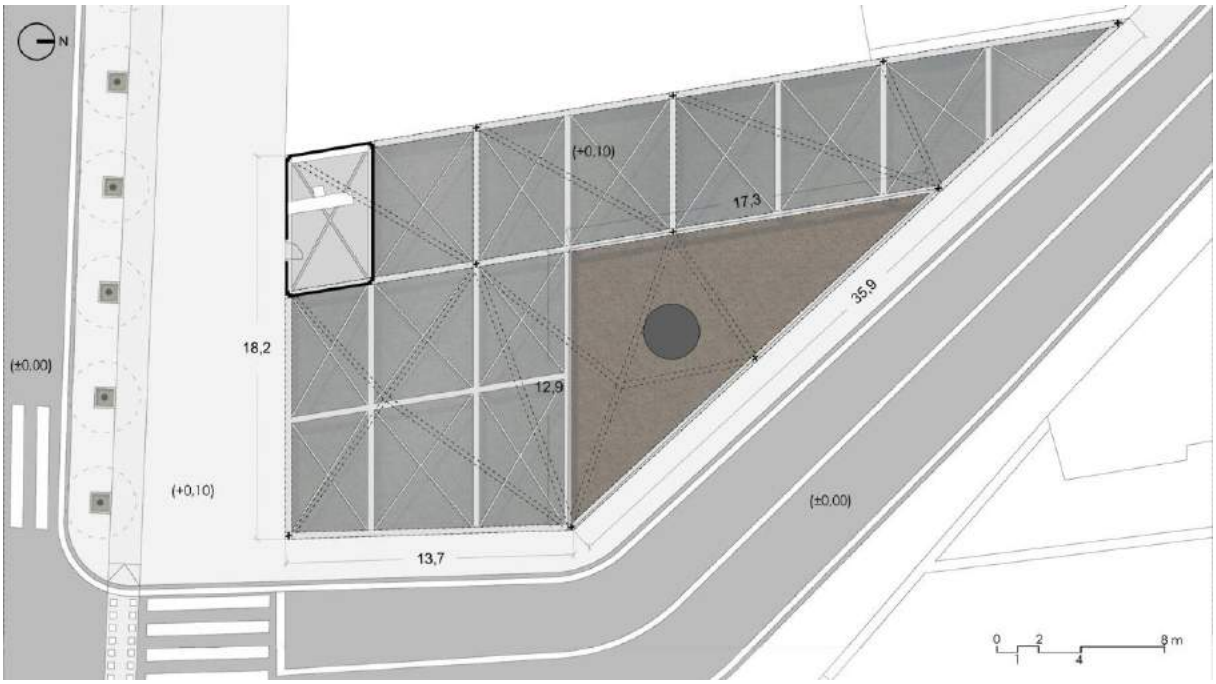

Fig. 11: Plan of the Castellum Acquae.

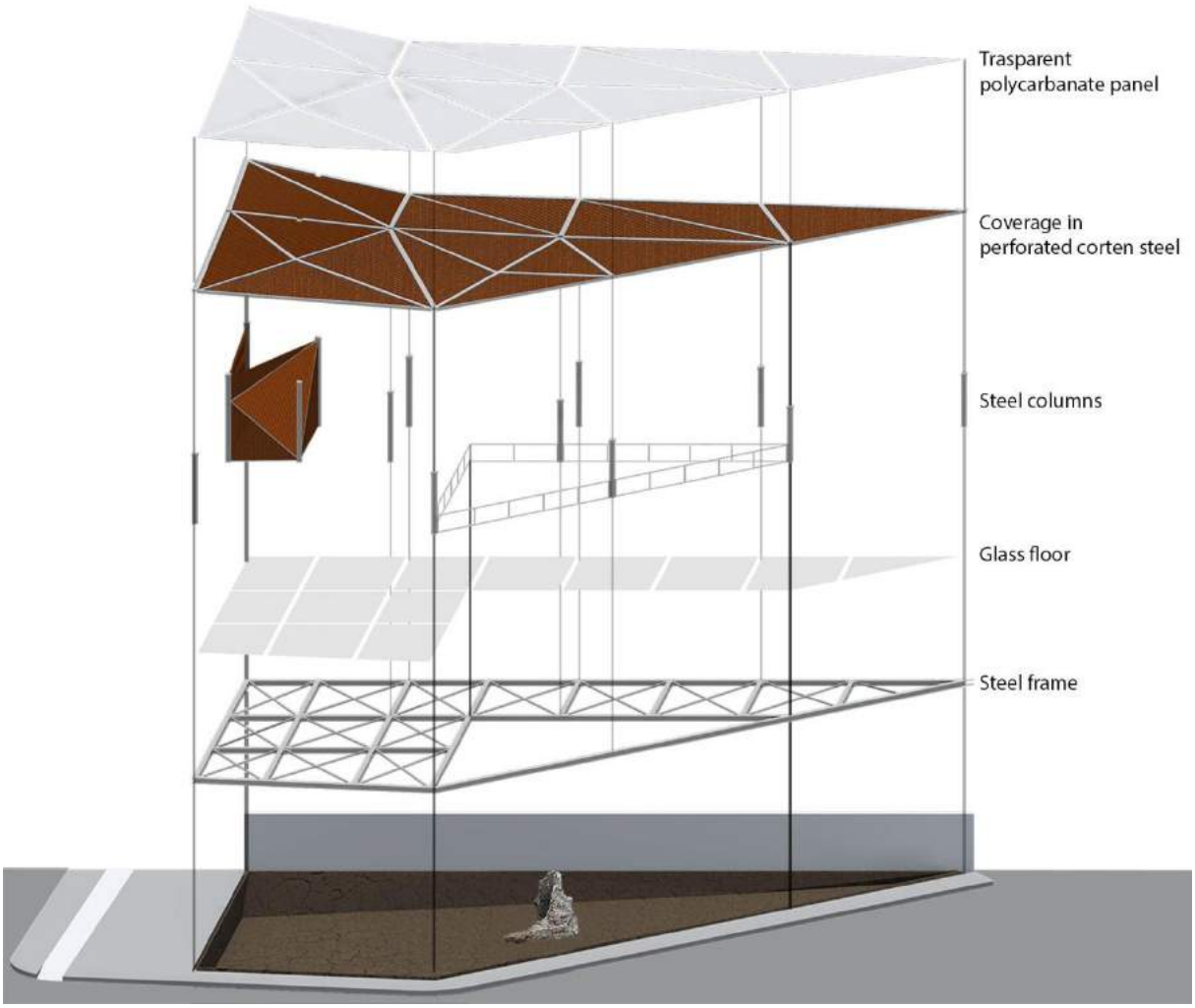

Fig. 12: Axonometric cross section.

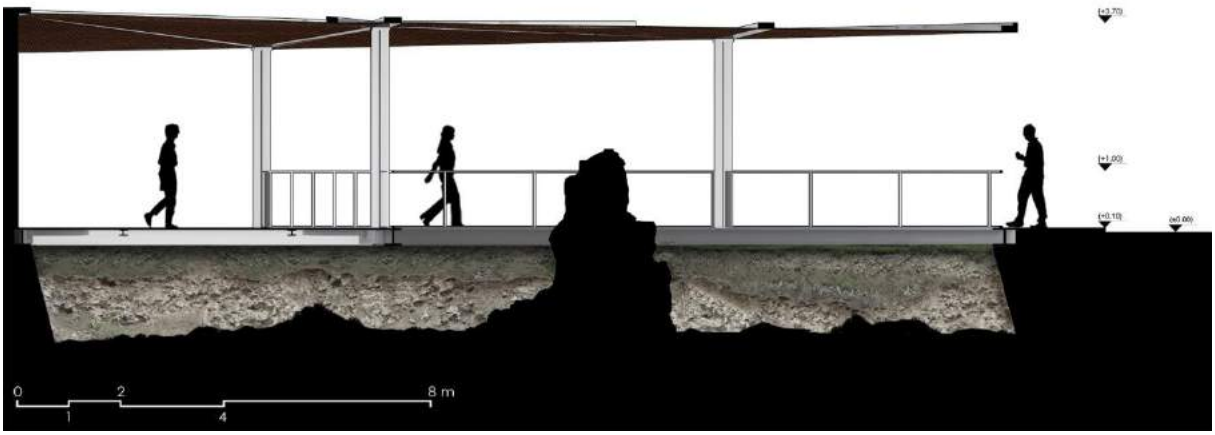

Fig. 13: Section of the Castellum Acquae.

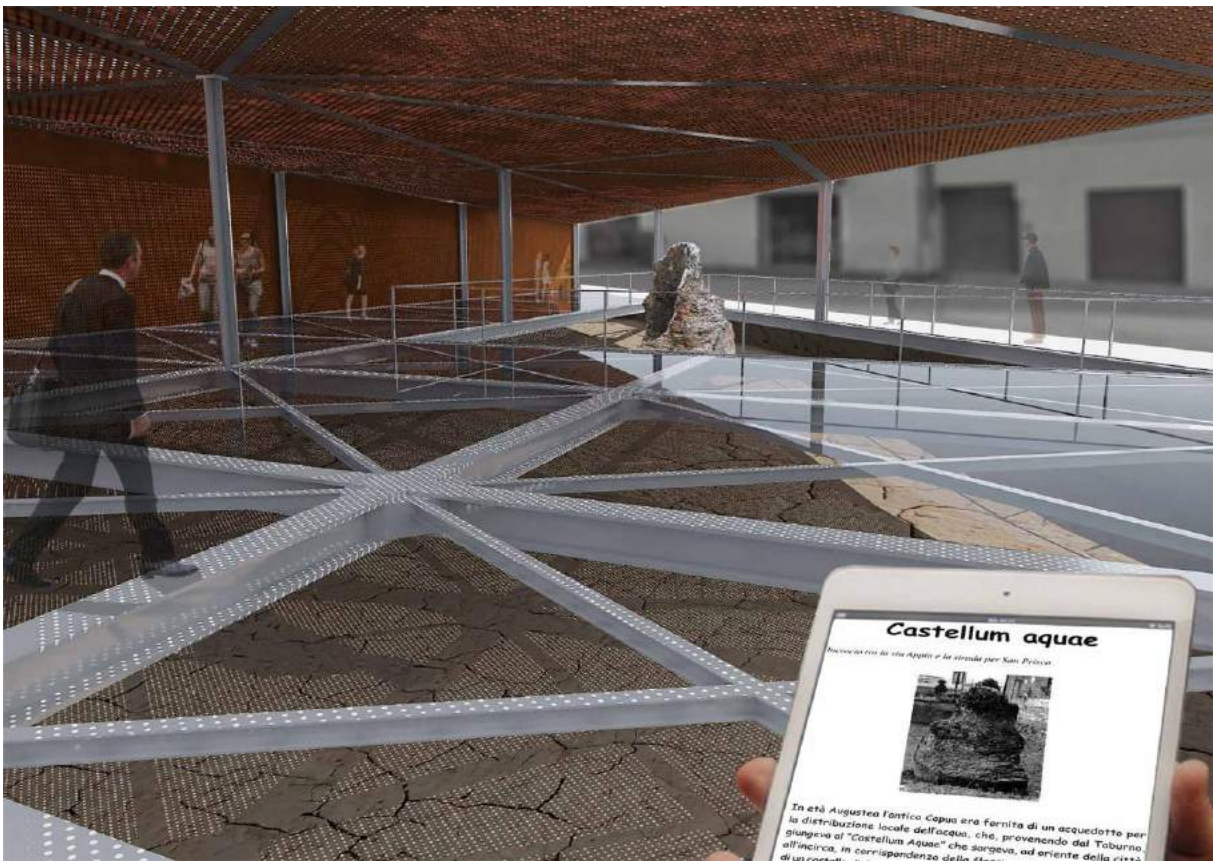

Fig. 14: Interior view with day lighting.

Fig. 15: Interior view with artificial lighting.

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3D Data and Augmented Reality in Heritage Fruition. A Case History.

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Abstract
The spread of 3d scanning has helped cultural artifacts that appear on web platforms for free download to become increasingly popular allowing, in the meantime, the easy online share of 3d models and the creation of virtual galleries.
Today museums that really take care of the future of their goods, have departments dedicated to the digital cataloging of their tridimensional collections. Unfortunately, often happens that the experience remains only virtual and a large amount of data, which are not used for real projects, are available on the web. Now these data can be used in order to achieve a thematic collection, printing in 3d the original archeological pieces that are not disposable. The next step is the communication of the reconstructed good through the use of augmented reality, intended as video mapping. It is an entirely open source process, that can provide new perspectives of study, preservation and use of the cultural artifacts; not a way to replace the good, but to strengthen it in its communicative aspect, allowing the visitor to look at archaeological goods not visible because situated in other collections or museums. The use of a video mapping performance on a perfect 3d printed copy underlines the great perspectives in museum communication and didactic. The aim of the article is to demonstrate the potential of this kind of musealization through case studies carried out by the authors.

Keywords: 3D Data ; Data sharing; Museum Sciences; Augmented Reality; Video Mapping.

1. Introduction
Modern technologies in the field of 3D data capture of reality have extended the possibilities of their use in the conservative area. The recovery of the three-dimensionality of a cultural good allows to take care in time of its conservation, because of the possibility of a direct comparison between its current state and the scan. It is an important step forward in this area; technologies have become open source and even less complex, allowing to as much people as possible to use them. Now even a smartphone is sufficient to realize a 3D scan (with a good degree of approximation) or to use a Kinect as an external sensor.
The storage of a so big amount of data, if on one side permits to secure the good – even in a virtual manner – on the other side pinpoints the ineffectiveness of the conservation when data are not usable. New methods of use (including, for example, the use of 3D print, augmented or virtual reality) and the possibility for everyone to use those technologies, open interesting perspectives on the future of the museum communication. It is a generally held thought that a newly formed cultural heritage has to be added to the current one providing for the virtualization of the existent and making it accessible in

every part of the globe and transmissible for the future. Platforms as Sketchfab [1] permit to everyone to upload to the web their scan files. Actually many of the most important museums in the world have begun to virtualize their collections and, when the good is easily accessible, the same users create a virtual copy.

2. State of art

In the creation of an infinite database and consequently an infinite reproducibility of some cultural goods, there is also an ethic meaning. Beyond the debate between Value and Valorize, namely the difference between the need to create awareness in respect to the heritage, and the tendency to communicate this value outwards [2], it is clear as both them have their development in the creation of awareness related to the good, and consequently the strengthening of cultural identities (Urban, National, European etc).

That is the case of the famous Bamiyan Buddha's, 2 statues 38 and 53 meters high, 1800 years old, destroyed in a terroristic demonstration act in Afghanistan in 2001. They became belatedly part of the UNESCO world heritage, despite the fact that the statues did no longer exist, but there were just empty spaces. In June 2015 they could return to their former glories through the use of digital technologies that reproduced holografically to scale the missing fragments (Figure 1) [3].

Fig. 1: **Buddhas before and after.**

In the specific case of Bamyran, the act goes beyond the mere meaning of mapping ending or "enhancing" mapping; it gives a real value to an absence, that is heavier as result of a terrorist act. The project emphasizes the idea that the stored data are never really lost, and that cultural heritage will still be a source of identity in spite of its physical presence.

From that adversity has taken place a new awareness, also thanks to the portability of 3D laser scanning. From the ashes of Buddha and those of the Iranian city of Bam - destroyed by an earthquake in 2003 - arose CyArk (from the first syllables of "archive" and "cybernetic ") , a digital ark for the protection of cultural heritage from terrorism, fires, earthquakes, floods, neglect, erosion . This project has become even more important, and later has been developed CyArk500 , that aims the scan of 500 sites in 5 years and today it has completed more than 20□ of work.

Whatever is the scale of the cultural good, the 3D scanning remains of great importance also for museum use, with new and unexpected consequences within the spread of multimedia content. That is the case of the 3D scan of the famous bust of Queen Nefertiti, preserved at the Neues Museum in Berlin, obtained using a Microsoft Kinect (Figure 2), that was performed in October 2015 violating the copyright rules . Few months after, the scan was uploaded via torrent on the web and was made available to anyone who wants to reproduce the bust using a 3D printer [4] . This provocation gives food for thought regarding the way in which the paradigms of fruition could change in the future in relation to the new mode of sharing the data of cultural heritage in the digital age. The cultural good starts to become non-exclusive and reproducible.

Germany has always denied the requests of Egypt for repatriation, transforming de facto the artifact in an icon of German culture, actually referring to an old " colonial conception" typical of the West - as says Al- Badri and Nelles-. The bust was officially scanned in 3D in 2011, but the data were not shared and served to create the plaster casts in a limited edition of just one hundred copies in Berlin. Since February 2010 has not been allowed to photograph the bust: this is a precautionary measure to protect the colored pigments, ruined by too many flash. The sculpture is still today one of the most imitated from Ancient Egypt, but now, thanks to the online data widespread by the two artists, is possible to create a perfect reproduction of the bust.

Fig. 2:**3D rendering of the bust of Nefertiti and "The Other Nefertiti", a 3D-printed bust installed last year at the Something Else Off Biennale in Cairo.**

Walter Benjamin had already predicted the issue with the advent of photography, and today we are facing the same issues in relation to new technologies; the axis of the problem remains the same [5].
In museums often happens that goods for various reasons – as loan, restoration, theft – are not exposed. The interaction between the presence of the physical and virtual component is compelling, coming to value assets whose presence is not normally perceived, and emotionally contributing to the value process of the good, including it as an element of a collective identity. In Italy there is a virtuous example of application of the technique described above and one of the first-ever application of video projections in archeology: the Roman Domus in Palazzo Valentini in Rome [6].

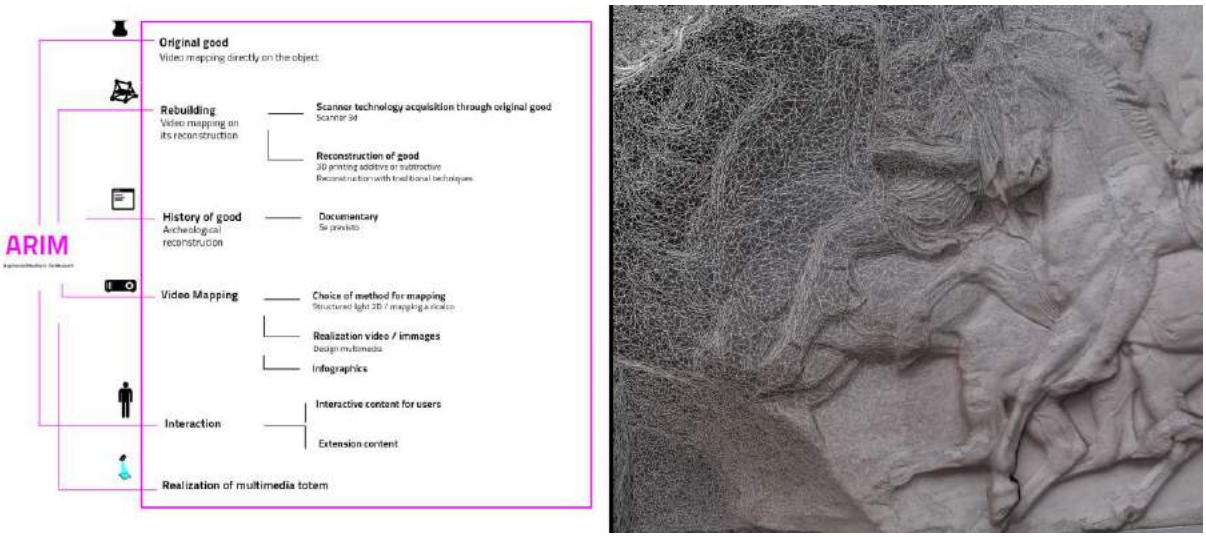

Fig. 3: **A.R.I.M.**

3. Proposed model: A.R.I.M. protocol

In order to adapt the video mapping applications to a common protocol of intervention it was developed and applied a general protocol called A.R.I.M. (Augmented Reality in the Museum), that respects some fundamental guidelines. The purposes of A.R.I.M (Figure 3) are based on the use of technologies that adopt a video projection system, which in its realization promotes the sustainable development of culture and opens to a possible audience of museum users interested in new technologies applied to cultural heritage.
The use of A.R.I.M. system has undeniable advantages and, among the highlights, there is the possibility to use faithful 3D reconstructions to turn them then into dynamic display and, where necessary, to rebuild the missing parts, creating a sort of digital anastylosis [7].
So, it would be possible to create not only a new guise and a new method of enjoyment through the multimedia installation on object, but even it could exist regardless of its physical presence.

4. Presence vs. Absence, Copy vs. Original

A new and important concept on which our team is working on is Absence, or rather Copy of the absence. There are objects which - although iconic of a place - have been exported from that place to be exposed elsewhere. There is an eternal debate related to the " Elgin Marbles" [8][9], whose return was covertly suggested by the creation of the new Acropolis Museum in Athens in 2009, where the parts had to find an ideal accommodation in a setting that could recreated their positioning in structure of the Parthenon. The old- aged question, that has been arising since more than 200 years, has seen a renaissance in modern times, when the British Museum - which has always refused to return them - has recently granted the Ilisso statue, one of the sculptures that adorned the west front of the Parthenon, for a loan to the Hermitage in St. Petersburg [10].

Actually the degree of acquisition of certain goods, as could be seen even from the case of the bust of Nefertiti, is a very strong act because those goods are perceived as country's identity monuments also by the "host" nation that wants to see recognized its right as a sort of “cultural usucapion”.

Without wishing to take part in the question, the situation described above is even more actual in the Italian ground, where it is not uncommon for local museums to be cheated out of their wealth, as the law of cultural marketing - of which the new Franceschini reform is the full expression - prefers to give more exposure and funds to the great museum centers, which are more attractive. Whatever the policy choice is, one of the two museum centers (local or national) in most cases will be devoid of the original.

Hence the idea of working on the concept of Absence and to exploit it by using the copies obtained with the above digital classification, in order to make the museum experience more experimental and immersive when compared with the same experience applied on the originals, where major problems - such as copyright, the delicacy of the pieces, the fragility of the pigments - subsist.

5. A.R.I.M. and the Parthenon North Frieze

From the collaboration between the Glowarp Studio and the SUN, Second University of Naples, arose a project for the valorization of a copy of the Parthenon, or better a minimum part of it, the Block N XLVI (one of the 115 panels that composes the frieze), actually at the British Museum (Figure 4A) [11]. The 3D scanning method of SFM (Structure From Motion) allows to get the data for the reproduction of the archaeological find in more complex cases or classical relief (simple cases)(Figures 4B;4C).

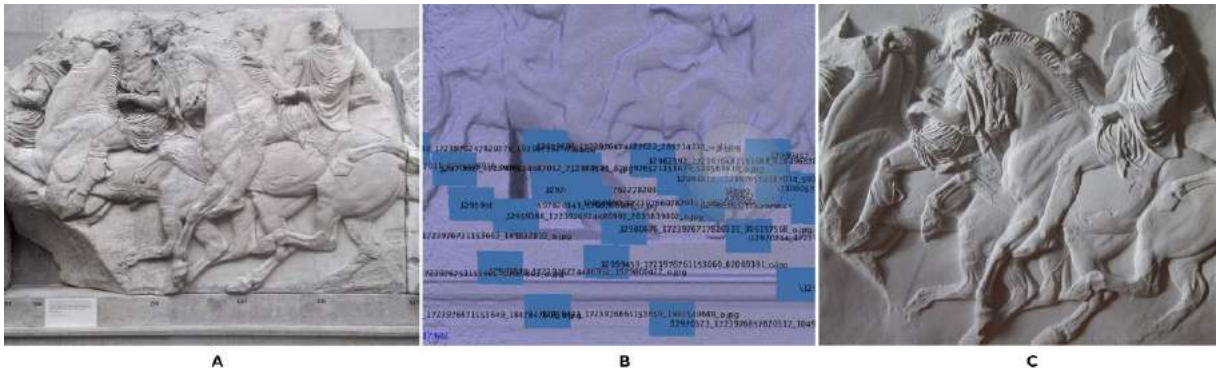

Fig. 4: **Original Frieze(A), 3D Model(B), Copy(C).**

In the indoor scale, when we work on cultural goods of medium/small dimensions, the phases of overlapping real and virtual model are not always evident, because optical distortions are inappreciable if compared to the general dimensions.

It is true that the vast majority of architectural reliefs, that constitute specific areas of architecture or archaeology, actually cannot be used for mapping - except in certain occasions-. One of those circumstances happens when the projector is placed at a distance so that we could consider its point of view as coincident with the infinite - with great approximation -, in the same way as happens in the orthogonal projections. It is clear that this rule is not enforceable in our case, where the proximity of the projector to the totem nullifies this solution. The techniques of indoor video mapping – often on a small scale as in this case - do not differ from the techniques used for architectural mappings, except for the accuracy that is necessary in details. The importance lies in two reasons: the first is the distance of the user and the second is the scale of projection, that arguably is not very big. These aspects are very important, because they determine the success or failure of the mapping file. Small discrepancies between the real and virtual model, using the usual proximity of the user, could cause annoying imperfections to the vision.

The first step was to fix the block on a white wall and move the projector empirically until did not reach the desired size of the projection screen. For the indoor projection, it was decided to use a wide-angle video projector with a high contrast, which allowed more vivid colors and details (35000: 1) and a 1024x768 resolution, 4: 3 XGA. It can be alternatively possible – if you know the brand and the model of the video projector – to evaluate distances and the relative size of the projection using appropriate online programs. Then to the block on which insisted the video mapping, was provided an area dedicated to informative infographics related to the panel (Figure 5). Given the spatial complexity of the block, it was necessary to combine three different mapping methods used not in a contextual way:

- mapping structured light (Figure 6): this method allows -once you decided the projector's position and its distance - to create an image exactly as it is perceived by the video projector (see Figure 9). This is the first image (Figure 7A), from which all the mapping work starts. In fact, considering that the block is white and the projector light is frontal and coming from the bottom, a lot of details, that only plain shadows can donate, are missing. For this reason the academics come to the aid of the following mapping methods [12]
- self-copying mapping: it allows, once you get the real-time image, to trace those details that were lost in the previous mapping method using Photoshop.
- photo mapping: it allows- once you get the image using previous methods - to use a scale picture modified with warping techniques to make it coincides perfectly with the mapping file created previously. This method allows a seamless texturing, full of details that perfectly overlay on the three-dimensional model.

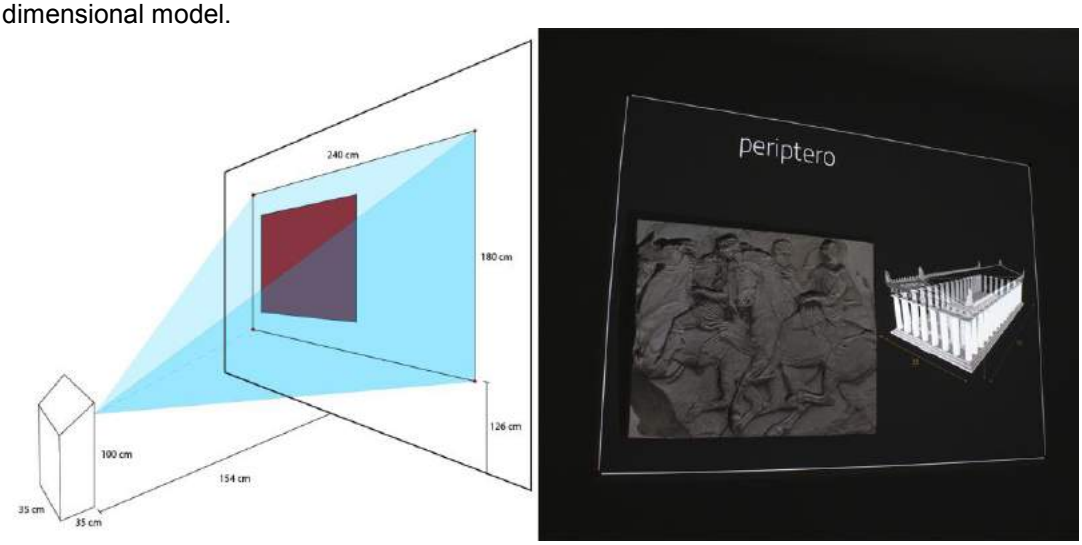

Fig. 5: **Multimedia totem project.**

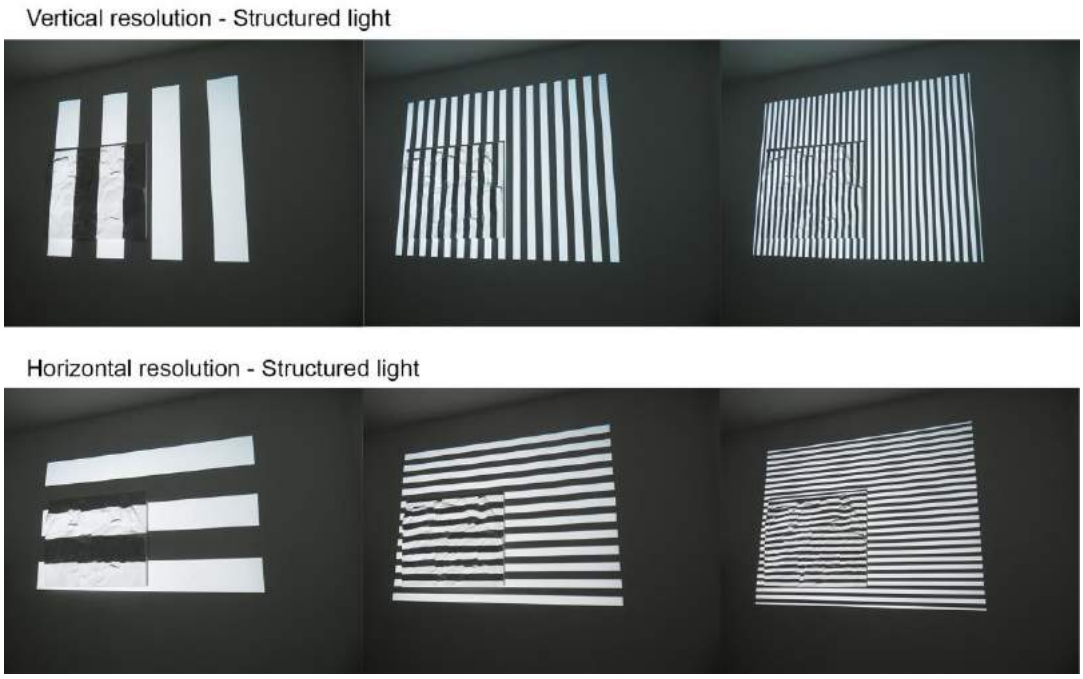

Fig. 6: **Structured Light.**

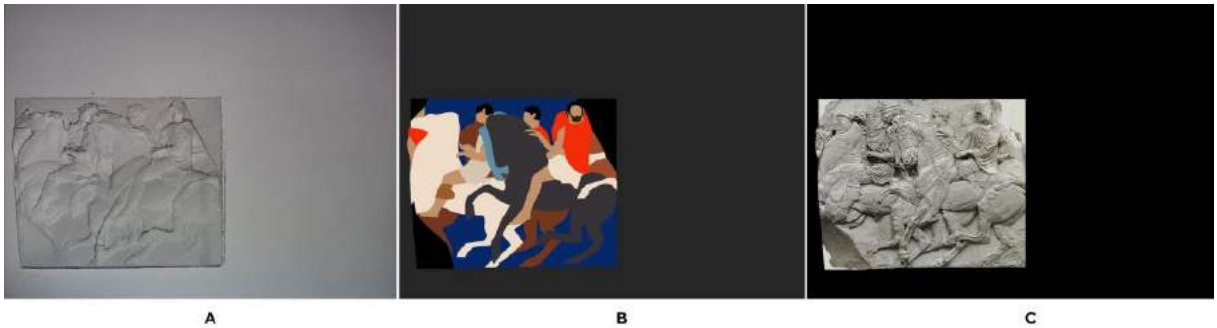

Fig. 7: **From structuded light to final image.**

Using the above-mentioned methods and correcting the imperfections in real time, it was possible to obtain the definition of the final image (Figure 7C), followed by the realization of the layer masks in Illustrator (Figure 7B). The creation of the layer masks was designed in agreement with the archaeological analysis of the piece - that provided useful information related to forms, details, spatial conformation and depth of the low relief. This is a very delicate step, because the layer masks represent the synthesis of forms from which all the necessary files for the production of the documentary arise. It was not necessary to create 3D files, because for this kind of work it was not required. Storytelling on a fragment of the Parthenon frieze is not easy, because the same iconic nature of the monument makes on one hand a set of information obvious, on the other they have to be specified. Due to the limited timeframe (10 min approximately), the idea of a choral narrative was abandoned, in order to achieve greater linearity in the narration. The main topics concerned the historical and political climate in which the Parthenon was born, its main architectural features, the frieze and its main interpretations, and in the end the technical specifications of the piece, the restoration of the original colors and missing objects via digital anastylosis .
In order to make the followed analysis accessible to the public, it was decided to use a language not too much sophisticated, and after, the use of more specific terms to explain them briefly. Historical facts have been narrated through the figures, both historical ones (Phidias, Pericles) and those divine (Athena, Poseidon), to keep the attention of the viewer on the humanity of the depicted characters. The gods and the wars were represented by means of some of the richest vascular iconography available, while the more technical data were emphasized through appropriated 3D animations synchronized to the text. The information related to the piece and his colors resulted simpler, as they were well visible directly on the piece, without imaginative filters (Figure 8) [13].

Fig. 8:**Frames of the final work.**

6. Conclusions

The descripted method is relatively new and opens interesting scenarios on the reproducibility of the good and its "image" value, linked to the use or to the transmissibility of its historical and cultural value. Today the question has become crucial since the existence of certain cultural property is no longer guaranteed.

Saving such data allows to secure their historical, artistic and symbolic value, also for future analysis. But, beyond that, those proposals for augmented reality applications on heritage are a different way to perceive the copy of a good not only in its physical representation but also in a communicative way, creating a new idea of fruition as much more charming and engaging, because the observer no longer plays a passive role, but becomes an active part of the visit.

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Le Vie dei Mercanti XIV International Forum
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Similarities and differences between the turkish and Italian architectural museum design approach.

The present research aims to analyze the architectural and cultural relationship between Italy and Turkey, specifically in the naval museum design approach. Very relevant are the node points among the Italian and Turkish culture, thanks to the Italian establishments in Istanbul since middle ages. In particular the Galata district, in Beyoglu, had been completely designed and built by Italians originally from Genova. Turkey, primarily Istanbul, has a long and deeply-rooted naval culture as the presence of the 'Halic', wich is the oldest shipyard in the world, and the Besiktas Naval Museum Bozcaada Husnu Pasa dated 1897 confirms. The naval museum had been masterfully re-designed and enlarged in 2013 by the Turkish firm DBArchitects. Going through a close examination, not only of the architectural approach, but even of the museographic issues and decisions, we can feel the design affinities and differences of the two cultures. This essay will discuss a thesis project of the Naval Components Museum of Karakoy held in collaboration between the Seconda Università degli Studi di Napoli and the □ildiz Technic University of Istanbul. The thesis, developed with the co-operation of two turkish professors, it's an interesting experience of comparison between two ways of conceive architecture.

Turkey, Istanbul

Turkey has been inhabited since the paleolithic age, including various ancient Anatolian civilizations, Aeolian, Dorian and Ionian Greeks, Thracians, Armenians, and Assyrians. After Alexander the Great's conquest, the area was Hellenized, a process which continued under the Roman Empire and its transition into the Byzantine Empire.

The relations have been further strengthened during the Ottoman Empire. While the peoples of the Mediterranean were at war with each other at that time, Italian and Turkish peoples have maintained their cultural and commercial relations. Relations with Venice, which has become preeminent among the states in the Apennine peninsula, were established as soon as in 1381. The content of the relations have been expanded when Venetians and Genovese rented their ships to the Ottomans for their expedition to Europe. All oriental merchants were able to reach Europe due to the tolerant attitude and policies of the Ottoman Empire. While marvelous carpets embellished the palaces of Florence, Italian bankers carried out activities in Anatolia.

During the reign of Sultan Mehmet II (the Conqueror), who was an admirer of Italian culture, relations reached their climax. The signing of a “Reciprocal Extradition Agreement” between the Ottoman Empire and Florence illustrates this trend. In fact, a citizen of Florence who killed Lorenzo de Medici and escaped to Istanbul was extradited to Florence because of this agreement. Sultan Mehmet II the Conqueror invited painter Bellini to his court and became the first Sultan to have his portrait painted.

Venetian Emissaries, dubbed as “Balyos” at that time, contributed a great deal to the pleasurable social life of Beyoğlu (Pera) with their grand palace in Taksim (Palace of Venice). In 1524, the Venetian Emissary held for the first time an exhibition of ballet for the Italians living in Istanbul.

During the reign of Mahmut II numerous Italians from different backgrounds such as officers, musicians, doctors, found a second homeland in the Ottoman Empire. Giuseppe Donizetti (brother of the famous opera compositor Gaetano Donizetti), who was invited by Mahmut II in 1827 as the conductor of the Orchestra of the Empire (Muzıka-ı Humayün) and the Italian musicians that came along are vivid examples of this trend. Donizetti conducted the orchestra for 28 years until his death and laid the foundations of the current Istanbul Symphony Orchestra. Donizetti was awarded with the title of “Pasha” by the Sultan and was replaced afterwards by the Italian conductors Angelo Mariani, Pisani and Callisto Guatelli (Pasha).

Italian operas and especially those of Verdi were frequently staged in Istanbul theaters. The French theater in Galatasaray the first opera and theater building, was built in 1839 by a Venetian architect named Giustiniani. Another Italian architect named Bosco established a second theater in Pera in 1841-1842 and the opera “Belisario” by Donizetti was the first opera to be staged in the Ottoman Empire. Another opera “Lucrezia Borgia” was staged in 1844. Cem Sultan, who was considered as a bargaining chip at the hands of European Christianity, spent the last period of his captivity at Sant’Angelo Castle, located at the banks of river Tiber.

Turkish and Italian relations have maintained the same course during the reigns of Kanuni Sultan S□leyman (S□leyman the Magnificent) and Mahmut II. In this period, there were good political, judicial, commercial and cultural relations between the Ottoman Empire and Venice. Similarly, it is known that Andrea Gritti, who was the Dodge of Venice in the 16. century established cordial relationship with S□leyman the Magnificent and the Ottoman Court. It is worth noting that Barbaro, the Emissary of Venice has continued to reside in Istanbul despite the Lepanto War (1571) waged between the Ottoman Fleet and the Crusade Fleet under the leadership of Venice. Ottoman Empire has overall kept its doors open to Italians and Europeans. Emissaries of Venice were able to move freely. Churches that testimony the establishment in the territories of the Ottoman Empire of Emissaries of the Holy See and Italian priests.

Numerous Italian architects and painters have also produced works in Istanbul. Chief among them is Raimondo D'Aronco, architect of Sheikh Zafir Compound. D'Aronco who came to Istanbul in 1896, was assigned by the Sultan with the restoration works of the monuments of the city. These works still cause the admiration of many tourists nowadays. Giulio Mongeri, Guglielmo Semprini, Gaspere Fossati, Vitaliano Poselli, Piero Arigoni have also been among the architects/engineers of buildings in Istanbul and İzmir, whereas in the Republican era sculptor Pietro Canonica was famous for his sculptures of Atat□rk. Fausto Zonaro had been cited along with Bellini as Italian painters in Istanbul. Sultan Abd□lhamid II assigned Zonaro as the painter of the court. Zonaro came to Istanbul in 1891 and returned to San Remo in 1911 due to the breakout of the Turkish – Italian War. Zonaro has painted the embellishments decorating the "Turkish Poems", written by Mehmet Emin □urdakul and published in 1899. Another Italian painter Leonardo de Mango went to Istanbul when the "School of Fine Arts" was established in 1883 serving there as a scholar until his death in 1927. The works of Abd□lhak Hamit Tarhan, Ahmet Mithat Efendi, Hüseyin Rahmi Gürpınar, Halit Ziya Uşaklıgil, Ömer Seyfettin, Fakir Baykurt, Kemal Tahir and many others bear testimony to this premise.

Turkish and Italian Architecture

The turkish architecture has affinities with Italian one thanks to the cultural, technological and morphological correlations. Inspired by the design characteristics of Fascist architecture in Italy and Nazi architecture in Germany, which sought a modern interpretation of Neoclassical architecture (the architecture of a modern era Roman Empire, according to their ideologies), there was a trend towards creating a new national architecture in Turkey around the 1940s. The movement was called the Second National Architectural Movement (Turkish: İkinci Ulusal Mimarlık Akımı). The large number of foreign architects employed in Turkey in this period (especially from Germany and Austria) was a major factor in the introduction of these architectural movements and their stylistical characteristics. The pioneers of the movement in Turkey were Sedad Hakkı Eldem and Emin Onat. In order to lead this movement, Sedad Hakkı Eldem, who was a professor, held National Architecture seminars at the Mimar Sinan University of Fine Arts, focusing on the traditional Turkish house styles.

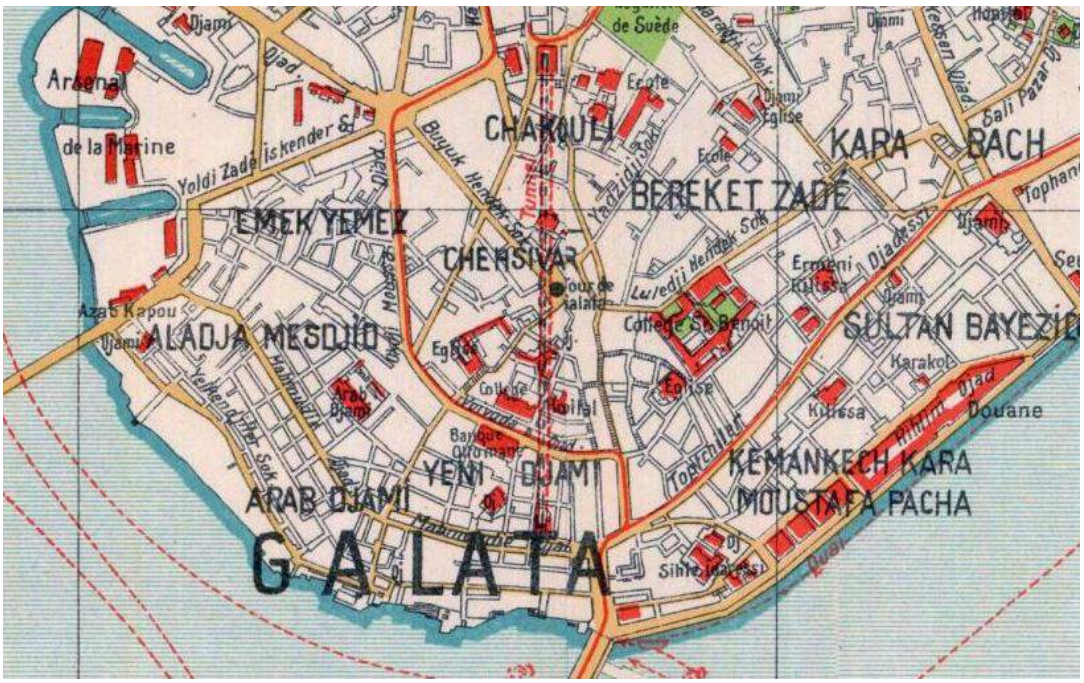
Similar to their contemporary equivalents in Italy and Germany, the government buildings of this style in Ankara and Istanbul had typically large proportions (high ceilings, high windows, etc.) in order to give the impression of a strong state authority. Some of them also had monumental facade designs reminiscent of Neoclassical architecture; but with more modern and plain rectangular shapes, symmetry, simplicity, and a general lack of ornateness.

Some of the buildings related to this style are the Ankara Opera House designed by Şevki Balmumcu (1933–34) and renovated by Paul Bonatz (1946–47); the General Directorate of Turkish State Railways (TCDD) designed by Bedri Uçar in 1938; Istanbul University Faculty of Science and Faculty of Literature buildings (1944–52); Anıtkabir (1944–53); Istanbul Radio Headquarters (1945–49); Şişli Mosque (1945–49); and the □anakkale Martyrs' Memorial (1954–60). The movement was particularly influential between 1935 and 1950. From the 1950s, the influence of this style started to diminish due to the next wave of influences, especially International Style and Rationalism. Until the 1980s, the government sector was the leading client when it came to architecture and construction. However, the liberalization of the economy paved the way for the private sector to become the leading influence. Notable architects from this period include Behruz □inici, Merih Karaaslan, Sevinç Hadi, Şandor Hadi, Ersen Gürsel, Mehmet Çubuk, Doğan Tekeli, Sami Sisa, Emre Arolat, Murat Tabanlıoğlu, Melkan Tabanlıoğlu, Hüsrev Tayla, Doğan Hasol, Atilla Yücel, Sema Soygeniş, Murat Soygeniş and Kaya Arıkoğlu. From the ’80 to present thanks to government policies there where positive effect on the construction industry and architecture. New methods such as prefabrication and curtain wall systems were introduced to Turkish architects and contractors in the 1980s. In addition, steel, aluminum, plastic and glass production increased, which allowed architects to free themselves from rigid forms. Notable architects from this period include Behruz □inici, Merih Karaaslan, Sevinç Hadi, Şandor Hadi, Ersen Gürsel, Mehmet Çubuk, Doğan Tekeli, Sami Sisa, Emre Arolat, Murat Tabanlıoğlu, Melkan Tabanlıoğlu, Hüsrev Tayla, Doğan Hasol, Atilla Yücel, Sema Soygeniş, Murat Soygeniş and Kaya Arıkoğlu.

Karak□y, Bey□glu

Karak□y, the modern name for the ancient Galata, is a commercial neighborhood in the Beyoğlu district of Istanbul, Turkey, located at the northern part of the Golden Horn mouth on the European side of Bosphorus. Karak□y is one of the oldest and most historic districts of the city, and is today an important commercial center and transport hub. The commercial quarter, which was originally the meeting place for Italian banks, shipyards and insurance companies in the 19th century, is today also home to mechanical, electrical, boat minute components, plumbing and electronic parts suppliers. Karak□y has been an urban port area since Byzantine times when the north shore of the Golden Horn was a separate settlement. The district developed rapidly, and the Genoeses built sturdy fortifications to protect themselves and their warehouses. Fragments of the Genoese walls are still visible, but the Galata Tower, the highest and strongest point in the walls, is the most visible. Galata’s urban design looked just like an Italian city. It is possible to see numerous architectural and urban similarities with Genova, Siena, Lucca etc.

The Galata Bridge connects Karak□y with the Old City, on which the fast tram line Zeytinburnu-Kabataş runs. The underground funicular, called Tünel, has been transferring people from its lower end in Karaköy upwards to İstiklal Avenue in Beyoğlu since 1876. Inaugurated on 17 January 1875, Istanbul's Tunnel (Tünel) is the world's shortest and third-oldest passenger terminal, after the underground systems of London and New □ork. This one-stop funicular climbs the steeply uphill for 500 meters from Karak□y to T□nel Square at the southern end of Istiklal Caddesi in the Beyoğlu district. People from all Turkey came to buy all kinds of naval hardware, minute components, ship mechanical tools, specialized in handcrafted brass components and anchors, chains, plugs, hooks, nautical items, propellers, steel neat cleat, brass swivel for sailing boats and powerboats. The shops, warehouse and personal houses where usually in the same building. This tradition in very similar to the Neapolitan ''casa e putéca'' business organization. Actually a lot of typical Turkish and Neapolitan traditions and culture are very similar and strictly related. Karak□y is also a popular place to eat especially seafood, b□rek (pastry), muhallebi (Turkish pudding) and baklava. Numerous tiny fish restaurants, pubs and cafés located under the Karak□y side of the Galata Bridge roadway attract local and foreign tourists. There are sixteen Christian churches, three Museums, Galata Tower, Camondo Stairs, six Synagogues and three Mosques in Karkoy confirming the multicultural and multietnical history of Karakoy. There are the Ottoman Bank Museum, Jewish Museum of Turkey and Istanbul Modern museums. Six schools and education institutes and a redlight district. In the past century Karakoy was an Italian settlement. Genoeses and Venetians built sturdy fortifications to protect themselves and their warehouses and gave the typical Italian urban design basics and important buildings. The Italian Bank, Liceo Italiano, fourteen churches, Italian Market Shops, Italian Assurance Building and a Fiorentine interesting Fabrics. Unfortunately only a few buildings are today visible because the others were destroyed during several Galata Bridge different orientations constructions.

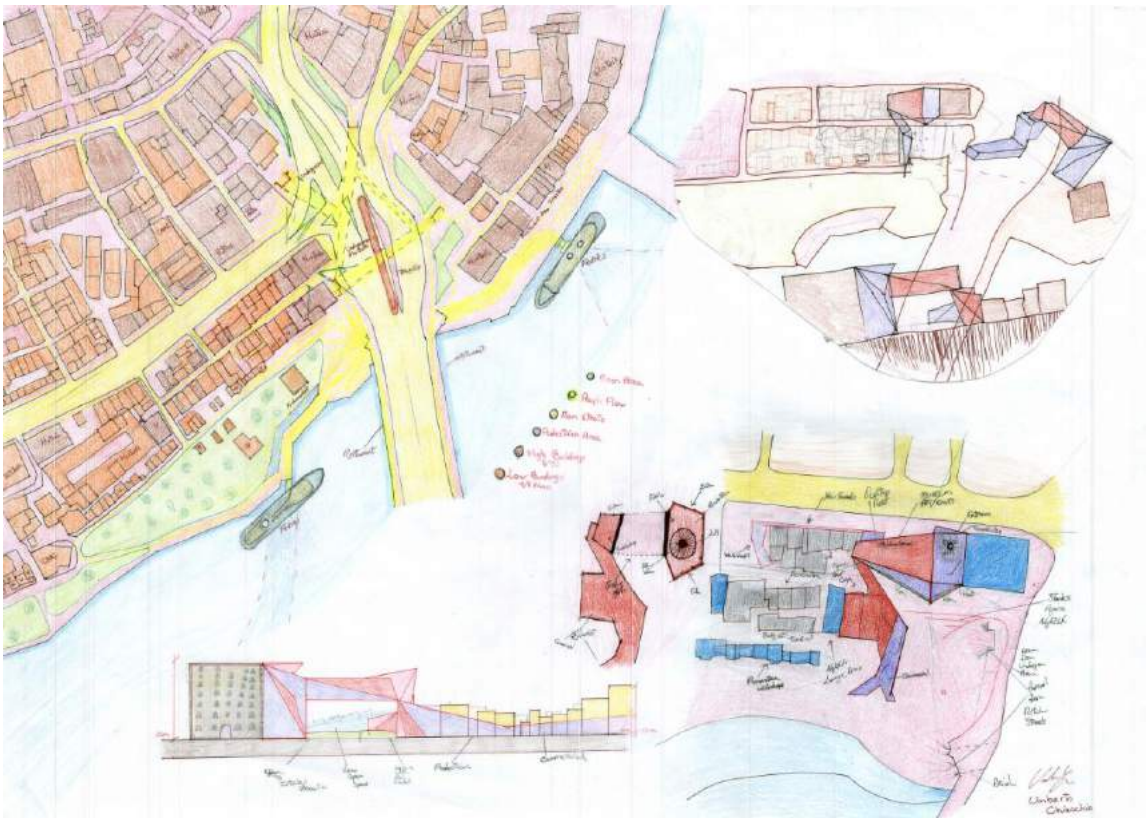


Galata map 19□□

Naval Minute Components Museum

The N.M.C.Museum of Karakoy is the result of a strategic and sustainable analysis on the district, history, economy, transportation, culture, touristic flow and of course needs of the growing population. The district is historically welded with the hand-made and machine-made production and commerce of all the small minute components for fishing boats, sail boats and ships. The old shops are specialized with small brass components and anchors, chain, oblò, bells lanterns, instruments, propellers and cleats. The museum mission is to keep alive this tradition and teach to the the job secrets.

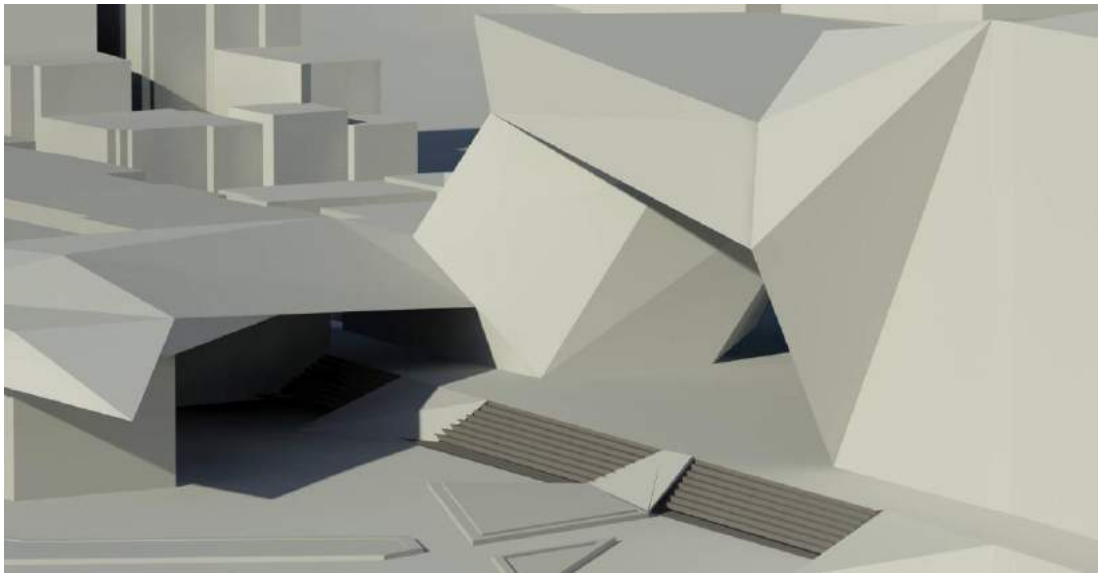
The Museum offers a rich overview: Air vents, Anchors, Belaying pins, Barrels wooden, Bells bronze, Binnacle, compasses, Boats, canoes and dugouts, Builder plates in brass, Buoys, Cannons bronze and iron, Chests, Cleats, Compasses, Dead Eyes, Deck prisms, Dive suits, helmets □ accessories, Figureheads, Flags, Flare pistols and guns, Floats, Fog Horns, Glass floats and jugs, Hatch covers, Liferings, Lobster traps, Maps and nautical charts, Navigational instruments — compasses, sextants, octants, chronometers, etc. Nets, Paddles and oars, Portholes, Pulley, Teak wood and ironwood table tops and panels in assorted sizes, Rope, Rope fenders, Scrimshaw, Ship clocks, Ship doors Ship grates, Ship lights and lanterns copper, brass and galvanized, Ship models, Ship's wheels/helms, Ship's key case, Signs handcarved and painted steering stations/Helms, Telegraphs Engine Signal, Telescopes and binoculars, Weather instruments barometers, anemometers, thermometers, hydrometers, Whaling harpoons, Woodcarvings doors, sea life, mermaids, pirates, figureheads. The Museum program: Museum, Exhibition, Auditorium, Workshop, Restaurant, Caf□, Shops, Square Urban Design and Green area.



design s□etches

Concept Design

The main concept direction is to dialogue with the existing built area situation giving a new technological light flawless all new structure that could be a new interesting reference point for Turkish people and tourists. The architectural sensibility pushed me to open again the two Italian small streets that went from 'Tall Galata' to the sea. Giving the possibility to people read the urban history of the area and enjoy the 'promenade architectural' through the old buildings and the modern museum area. The engineering approach suggested me to design a BRIDGE structure with the intent to put in straight communication the pedestrians with the sea, awesome view to the 'historical peninsula', and to the Suleymaniye New Mosque, Blue Mosque and the Santa Sofia which are the three more important Mosque in Istanbul. The bridge structure creates an important urban gap that gives the opportunity to people to feel included and protected within the relationship between the open/close area public/private area.



design

concept design

Project Upgrade

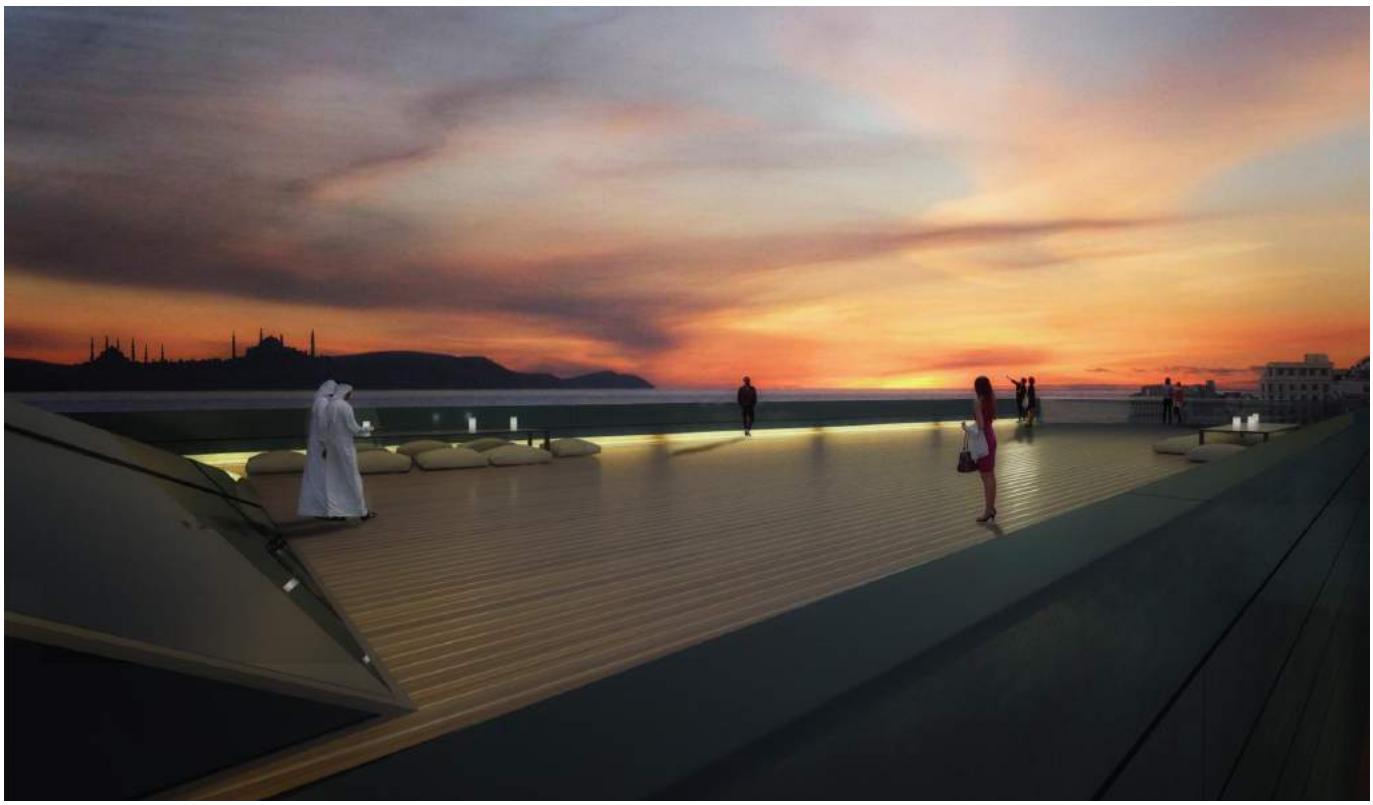
In this unusual structure the N.M.C.M had to find its place in a unique historic and spatial context, in which the museum needs to prove itself with an understanding of the character of the region, culture and morphology. It is a sensitive art adding new to old in a historic area. First of all there was the desire to understand the area's characteristics and then strengthen it but at the same time create something new and contrasting. In a context of small scattered houses, it is shaped by the interstices of this urban domestic fabric and establishes a new public domain. But in doing so it breaks into a horizontally overlapping body searching and stipulating a scale of transition. Architecture can change direction and approach dramatically when static, design and functional issues occurs. In the mature stage of the project the design focus was on a more tight, clean and remarkably dynamic design inspired by the pure dynamism of the exotic car design, high tech yachting, sailing boats trends, bridges, nature and shades of human body. Designing the urban gap as one of the centerpiece of the exhibition giving an open, outdoor/indoor area where visitors experience the scale and vibration of the old/new urban district approach. The interiors have a softer and clean energy. All floors are connecting exhibition spaces with the auditorium, workshop, office, café and the floor within the museum gently creating exciting and sculptural spaces. All technical components of control are placed in the basement, guaranteeing a subliminal operation of all operations of support systems. A lot of attention has been paid to sustainability, both in terms of services and the re-use and use of materials. The building has been fitted with a cold-heat storage system and natural materials have been used.

e□terior render

e□terior render

interior render

interior e□hibition



rooftop render

Le Vie dei Mercanti XIV International Forum
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Smart Design, Planning and Technologies
Aversa | Naples 16 - Capri 17, 18 June 2016

The thermal heritage of Vesuvius area. Splendor, decline, hypothesis for valorization

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Abstract
Hydrotherapy is a very ancient practice, but the frequentation of public baths reached its maximum expansion in Roman times, becoming for many a daily appointment, as evidenced by the remains of facilities found in all parts of the empire.
The therapeutic tradition never went completely lost, but the hydrotherapy had a new phase of development towards the end of the eighteenth century and especially in the nineteenth century, when it became the first type of tourism with the characteristics of what is called modern tourism, although still restricted to the aristocracy and the emerging middle class.
In this period Torre Annunziata and even more Castellammare, already holiday areas in Roman times, hosted great tourist flows linked to spa treatments, hosting international celebrities, exhibitions, cultural and musical events until the mid-twentieth century.
After the war, the coastal territory of Vesuvius has known a violent industrial and residential urbanization, that have altered the delicate environmental and landscape balance, leading to forms of urban decay and social hardship. Tourism has had a big decline compared to the golden times of the past, and does not represent a leading sector for the economy despite the great potential.
The relaunch of the spas, following on the nineteenth-century tradition of care and leisure offering, actualized both from the point of view of the treatments of modern spas, and the leisure tied to the natural and cultural richness of the area, properly developed through a network of communication and promotion of the territory, can be an important proposal for a rich and articulated itinerary, contributing to the tourism development of the Vesuvius area.

Keywords: thermal heritage, Vesuvius area, valorization, communication, tourism development.

1. Origins and development of thermalism
Hydrotherapy has ancient roots, but the attendance of the public baths reached its peak in Roman times, becoming for many a daily appointment, as evidenced by the remains of facilities found in all parts of the empire. During the imperial period, the previous establishments of relatively small dimensions were replaced by monumental complexes which also included other services, such as libraries, meeting rooms, lounges for parties, gymnasiums, swimming pools, parks, solarium, that made them similar to the modern health centers, intended not only as places of care, but also for recreation, meeting and socializing.
The therapeutic tradition never went completely lost, but the hydrotherapy experienced a new phase of development towards the end of the eighteenth century and especially in the nineteenth century, when it became the first tourism typology with the distinctive characteristics of what is called modern tourism, although still reserved to the aristocracy and the emerging middle class. (Battilani, 2001).
Many thermal resorts in this period reached great fame and acquired complexes appropriate to the needs of a growing number of visitors. Among the most popular destinations there were Bath in England, Spa in Belgium, Baden-Baden in Germany, Karlsbad and Marienbad in the Czech Republic, Aix-les-Bains and Bagn□res-de-Luchon in France.

A second period of great development occurred in the *Belle Epo□ue*, as demonstrated by the construction of several complexes in *art nouveau* style in many European locations. This is the period of maximum development of thermalism in Italy, whose main destinations were Montecatini, Salsomaggiore, San Pellegrino and Abano.

Fig. 1: The "Terme Tettuccio" in Montecatini.

The modern indications about spa treatments determined the architectural style of the spa complex, which continued to follow the tradition of the Roman facilities, leading to characteristic buildings called *Stabilimento* in Italy, *Bain* in France, □*urhaus* in Germany, with a central courtyard and rooms dedicated to the meeting and leisure in addition to those destined to care.
These architectures have become a symbol of cultural integration of the European countries, able to attract a large number of visitors both for the traditional features and the dispensed treatments, often combined with a landscape of great interest. For these reasons, the documentation of spas can be of great interest to preserve and enhance a testimony of landscapes, culture, traditions related to the European identity.
It can be argued that the nineteenth century spas, after centuries in which it was intended only for therapeutic purposes, follow-up directly the Roman tradition of place for cultural exchange and socialization, with the difference that the spas of the Roman period were essentially urban-type and intended for residents, while the nineteenth century thermalism assumed a dimension connected to the tourism, or the movement of people towards a spa center set in a pleasant place and in a non-urban context, that became a place for recreation and social life with attractions able to attract an international and wealthy audience.

2. The thermal heritage of the Vesuvius area. Splendor and decadence

Already in Roman times between the higher classes it had spread the phenomenon of holiday intended in the etymological meaning of residing for a certain period of the year out of the town in healthy and pleasant places, especially in the area of the Campania, near Rome and in Etruria. Among the Campania resorts there were Ischia, Capri, Baia, Miseno and Stabia, whose fortune as a holiday destination can also be attributed to the presence of thermal waters.
The presence of mineral springs in Castellammare was in fact known since the times of the ancient Stabiae, as evidenced by the writings of Pliny the Elder, Columella[1] and Papinio Statius. Pliny, in the XXXI book of the □*istoria Naturalis*,[2] first tried to divide the natural waters by classifying them

[1] Columella Lucio Giunio Moderato, *De re rustica*, I sec. D.C. wrote: "*Fontibus et Stabaie celebres*".
[2] Plinio Seniore, □*istoria Naturalis*, book XXXI.

according to the temperature and composition: he identified the sulfur, bituminous, the acidulous, salt and ferruginous, and tried to associate a specific therapeutic action to each of them.
Later, the coast between San Giorgio a Cremano and Torre Annunziata became a holiday resort and summer residence for the royals of Naples since the Angevin time, chosen for the healthy climate and the amenity. In the eighteenth century, the Vesuvius area became a meeting place for holiday and leisure for the noble and high bourgeoisie as an alternative to the west of Naples traditionally destined to these activities. (Di Stefano, 1979).
During the eighteenth century the towns of San Giorgio a Cremano, Portici, Ercolano, Torre del Greco, and of Torre Annunziata and Castellammare, were connected each other and with the city of Naples through the main axis of the old way of Calabrie, where prestigious villas were built for the noble citizens of Naples. Along the Vesuvius coast the villas were in direct relation with the sea, drawing the front of the coast between Castellammare and Naples. (Pezza, 2002, p. 88).
After the unification of Italy, the royal and noble residences were replaced by the buildings and villas of the bourgeois and intellectuals of Naples, and Castellammare gained increasing importance as a spa and seaside resort, combining the aspects of care and those of leisure. (Ghiringhelli, 2006).
Consider that the presence of hot springs, only in the town of Castellammare, offers 28 different varieties of water, divided into sulfur, calcium bicarbonate and medium mineral.
In his guide of 1846, Schivardi describes Castellammare both for the importance of its curative waters and for the beauty and charm of the place. “La città è rinomata per la ricchezza delle sue produzioni, per l’affluenza grande degli stranieri, per l’eleganza delle sue ville. Sul lido si veggono bagni con la forma di tempietti, di padiglioni, di chioschi, sempre aperti a chi vuole bagnarsi nel mare. Si passeggia lungo la marina respirando le fresche aure della sera nei calori del luglio. Si sale alla villa reale di Quisisana per un viale di castagni e il luogo fa onore al nome”. (Schivardi, 1846, p. 69).
The first establishment of the baths and mineral waters was built in the mid-nineteenth century to facilitate the use of thermal waters for therapeutic purposes, with a fairly simple floor plan consisting of a pavilion for the bathrooms and a large foyer with a main front in classicist style. (Caccioppoli, 1995).
The complex was the object of numerous enlargement and adaptation, including the creation of the famous Moorish Pavilion in 1883 by the architect Filosa, and the dispensing tub of wrought iron built in 1900 on the designs of the engineer Eugenio Cosenza. Since the late nineteenth century until its demolition in 1956 to make place to the actual complex, it hosted international celebrities, musical groups, art exhibitions, cultural and social events and celebrations.

Fig. 2: Castellammare. Facade of the “Terme Stabiane” in a period picture.

Fig. 3: Castellammare. Interior of the “Terme Stabiane” in a period postcard.

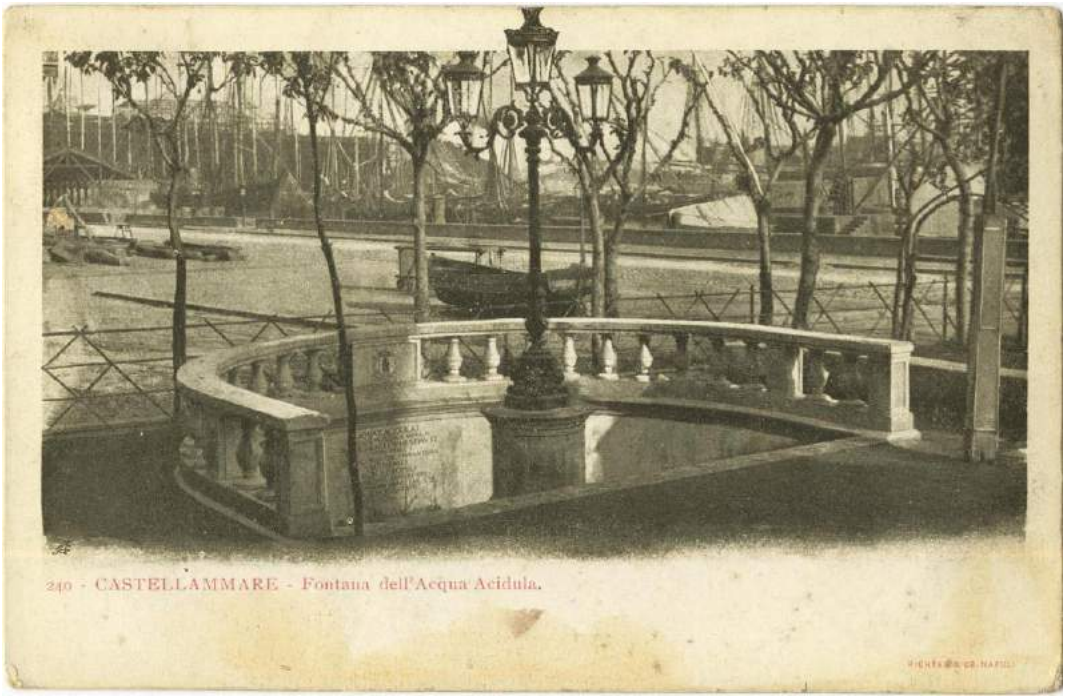

Fig. 4: Castellammare. The acidulous water fountain in a period postcard.

The importance assumed in that period from Castellammare as a tourist destination is evidenced by a series of tasks from the municipal administration for urban renewal projects, with the goal of bringing the city to the level of leading European thermal resorts. For example from the unrealized projects of the engineer Ercole Lauria in 1862 emerges the typical nineteenth-century conception of the spa resort as a place for leisure, so that the central hall was designed to be used also for shows.
As further evidence of the importance of Tourism in that time, Castellamare was protagonist of some tourism promotional posters signed by famous graphic designers as Riccobaldi and Puppo, (among the most active and well-known since the forties), that focused just on the presence of thermal water, evidently considered as the element more able to capture desires of the potential audience.

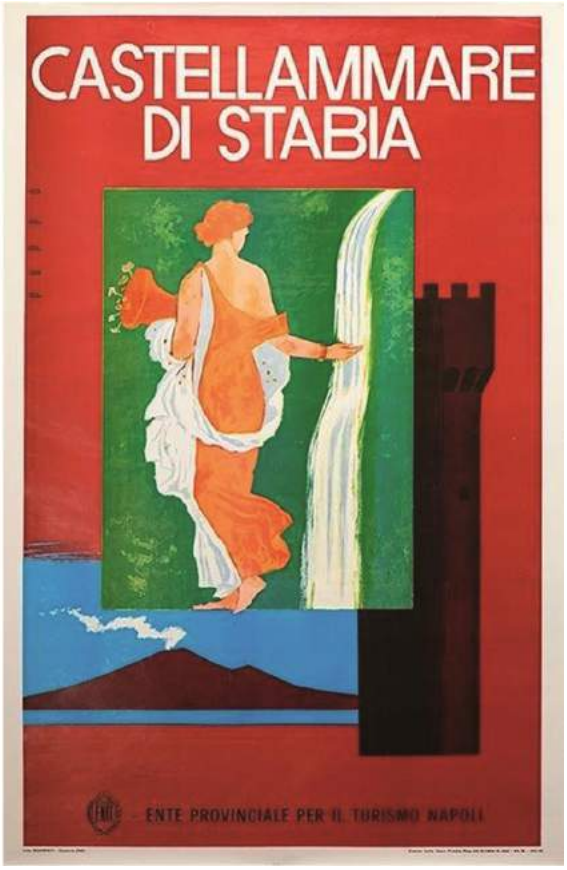

Fig. 5-6-7-8: Promotional posters of Castellammare. Gino Frattini, about 1950. Giuseppe Riccobaldi, 1948. Mario Puppo, 1954 and 1960.

Currently, the city offers three spas, the “Terme Antiche” open only a few hours a day to allow the collection of various types of water, The “Parco idropinico”, and the “Nuove Terme”, where it is possible to receive treatments for different pathologies. Moreover some waters, as the *water of the Madonna* and the *Acetosella water*, are bottled and distributed on the Italian and international markets. Also the town of Torre Annunziata was the seat of bathing and spa tourism. The hot springs in the area were already known in Roman times, as evidenced by the villas of Oplontis, including the famous villa of Poppea Sabina, the largest patrician villa discovered in Campania, that probably was the summer residence of the second wife of Emperor Nero, and inside included a private spa complete with all the rooms characteristics of public facilities: *calidarium, tepidarium* and *frigidarium*. (Fergola, Pagano, 1998).
In 1831, during the drilling of an artesian well, a team of engineers of the Bourbon army found part of the hydraulic system that fed the Oplonti baths, made by the Marcus Crassus Frugi consul in 64 a. D. and fallen into disuse during the Middle Ages. The director of operations, General Nunziante, ordered the construction of a spa center in the same place incorporating the ruins of the ancient complex, with the aim of renewing the practice of hydrotherapy. Thus arose the “Terme Vesuviane Nunziante”, repeatedly renovated to fit the needs of the times. In Bourbon period they acquired such importance that King Ferdinand II ordered to extend the rail route Naples - Portici to allow the sick to travel in Torre Annunziata to receive thermal therapies.

Fig. 9: Torre Annunziata. The “Terme Nunziante” in a period postcard.

Currently the Vesuvius Baths include a vast polyfunctional complex with sports facilities, gym, beach, tennis and catering, exceptionally favored by the suggestion of the environment, between the rock of Oncino and the volcanic sand beach.
After the war, the coastal territory of Vesuvius has known a violent industrial and residential urbanization, that have altered the delicate environmental and landscape balance, leading to forms of urban decay and social hardship. In this context, tourism has had a big decline compared to the golden times of the past and does not represent a leading sector for the economy, despite the great possibilities related to the landscape beauty of the coastline and the slopes of Vesuvius, the archaeological evidence of the ancient city of Pompeii, Herculaneum, Oplontis and Stabiae, the Vesuvian villas of the Golden Mile, the palace of Portici and Quisisana in Castellammare, in addition to the presence of hot springs in the towns of Castellammare and Torre Annunziata.

3. Hypothesis for valorization of the thermal heritage

Already in the Regional Operational Program 2000-2006, the Campania Region identified as one of the strategic objectives for the development and tourist enhancement the "Integrated Project Thermal Chain", which aimed to involve all the thermal municipalities of Campania, whether coastal or interior, in a single and coherent development plan to constitute a whole and articulate regional spa offer.

Also the Strategic Plan for the enhancement of cultural heritage 2007-2013 related to the territorial area called "STS F3 Golden Mile Torrese-Stabiese", which includes the municipalities of the coastal slope of Vesuvius from the east of Naples to Castellammare di Stabia, includes among its strengths the presence of important thermal resources in Castellammare and Torre Annunziata.

Despite these indications, today there isn't a network of valorization, either of the spas each other, either within the territory of Vesuvius for the promotion of different aspects - natural, cultural, thermal, bathing - that could characterize the tourism offer.

Putting the offer into a network and adapting it to the specific needs of the national and international demand, coupled with the creation of appropriate accommodation services and transport, is instead a primary strategic objective to be pursued so that the potential of the area can be expressed and valued making a system, in which the main and most well-known attractors can pull also the less known heritage.

The reports on the Italian and international tourism show that in recent years there has been an evolution of cultural tourism from more traditional forms, based on the visit of single museums and monuments, to more dynamic and participatory forms, such as the tourism of the territory, the landscape tourism, the urban tourism and the training tourism. (Cusimano, Giannone, 2007).

At the same time, there has been an evolution of the concept of cultural heritage, which from single site or monument expanded to include also intangible dimensions of culture, so it is necessary to satisfy a cultural demand more and more varied and specific, from cultural landscapes to cities of art, from artistic production to crafts, traditions, styles and habits of the local population.

So are now emerging new proposals related to cultural tourism that are oriented towards a "creative tourism",[3] that is a mode of active involvement and participation of the user through innovative uses of the sites, such as shows and events where tourists take part in the performance, or cultural itineraries where you can learn the local culture. (Piscitelli, 2011).

The campaigns for tourism promotion are adapting to these new demands, and many communication campaigns addressed to the cultural and creative tourism aim to emphasize the variety of experiences that you can live in a place. In this perspective, it becomes important for a place to try to root in some way its cultural events, to make them impossible to reproduce in other contexts. Basically it means to think in terms of building a site instead of marketing it, to design a cultural route, to promote and communicate it by relying on the most authentic, grounded and true aspects of the place.

Managing this evolution, cities and regions increasingly need to add to their traditional role as guardians of culture, the capacity of management, invention and creation of culture. It is in fact increasingly evident that to be attractive and competitive in the panorama of European tourism offers it is necessary to adopt new modes of representation and integrated communication for the development of specific local identities, through the identification of an idea-vocation of the area and the motivation of the local community for a constructive coexistence with tourism.

The relaunch of the spas, following on the nineteenth-century tradition of care and leisure offering, actualized both from the point of view of the treatments of modern spas, and the leisure tied to the natural and cultural richness of the area, properly developed through a network of communication and promotion of the territory, can be an important proposal for a rich and articulated itinerary, contributing to the tourism development of the Vesuvius area.

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[3] "Creative tourism is travel directed toward an engaged and authentic experience, with participative learning in the arts, heritage, or special character of a place, and it provides a connection with those who reside in this place and create this living culture".
Definition adopted from UNESCO in: UNESCO Creative Cities Network, *Towards sustainable strategies for creative tourism. Discussion report of the planning meeting for 00 international conference on creative tourism*. Santa Fe, New Mexico, USA, October 25-27 2006.

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Virtual architecture: 3D representation in archeology - a new approach to the presentation of ancient architecture –

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Abstract
Reconstruction based on studies, drawings, plans and literature credited along with a reworking scientific suitable to increase the three-dimensional realism. Especially the lighting simulation of light will be assisted by the latest technologies that embrace the techniques of photon mapping and Importons and Irradiance Particles from the latest discoveries in the field of simulation of materials using the calculation algorithm called BRDF (bidirectional reflectance distribution function) with regard to the reflections of the surfaces.
The next step to the description of the project is the implementation of the work in an archaeological context plausible with extremely realistic by adding plants typical of the place and the climate of the place. Of high importance is the presence of objects, tools and all the tools accredited by written evidence that framed the environment giving a sense of lived and permeated the scenes of daily life.
The software suggested for this type of analysis and creation are:

- Generic software of polygon modeling that supports the subdivision mesh (OpenSubdiv) uses advanced software technology from Pixar for modeling and animating subdivision surfaces on massively parallel CPU and GPU architectures.
- Generic software that is specialized in the simulation of the tissues, for example Marvelous Designer
- Generic software for modeling realistic vegetation, for example SpeedTrees, ideal for creating realistic foliage in architectural visualization projects, delivering fast procedural modeling and rendering of a vast range of highly detailed animated trees and plants.

The complete three-dimensional model will be developed on two types of multimedia platforms, the first, light usable mainly on portable devices such as phones and tablets equipped with GPS, accelerometer and gyroscope. The second usable on professional platforms equipped with adequate hardware sector to ensure a more effective experience exploratory virtual archeology. Platforms suggested for this purpose are respectively Unity 3D and Unreal Engine.

Keywords: 3d – 3d archeology – Modeling - rendering

1. New BRDF in light simulation
Reconstruction based on studies, drawings, plans and literature credited along with a reworking scientific suitable to increase the three-dimensional realism. Especially the lighting simulation of light will be assisted by the latest technologies that embrace the techniques of photon mapping and Importons and Irradiance Particles from the latest discoveries in the field of simulation of materials using the calculation algorithm called BRDF (bidirectional reflectance distribution function) with regard to the reflections of the surfaces.The deadline for submission of full papers is March 25th 2015. After that date, papers will not be considerate for oral presentation and publication. lighting simulation processed by one of the houses of hardware and software world's most famous: NVIDIA. As the world leader in visual computing, NVIDIA constantly advances visualization by developing rendering technologies that leverage the most advanced GPU architectures and compute languages.

NVIDIA solutions range from the underlying technologies for building or accelerating custom rendering applications, to complete rendering solutions shipping within leading 3D design and entertainment applications.

2. NVIDIA Iray

NVIDIA Iray is a highly interactive and intuitive physically based rendering technology that generates photorealistic imagery by simulating the physical behavior of light and materials. Unlike traditional production renderers, Iray delivers results reflecting real-world behaviors. Designers don't need expert knowledge of computer graphics techniques to quickly achieve photorealistic results.

Iray progressively refines its image until completion, providing consistent results from interactive editing to final frame. It's a highly predictive approach that marries with the scalable, world-class performance across NVIDIA GPUs to give constant feedback and rapid results. This slashes the time needed to perfect scenes and deliver images rivaling photographs.

Iray is a high-performance, global illumination rendering technology that generates imagery by simulating the physical behavior of light interaction with surfaces and volumes. Images are progressively refined to provide full global illumination including caustics, sun studies, and luminance distributions.

3. Global Illumination

Global Illumination works from light sources that emit photons into the scene, bouncing them around to deposit indirect illumination on the surfaces they strike. This illumination is typically cleaned up using Final Gather and then combined with direct illumination and surface finishes to produce a final render. I find that Global Illumination is essential for most interior scenes and is not generally as useful for exterior scenes. Exterior scenes that use Final Gather with a daylight system often produce great results without adding Global Illumination.

That said, Global Illumination can be effective for specific outdoor scenes and can greatly boost illumination, as I cover later in this chapter. Final Gather was first used as a cleanup mode for Global Illumination, eliminating the need for exceptionally high settings for photons and removing noise from the Global Illumination solution.

Although Final Gather has improved greatly over the years, the combination of Global Illumination with Final Gather often produces the best results with the least amount of render time.

The photons for Global Illumination and Caustics are two-dimensional points in 3D space and are bundles of red, green, and blue (RGB) light energy emitted from a light source. Each photon carries only a portion of the energy from a light source; the total RGB color energy of each light is divided by the number of photons emitted by that light. Brighter lights in a scene emit more photons than dimmer lights to help even out the Global Illumination solution. This way each photon has a more similar weight and a more even distribution. Photons are reflected off diffuse surfaces in your scene, transporting color energy from surface to surface. The photon method of producing indirect illumination is closer to what occurs in nature, and photons can trace through reflections, can bend through refractions, and are absorbed and reflected by surfaces in a scene. A diffuse surface, however, is required for a photon to have an effect on that surface, because mirrored and transparent surfaces will reflect or refract a photon and not store the photon's energy.

There are two diagnostics modes for Global Illumination: Photon Density and Irradiance. They each produce color images with blue, cyan, green, yellow, and red, and each color represents a different quantity of photons or value for irradiance. On the blue end of the spectrum, the value is always zero photons or irradiance.

Photon Density is a representation of your scene with colors ranging from dark blue at the lowest photon density to cyan, green, yellow, and red, with each progressively "hotter" color representing a relatively higher density. The Photon Density diagnostics mode is useful for identifying the overall coverage of photons in your scene and helps determine whether adjustments need to be made to photon quantity to ensure all surfaces have an even coverage in photons. The left side of Figure shows Photon Density, and in this case Blue is 0 photons, Cyan is 591 photons, Green is 1183 photons, □ellow is 1775 photons,

and Red represents 2367 photons, which is the maximum density in this rendering of half the Sponza image. Irradiance Irradiance is defined as the "area density of flux" and is measured in watts per meter squared (W/m□2). This diagnostics mode shows the relative brightness of the stored photons in the same color scheme as Photon Density. On the right side of Figure, Blue is 0 irradiance, Cyan is 4949 W/m□2, Green is 9918 W/m□2, □ellow is 14878 W/m□2, and Red is 19837 W/m□2, as read from the Render Message dialog box. It only displays the irradiance of the photons and not direct illumination or Final Gather.

4. Importons and Irradiance Particles

Importons and Irradiance Particles are two relatively new indirect illumination technologies in mental ray. The term Importons is short for "importance photons" and is a technology that minimizes Global Illumination data based on how important a rendered area is to the illumination of the final image. Importons allow you to emit more photons into your scene; they keep just the photons you need for your image to reduce the memory requirements that high photon numbers might require.

Importons also work with the next technology, Irradiance Particles. Unlike the other indirect illumination technologies, irradiance particles calculate direct and indirect illumination for every particle. Importons determine the placement of irradiance particles on surfaces in your scene, ensuring that irradiance particles are placed along the most important regions of your image. Irradiance particles can replace Final Gather and Global Illumination for use in scenes, and they produce faster and higher-quality renders in many cases. Irradiance particles have a set of parameters similar to Final Gather, and they can produce image-based lighting effects that include shadows.

Both importons and irradiance particles are evolving technologies and continue to improve with each release of 3ds Max/Design and mental ray.

Importons are "importance-driven" photons used to clean up and optimize Global Illumination in your scene and to define where mental ray stores irradiance particles. Like Global Illumination photons, importons are distributed throughout your scene by bouncing from surface to surface; however, unlike Global Illumination and Caustic photons, importons do not distribute light energy and are emitted from cameras instead of light sources. Rather than transferring light energy, importons measure how visible a surface is in the final image and how the illumination at a point contributes to the final image. Objects shown in a reflection, for instance, would receive less importance — and less attention at render time — based on its visibility within the reflection. Less important areas have their photons merged in varying amounts depending on their contribution to the image. Merging photons transfers the illumination from the merged photons into the remaining photon, and energy is never lost. This intelligent merging helps improve the quality and smoothness of the Global Illumination solution and greatly reduces the memory requirements because fewer photons are stored. The PMAP file size will be a small percentage of the size it would be without importons, and although the new PMAP size depends a lot on the content of your visible scene, file reductions of 90 percent or more are common.

Rendering with importons adds another preprocessing phase to the rendering of your image which happens before Global Illumination photons are emitted from light sources or before irradiance particles are generated. There are no visual diagnostics modes for importons because they are discarded right after they are used by Global Illumination or irradiance particles; however, you can see the end result they have on Global Illumination with the Global Illumination visual diagnostics modes. As with Global Illumination calculation, with importons creation, there is no visual feedback to the user beyond what is visible in the Render Message dialog box. 3ds Max/ Design displays the "Current Task: xx.x Rendering" status in the Rendering status dialog box as importons are emitted and importance calculated.

5. Simulating Light with Maxwell render: great result

Other software capable of achieving highly realistic representations is Maxwell by Next Limit Team.

Maxwell Render is a standalone render engine for making perfect images, films and animations from 3D models. It is the complete solution for anyone who demands immaculate results on a deadline.

Offers maximum quality, speed, and compatibility for architects, designers and visual effects artists.

Maxwell Render is impeccably accurate, because its engine is based on the physics of real light - so this means predictable and beautiful results with a lot less tweaking.

The Maxwell Render camera is designed to work like a real camera so it is important to understand some photographic concepts. One is exposure, the other depth of field. Understanding these two concepts is a crucial first step towards your virtual photography with Maxwell and we recommend reading carefully through this page if you are not already familiar with them. If you're already an amateur or pro photographer then you will feel right at home with the Maxwell camera.

In Maxwell V3 we introduced the concept of material **Types**, which use a reduced set of intuitive parameters that greatly simplify and speed up the material creation process. These are the current simplified Types available:

- Metal (all kinds of metals)
- Opaque (any kind of opaque diffuse or shiny materials such as solid plastics, shiny wooden floors, concrete etc.)
- Transparent (all transparent glass and plastic materials which are not translucent - ie, they do not have sub surface scattering)

- Translucent (all transparent and semi transparent materials which are translucent - plastics, marble, milk)
- Car paint (for creating multilayered paints such as metallic car paint)
- Cloth (useful for velvet, satin, and any other types of cloth)
- AGS (special transparent material useful for speeding up interior renders).
- Emitter (for creating light emitting materials and light projectors)
- Custom (this simply switches the material editor to the advanced version)

At the heart of the Maxwell material system is the BSDF (which stands for Bidirectional Scattering Distribution Function, - a set of algorithms that describe how light interacts with various material types). The BSDF contains all the parameters needed to create many different types of materials, ranging from clear glass to sandblasted glass, plastics, metals and translucent materials such as skin, porcelain, and wax. The most simple materials are created with one single BSDF, while others are a mix of several BSDFs, or even several Layers containing several BSDFs

6. Plants: botanic in virtual world

The next step to the description of the project is the implementation of the work in an archaeological context plausible with extremely realistic by adding plants typical of the place and the climate of the place. A generic software for modeling realistic vegetation, for example SpeedTrees or , is ideal for creating realistic foliage in architectural visualization projects, delivering fast procedural modeling and rendering of a vast range of highly detailed animated trees and plants.
SpeedTree is a powerful toolkit used to create 3D animated plants and trees for games, animations, visual effects and more.
Easily export cached SpeedTree models into the open Alembic framework (.abc) for exchanging animated scene data with popular platforms like Maya, Houdini and 3dsmax.

Of high importance is the presence of objects, tools and all the tools accredited by written evidence that framed the environment giving a sense of lived and permeated the scenes of daily life.
The software suggested for this type of analysis and creation are:

a) Generic software of polygon modeling that supports the subdivision mesh (OpenSubdiv) uses advanced software technology from Pixar for modeling and animating subdivision surfaces on massively parallel CPU and GPU architectures.
b) Generic software that is specialized in the simulation of the tissues, for example Marvelous Designer

The software of choice for the kind of modeling in high detail is 3dsmax for this proposal.

7. Immersive 3d space

The complete three-dimensional model will be developed on two types of multimedia platforms, the first, light usable mainly on portable devices such as phones and tablets equipped with GPS, accelerometer and gyroscope. The second usable on professional platforms equipped with adequate hardware sector to ensure a more effective experience exploratory virtual archeology. Platforms suggested for this purpose are respectively Unity 3D and Unreal Engine.

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A "stream of culture": an integrated approach between urban developments and historical water infrastructures[1].

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Abstract
The Rideau Canal, located between Kingston and Ottawa, Canada, has been a World Heritage Site since 2007. It was added to the World Heritage List (WHL) for being an excellent example of a slack water Canal in North America, as well as for its continued use throughout the years. UNESCO nominated this site in the WHL according to two criteria: for being a tangible representation of human creative genius and for representing an outstanding example of a type of infrastructure on a territorial scale, illustrating a significant stage in human history. Stressing the relationship between the Rideau Canal and the redevelopment of one specific area crossed by it - Lansdowne Park, Ottawa – this study outlines criticalities and challenges between urban development and cultural landscape conservation. The paper addresses these issues considering the Canal's current safeguard actions within its buffer zone and evaluating the gaps between the protective measures outside the small buffer zone and the management of changes along the Canal. This analysis is developed through an in-depth study of current management plans, policies and legislation related to the protection of the Rideau Canal and the various stakeholders involved. Final remarks concern a comparison with a similar site in Milan, Italy. This correlation outlines alternative strategies for a sustainable integration - from the cultural, social and economic point of view - between water infrastructures and urban developments.

Keywords: Water Infrastructure, Urban Development, Cultural Landscape, UNESCO, Buffer Zone.

1. Introduction
As the Heritage profession continues to expand its traditional boundaries to integrate different disciplines and ways of thinking about heritage, the use of cultural landscapes has provided a way of integrating these various heritage elements and approaches within a space to conserve them for both current and future generations; yet, how truly protected are these landscape elements when development outside their official borders and buffer zones are occurring? Taking the Rideau Canal as a case study, and through an in-depth analysis of its physical changes over the last century in a specific section selected, this paper aims to analyze the critical issues associated with the corridor cultural landscape of the Canal and the protection limits of its buffer zone, focused on the urban

[1] While the four authors have contributed equally to the paper, Davide Mezzino wrote the paragraphs 1. Introduction,paragraph 2.The management of the canal: stakeholders and paragraph 5. Conclusions; Giovanni Castaldo wrote paragraph 4. The case of the Darsena project in Milan; James Arteaga wrote paragraphs 3. Recent changes: Lansdowne Park redevelopment; and Tatiana Kirilova Kirova wrote the Abstract.

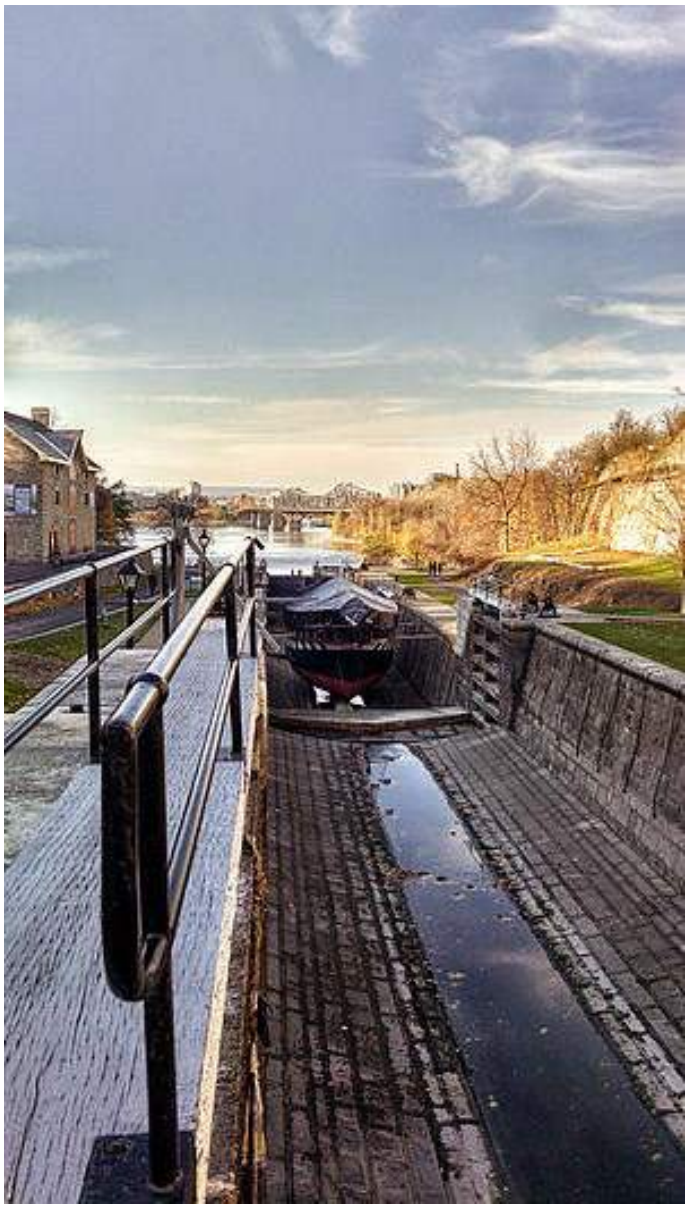

Fig. 1: The Rideau Canal locks and their connections with the Ottawa urban landscape. Photo by James Arteaga.

context. The paper provides an overview of the various stakeholders and outlines critical aspects of the current legislation system, underlying the lack of integration between heritage and urban planning policies.

Furthermore, this study provides a comparison with the Darsena Canal in Milan, Italy. This Canal was part of the broader system of water infrastructures that featured the city of Milan from the Middle Age until the XX century, when most of them were buried. The recent interventions of the Darsena Canal in the south area of Milan are presented. The comparison with the Italian case study outlines how historical infrastructures as tangible elements of identity can be the driver of a sustainable urban development from the social, cultural and economic point of view.

1.2 Historical framework: the Rideau Canal

In response to the War of 1812 between British North America (Canada) and the recently independent country of the United States, the Rideau Canal was built as a defensive measure by the British government. [1]

Lieutenant-Colonel John By of the Royal Engineers Corp was appointed supervisor of this extravagant project that would become one of the largest projects conducted in the British Empire. [2] The purpose of the Rideau Canal was to provide an alternative route to reach the Great Lakes from Montreal and Kingston without the need to use the St. Lawrence River, which in many parts was the border between the two countries and could have potentially severed trade in the British colony. [3]

Construction began in 1826 and was completed in 1837. It was originally owned by the British Government until responsibility was taken over by the Canadian Department of Railways and Canals in 1855 [4]. Within the scope of the project, 47 masonry locks and 52 dams that spread along the 202 kilometers of the Rideau Canal were built [5]. Fortunately, the Rideau Canal, was never needed for defensive purposes; but instead, was a transportation route between the 19th and 20th century. In 1972, because of the major recreational use of the Rideau Canal, it was transferred from the Department of Railways and Canals (currently the Department of Transportation), to Canadian Parks Service [6] (currently Parks Canada) [7]. The first recognition of the Rideau Canal as a significant heritage structure was in 1926 when it was commemorated for its 100th anniversary and became a National Historic Site of Canada [8].

In 2000, The Rideau Waterway, which includes the Rideau Canal and the Rideau River, was designated as a Canadian Heritage River for its outstanding natural, cultural and recreational values, as well as its high level of public support [9]. Seven years later, the Rideau Canal was added to the World Heritage List[2] because it was the most well preserved example of a slack water Canal in North America and it was one of the oldest Canal that remained operational throughout the years. All main

[2] The Rideau Canal fulfilled two criteria's during the nomination process which allowed it to be added to the List: 1) "Criterion (i): Represents a masterpiece of human creative genius; 2) "Criterion (iv): An outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage (s) in human history. Source: http://whc.unesco.org/en/list/1221 Accessed on Sunday, April 1, 2016.

elements of the Canal, including its various related structures were preserved including: fortifications, dams, watercourses and bridges, as well as hand-powered winches, and the physical form of the channels that have remained intact. As identified by the UNESCO nomination, all elements of the nominated area are protected at the Canadian national level under the Historic Sites and Monuments Act of 1952 and 1953 [10].

2. The management of the canal: stakeholders and actors

The specific section selected for this analysis is located in the capital of Canada, Ottawa and is bordered by the Bronson Street Bridge in the west, Lansdowne Park on the east and goes through the well-established neighborhoods of the Glebe on the northern edge and Old Ottawa South on the southern edge of the Canal.

The analysis was conducted through, historical research utilizing historical aerial photos going as far back as 1958, archival personal photos, engineering plans and historical perspective maps. In addition, Library and Archives Canada was used to collect historic Fire Insurance Maps of Ottawa that dated back to June 1878. Along with these sources of information, stakeholders' websites were heavily used to understand what role they played in the development, creation, and maintenance of the Rideau Canal over the years, including: Parks Canada, The National Capital Commission (NCC), the Province of Ontario, and the City of Ottawa.

2.1 The Neighborhood: the Glebe

The Glebe is one of the oldest suburbs in the City of Ottawa, and is located south of Parliament Hill and the downtown core. The Rideau Canal, together with Dow's Lake defines the southern, eastern and western borders of the neighborhood. It is a major contributor to the landscape of the Rideau Canal and is home to Lansdowne Park.

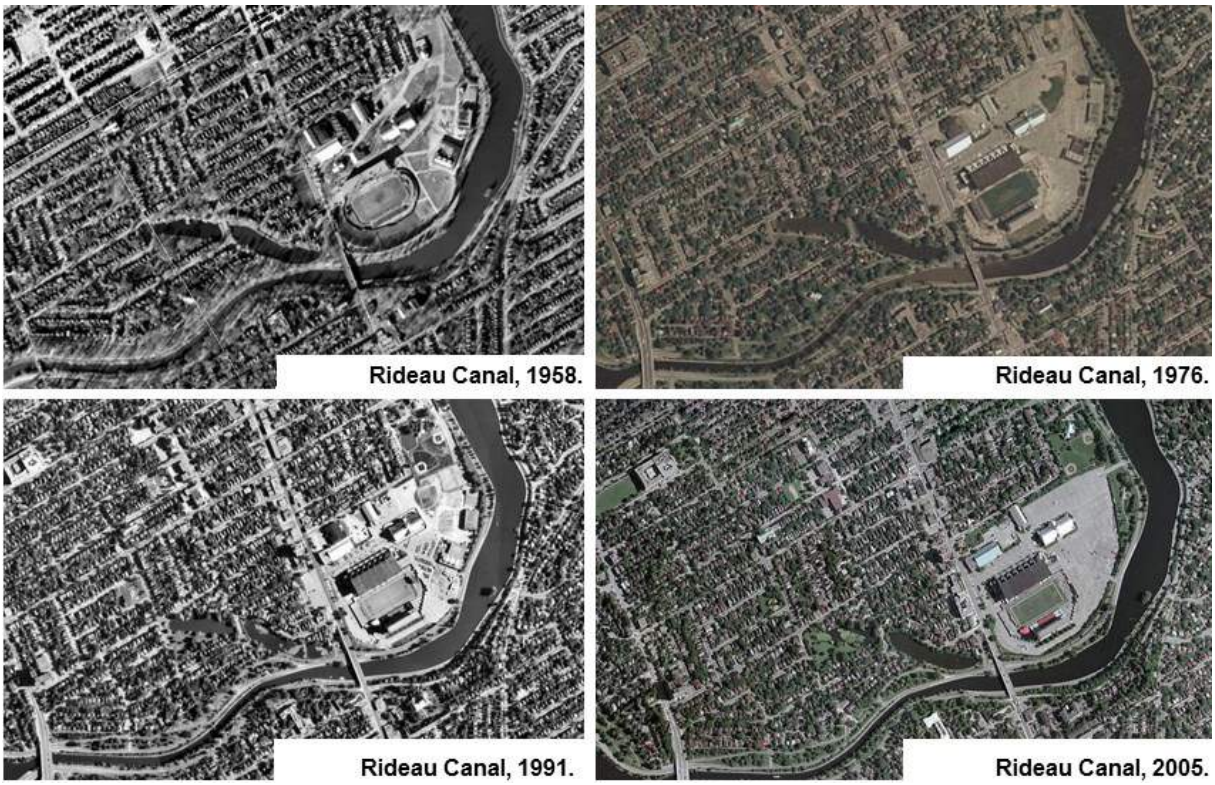

Fig. 2: Historical aerial photos employed in the site analysis. Image source: http://jamesarteaga05.wix.com/rideau-canal#!aerial-photographs/c1ayy Accessed on Saturday, October 3, 2015.

Until the 18th century, the land that the Glebe neighborhood occupies was used for hunting activities by the Algonquin peoples. In the 1800s, the forest area was cleared, and divided into lots, to be settled and built on. Even after the building of the Canal, in the 1840s, the land was mostly used for agriculture. The land was not considered valuable until the end of the century when the residential neighborhood started to be developed.

In 1868, the Ottawa Agricultural Society acquired a portion of the land, where Lansdowne Park is currently located, for the purposes of a fairground, which made the Glebe an area where people went for sporting events.

In the 1910s, the area became a truly urban area; many churches and schools were built, as well as residences and stores. In this period the Queen Elizabeth Driveway was built, slightly altering the original path of the Canal. The additional residences within the neighborhood built in the 1950s were considered to be one of the last significant physical changes along the Canal within the Glebe area.
Currently, with its high-end residential market, a main street with shops and restaurants and a very involved community, the Glebe continues to keep the feeling of a small town alive within the downtown core of the Capital.

2.2 The Rideau Canal: Stakeholders

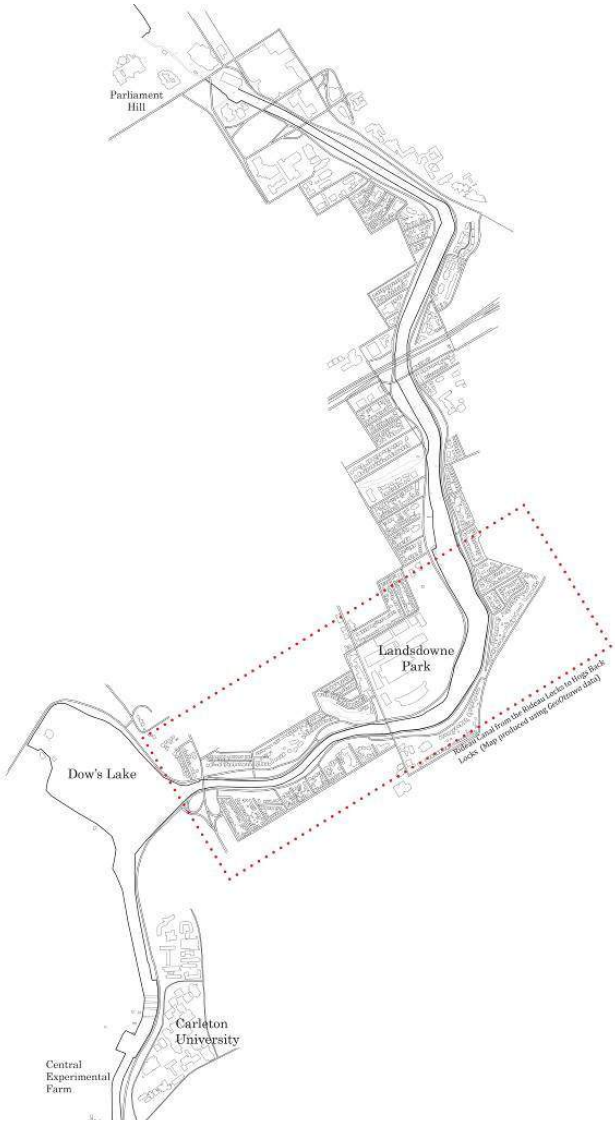

Fig. 3: Map showing the morphology of the Rideau Canal from the Rideau River to Mooneys Bay.

Due to the vast size of the Rideau Canal, there are multiple stakeholders and actors who have a role in the protection and maintenance of this important landmark. These include: government organizations, community-based non-profit groups, private landowners and of course the indigenous communities that identify themselves with land around the Rideau Canal. For the purposes of this critical analysis, three specific stakeholders were identified for their direct involvement with the Rideau Canal in the selected section. These included Parks Canada – the owners of the Rideau Canal and mandated to '...protect and present nationally significant examples of Canada's natural and cultural heritage, and foster public understanding, appreciation and enjoyment in ways that ensure the ecological and commemorative integrity of these places for present and future generations.' [11], the National Capital Commission (NCC) – the owners of the riparian lands and mandated to 'responsible for planning, as well as taking part in the development, conservation and improvement of Canada's Capital Region.' [12], and the City of Ottawa – the municipality in which the Canal is located.

2.2.1 Parks Canada

The Rideau Canal, as previously mentioned, is currently owned by Parks Canada. Because of this, it is the primary organization responsible for the protection and maintenance of the Canal. It was Parks Canada who created the Rideau Canal Management Plan (2005), which was to be the ideal vision of the Canal within a fifteen years span (ending in 2020) and was meant to be reviewed every five years to make any necessary revisions. It is within the Management Plan that the Rideau Canal buffer zone was identified as being a 30 meters setback from the shoreline for all new constructions and also required a frontage of 50 – 75 meters for waterfront lots. [13] In addition to the Management Plan, Parks Canada developed Ten Principles for Good Development along the Rideau Canal. [14]

1) Understand the landscape character;
2) Conserve wetlands;
3) Maintain a natural shoreline;
4) Set back development from the shorelines;
5) Plan the site to retain natural vegetation;

6) Preserve historic buildings and cultural features;
7) Appropriate building design;
8) Low impact dock design;
9) Minimize discharges to the Canal;
10) Seek further advice

The plan also mentions the strong role the municipalities along the Rideau Canal have in controlling the scale, location and type of development in the buffer zone. It is also interesting to note that the plan also mentions how municipal governments are 'to ensure that consideration [is] given to the conservation management of lands beyond the 30-m buffer zone, particularly where development has the potential to degrade the heritage values of the nominated property.' [15]

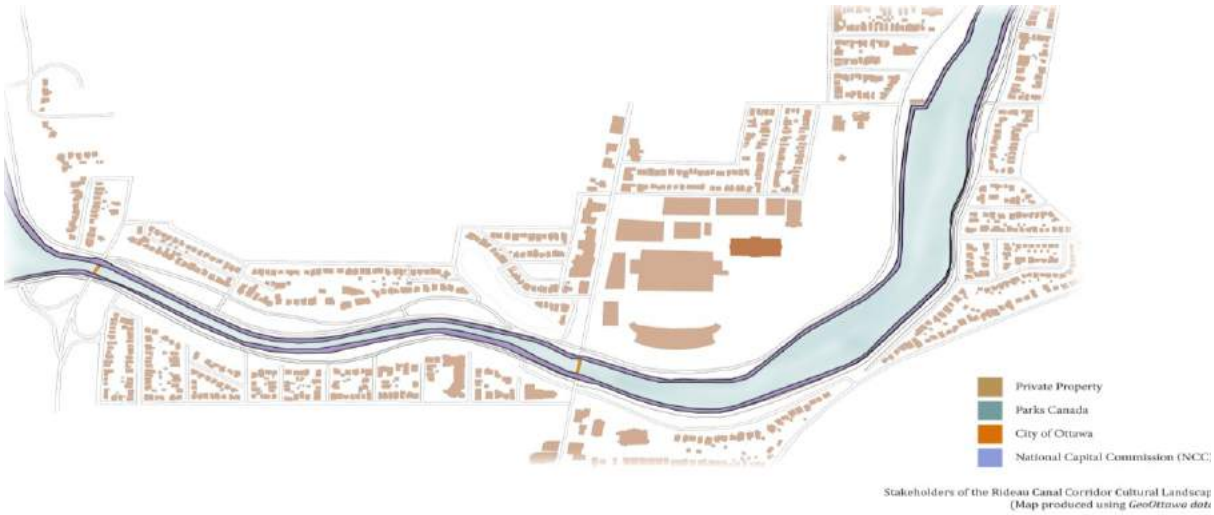

Fig. 4: Map showing the land stewardship of the different stakeholders within the research area.

2.2.2 City of Ottawa

As mentioned in the Management Plan (2005) municipalities have a major role in maintaining the buffer zone along the Rideau Canal. The City of Ottawa is responsible for the management of change on both private and public lands through zoning by-laws as mentioned in the Rideau Canal Management Plan. The Official Plan of the City of Ottawa retains a section dedicated to Cultural Heritage Resources. In this section, it identifies various aspects of heritage conservation including, how to protect and designate a property. The most interesting thing in this section is that it identifies major cultural landmarks such as the Rideau River and Canal corridors, scenic-entry routes, and multi-use pathways. These unique features of Ottawa have special regulations that are outlined in this section providing specific guidelines about the management of these unique travel routes. It also provides regulations and procedures that are needed to be done before anything is approved for development. [16] Currently, the city has designated the riparian lands adjacent to the Rideau Canal as Open Space (Zoning by-law O1L[310]-h), which restricts much of the development that could potentially occur on the land [17] [18].

2.2.3 National Capital Commision

The National Capital Commission (NCC) - who identifies the Canal as an important landmark and cultural landscape in the Capital Region - owns the riparian land along the section of the Canal located in the Glebe and Old Ottawa South. Currently, much of this land is only used as part of the scenic roads network found in Ottawa, which is owned and operated by the NCC [19]. Because the NCC is responsible for the management of these lands, it has a major role in the protection of the Canal's cultural landscape. In addition to this, the NCC has identified the Queen Elizabeth Driveway scenic route adjacent to the Canal as a landscape within itself, and would therefore increase the sensibility of any development adjacent to this specific section of the Canal [20].

3. Recent changes: Lansdowne Park redevelopment

Despite the efforts of the various stakeholders to protect the cultural landscape character of the Rideau Canal with different legal measures, one development along the Canal has brought the issues of heritage legislation/policy and its power - or lack thereof - to protect heritage assets, specifically cultural landscapes in dense urban areas, to the public's attention.

The Lansdowne Park project has been a very controversial redevelopment project that was completed in 2014. Led by one of the biggest developers in Ottawa, the project aimed to restore and create a new sports stadium, build commercial and office space, and construct condominium apartments on the site of the previous Canadian Exhibition Place - home to various heritage buildings such as the Aberdeen Pavilion. Regardless of different opinions concerning whether or not the project was successful in beautifying the area, it seems as though the project did not take into consideration the significance of the redevelopment area's proximity to the UNESCO site boundaries and its implications to the Rideau Canal cultural landscape.

After analyzing the gradual morphological change along the Rideau Canal's Corridor Cultural Landscape, one is able to see the drastic change that has occurred at Lansdowne within a short time. Because of its location, its proximity to various heritage sites, and its cultural significance to the community, there were many concerns regarding the grand scale redevelopment project. To comply with the desires of the development group, the city was required to transfer 25% of the public land available at the site to the hands of private ownership in order to accommodate the new shops, offices, and condominiums. [21] This resulted in significant alterations and, in one instance, to the relocation of a designated heritage building from its original location, which is against heritage principles and guidelines. [22] Also, numerous high density residential buildings towering the existing site and the community surrounding it, puts into question the compatibility of the development in relation to the existing urban fabric. And yet, with all these changes on top of the site, the most infringing aspect of this project was the infringement of the protected view planes that were identified in the Aberdeen Pavilion's heritage conservation easement – an easement being a legal document of protection between the owner and the government well as the view planes of the Rideau Canal [23] [24].

These controversial issues regarding the heritage on and off Lansdowne Park, makes one begin to question the effects of similar development projects happening around Cultural Landscapes and the issues regarding the effectiveness of the buffer zones around these sites, as well as the integration of heritage policies and planning legislation.

Fig. 5: Lansdowne Park and its last developments, 2014. Photo by James Arteaga.

4. The case of the Darsena project in Milan

The Darsena Canal, within the Navigli water system, represents a character defining element in terms of urban, environmental and socio-economical identity for the city of Milan. Indeed, the city, is nicknamed 'water-city' for the extensive presence of canals and water infrastructures [25].

The origins of the diffused and widespread system of artificial canals in Milan and more in general in Lombardy Region hail from the Roman Age [26], with the deviation of rivers Olona and Vettabbia. Furthermore, in the Middle Age and in the Renaissance the Naviglio Grande on the south side, the Naviglio Viarenna on the north side and the Naviglio Martesana on the north-west side of the city were gradually built. In 1457, Leonardo da Vinci promoted the rationalization of the whole water infrastructure system, in particular through the optimization of the 'Conche' [27] (canals) for both people and freight transport. Implementation works were carried out during the Napoleonic and Austrian dominations of Milan. During the Fascist regime the majority of Navigli were buried to facilitate the mobility of automobiles. After Second World War, the Darsena was abandoned and

became an empty urban space. Despite of their environmental, social and cultural values the Navigli's canals[3] have not been always considered within the urban development in the last thirty years.
In 2004, the Municipality of Milan has launched a competition to foreseen an innovative public space characterized by a renovated use of the waterways (Navigli and Darsena). The competition concerned the design of a pedestrian square, new public spaces, a market and the renovation of the Darsena banks, as well as the water maintenance works. The project has been completed within May 2015 in occasion of the opening ceremonies of EXPO 2015.
The primary objective of Darsena Canal project is to find a balance between the conservation issues and the economic aspects of urban growth. Water infrastructures and built heritage are recognized as drivers of attractiveness for local inhabitants, tourists, real estate investors, retail and manufacturing activities. Data provided by the Municipality of Milan confirm that tertiary and retail vocation of the Darsena area improved over the last 5 years (office land-use: +1.5%; retail land-use: +7.2% both percentages values higher with respect to Milan average [28]). These evidences strengthen the direct relationship between 'territorial capital'[4] [29] and economic spillover, where the cultural element of the Navigli contributes to implement the potential territorial capital of this area.
Therefore, the recent Darsena renovation project focuses on the key role of waterways as character defining elements in the urban context of Milan. The redevelopment project of Navigli area, as well as the recent urban planning policies [30], identify the water infrastructures as a key-factor to increase the environmental and social quality as well as the involvement of the local community in the redevelopment processes. According to the European Landscape Convention (2000), the UNESCO Recommendation on the Historic Urban Landscape (2011) and the Convention for the Safeguarding of Intangible Cultural Heritage (2003-2007), the morphological configuration of Navigli and Darsena represent part of the historic urban landscape, as well as element of urban identity due the intangible aspects relating to its history and its roles within the city of Milan.

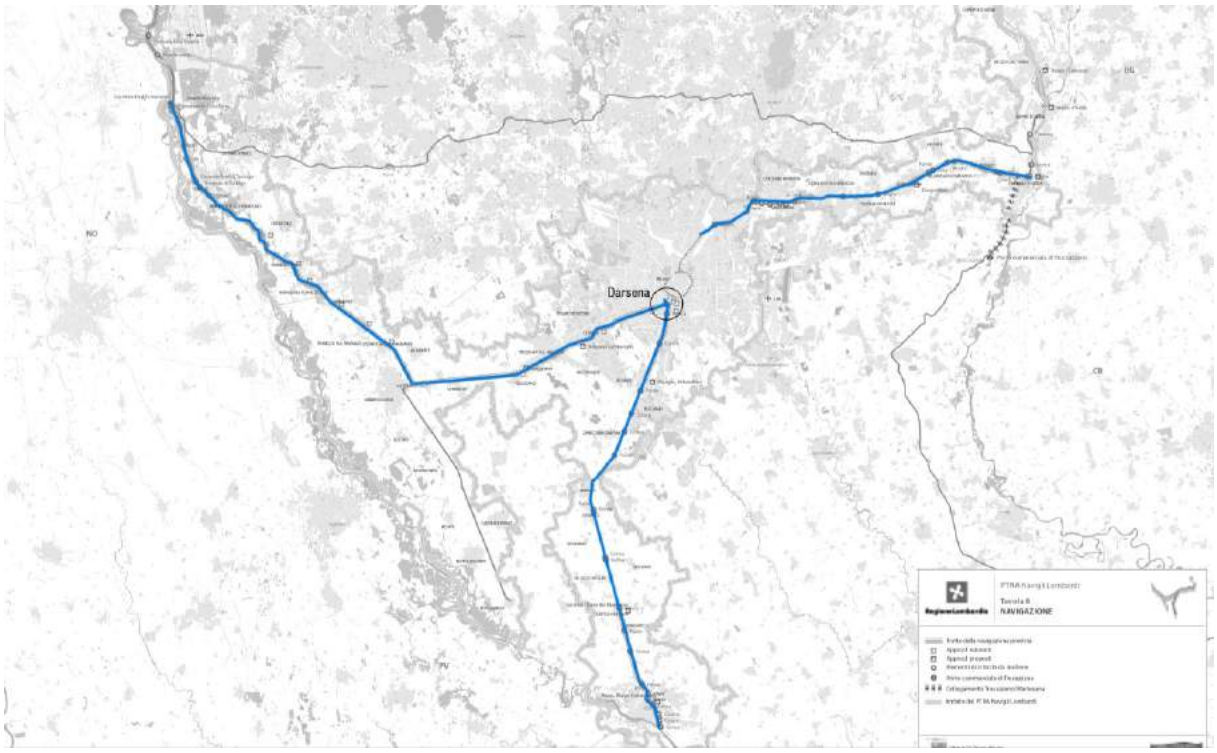

Fig. 7: The Navigli's canals system. Image source: Piano Territoriale Regionale d'Area (elaborated by the Authors).

Furthermore, the Darsena Canal project represents a positive example of integration between heritage conservation and urban development issues. Currently, there are not prescriptive norms for new urban development directly related to the presence of the waterways[5] nor any buffer zone. Nevertheless, the recent urban development – including the Darsena project – is oriented to a

[3] Lombardy Region has presented the candidacy of Navigli to the Word Heritage List (WHL) in 2014.
[4] Territorial capital may be seen as the set of localised assets – natural, human, artificial, organizational, relational and cognitive – that constitute the competitive potential of a given territory (Camagni, Capello, 2009).
[5] Construction Index for historic and consolidated areas <1 sqm/sqm). Comune di Milano. 2012. "Piano di Governo del Territorio" Piano delle Regole art. 6, Documento di Piano art. 5. http://www.comune.milano.it, (2015).

sustainable growth, respecting and promoting the historical elements. On the one hand, the development consists of the rehabilitation and reuse of the widespread heritage of industrial and manufacturing buildings, developed in particular over the 19th and the 20th century along the canals. The refurbishment and restoration projects, both for tertiary and housing, contribute to keep and preserve the historic traces and the local identity. On the other hand, the enhancement of the canals and their surroundings is based on the improvement of public spaces, through the creation of new gardens, parks, greenways, squares, cycle paths.
The management model of Navigli and the planning legislation are supporting the balanced development of this area of Milan. Indeed, the whole water infrastructure is managed by Navigli Lombardi Company [31], founded by a series of public and private institutions, both at local and regional scale. Therefore, this trans-sectorial and multi-scaling management approach is fundamental to guarantee coherent design actions. The Metropolitan Government of Milan established in 2015 may represent an important governance framework for coordinating the design activity set.
Finally, the results of this project derive from the balanced mixture between conservation, local identity, enhancement, urban development and economic growth issues. As Saverio Muratori stated "[…] a coherent balance between permanencies and changes in our cities […]" has been followed in the presented approach [32]. In these terms, Darsena and Navigli project may represent a best practice replicable in similar contexts.

5. Conclusions

According to these issues, the broader protection of the Rideau Canal remains a challenge in the Ottawa urban landscape with respect to its dimension and scale. Therefore, the following questions arise:

- How broader concept of conservation can define new boundaries of heritage sites?
- How to integrate the conservation issues in the planning practice?
- What are successful models for conserving 'cross-border' cultural landscapes, historical routes or urban landscapes?
- How should we deal with urban development and heritage conservation?

In line with these issues an alternative approach should be developed. The buffer zone boundaries should be rethought in order to improve a protection of the vistas, changing of views and significant elements regarding the cultural landscape.
Moreover, to make conservation actions more effective, an integrated approach for the Site within its urban landscape is advisable. According to the UNESCO Recommendation on the Historic Urban Landscape (2011), it is necessary to promote a further integration between the urban planning policies and the UNESCO management plans. In the presented case of Lansdowne Park, a lack of integration between the City of Ottawa's Official Plan and the UNESCO management plan developed by Parks Canada was found. According to our analysis this gap between heritage and planning policies allowed the redevelopment of the Lansdowne Park area that did not fully address the compatibility issues (in term of materials adopted, urban shapes, buildings height, etc.).
The presented case of the Darsena Canal in Milan is an example of how to deal with the historic water infrastructure conservation and promotion within urban areas, suggesting a possible integration between heritage conservation and urban development. Furthermore, it outlines how economic and social growth can coexist, promoting a sustained growth.
¬In a future perspective, an integrated approach could also include the practice of 'knowledge-sharing' between similar cultural landscapes, such as the Erie Canal in North America, the Canale Cavour in Italy or the Canal de Castilla in Spain, in order to share and disseminate best practices in the management of this kind of site and the integration with their contexts.
Finally, another recommendation concerns the seriality issue. The Rideau Canal can create a network with similar historical and geographical contexts or purpose-built sites. In order to improve the knowledge and the importance of these kinds of structures all over the world, an interactive dynamic digital platform connecting similar sites could be developed. This systemic approach will support conservation processes combining technology, landscape, nature and *genius loci* orienting future developments.

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Churches, nature and culture in Chiloe's landscape

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Abstract
In the year 2000, UNESCO included sixteen churches of Chiloe's archipelago in the World Heritage List. They represent an outstanding example of religious architecture which represents a constructive tradition, named Escuela Chilota de Arquitectura. This tradition was introduced by Jesuit missionaries along XVIIth and XVIIth centuries and it was followed by Franciscans in the XIXth century . These churches express Chiloe´s cultural richness, based on a successful mixture of indigenous and European cultures which still prevails. Furthermore, they constitute a singular example of landscape and architecture integration.
Geographical structure and cultural constructions combine in Chiloe's landscapes. These constructions relate to the history of Chile's colonization, indigenous peoples, missionaries and South Pacific navigation.
This article focuses on Chiloe's churches as essential elements of a unique cultural landscape. It is the outcome of an adaptive process to a complex, far-off territory and a singular colonization modality based on missional pilgrimage. Unfortunately, the scale of different contemporary interventions and urban processes are affecting Chiloe's landscape, weakening the importance of churches as key components of landscape.

Keywords: Churches of Chiloé, Chilean world heritage, cultural landscape, Jesuit Mission, Chiloé Archipelago

1. Chilean geography as colonization factor.

A gradual submergence of the continental edge, as well as geological processes linked to glacier melting, modelled Chiloé's territory. Araneda (2005:9) explains that melting ice flooded lower lands and ocean currents eroded the mountains separating Chiloe and the continent and generating an archipelago of 33 islands, some of them uninhabited. Isla Grande stands out with 180km long and an area of 8.344 km2, the biggest island in South America after Tierra del Fuego.
From a geographical perspective, Urbina (2012:23-24) remarks that Chiloé had a frontier character as far as Chacao Channel –which becomes between the archipelago and the continent- represented the confine of America and Chiloé was the place where the last Spanish kingdom's southern possession in America had been settled.
The first Archipelago news date from 1540, when Alonso de Camargo's expedition sought it; Ancud Gulf –located in the North Coast of Isla Grande- was explored by Francisco de Ulloa in 1553. Subsequently expeditions to the Strait of Magellan, by Juan Ladrillero and Francisco Cortés, travelled along Chiloé's coast. The first expedition that arrived to the archipelago from the continent - under the command of Garcia Hurtado de Mendoza- arrived across Chacao Channel in 1558. Spanish colonization of the distant region of Chiloé –which was incorporated to the Chilean territory under the name of Nueva Galicia-, started in 1567. This year Mart□n Ruiz de Gamboa founded Santiago de Castro in the eastern coast of Isla Grande. He founded Castro to help the Spanish ships after the dangerous journey from the Atlantic to the Pacific across The Strait of Magellan. Chiloé was a strategical territory for the navigation across South Pacific as far as it was in the seaway to the

Viceroyalty of Per□. According to Guarda (1990:131), Isla Grande of Chiloé had two features that constituted a double-edged sword in order to protect the colonization and to defend Chacao Channel: The first was a difficult geographical situation, with severe climate, violent winds and a dangerous coastal relief. These features constituted a natural protection from the enemies but they were as well the cause of numerous shipwrecks and damages in the Spanish facilities. The second was the poverty of inhabitants, which subtracted incentive to foreign colonization in the islands, but at the same time prevented the consolidation of the Spanish settlements. Furthermore, the indigenous upraising of 1598 and the recession of the Spanish conquer had a negative influence in Chiloé as far as Castro, though being far from the war scenario, had to prevail without other cities' support (Urbina, 1983:30).
Castro managed to endure in spite of its isolation and several Dutch pirate attacks in 1599, 1615, and 1643. Urbina (1983:47) showed how these circumstances resulted in a decrease in urban population and Castro declined as far as the city survived just a as gathering centre for neighbours in religious celebrations; furthermore, Guarda (1978:62-63) remarks that Castro became an example of urban decrease in America. Progress in archipelago's geography was a positive consequence of Dutch attacks as far as a map of Castro was made in the course of the invasion; nevertheless, at the end of XVIIIth century, Chiloé was still an almost unknown territory as cartography was imprecise and there was only a vague knowledge of Austral geography in Europe (Urbina, 1983:29).

1.1 Description and image of Chiloe's geography

Jesuits missionaries performed the first comprehensive descriptions of the archipelago and explained the dangers of the rugged geography. Gonz□lez de Ag□eros (1971:88-89) argues that the mountains and ravines occupy most of the islands and in many places the mountains reach the shores and it is only possible to advance through the beaches. This progress is also risky because the sea floods the bays and the steep slopes prevented passage. In addition, the interior of the islands was covered by impenetrable forests and the west coast was exposed to the action of the Pacific Ocean (Gonz□lez de Ag□eros, 1791:77-78).
The weather, extremely humid, and frequent storms, was an outstanding topic in the stories of the first explorers who sailed the coast of southern Chile and in the letters of the Jesuits, who could not continue with their evangelizing work in unfavorable months; in that regard, Hanisch (1982: 43) notes that "*pueden ir por la mar del sur una vez al a□o, por□ue no ha□m□s □ue dos o tres meses en □ue se pueda entrar □salir*".
The mountainous character of the territory, which was also covered with forests, was the cause of the population dispersion by the few coastal plains of Isla Grande eastern slopes and inner islands. The displacements are generally carried out by sea or along the coast along the beaches (Gonz□lez de Ag□eros, 1791:88-89). These climate conditions had a decisive influence in the distribution of indigenous settlement and the location of the Jesuit churches. Gonz□lez de Ag□eros (1791: 84-89) states that villagers sought shelter in the Inland Sea of Chiloé -marine space between the archipelago and the continent- to avoid the cliffs and high winds on the west coast. Different authors (Barros Arana, 1856:4; Beranger, 1893:14-15; Moraleda, 1888:203-205; Weber, 1903:2-4; C□rdenas, Montiel and Hall, 1991:103,158-159 and Hanisch, 1982:215) have referred to the relationship between geography, climate and settlements.
Geographical complexity, difficulties in consolidating the occupation of the archipelago and a sense of desolation expressed in the landscape was highlighted in the narrations of the seventeenth and eighteenth centuries. Relief and climate were determinants of lifestyle and local character in the descriptions of missionaries and officers. In the nineteenth century, travellers and explorers delivered a reading of the landscape that included the feeling that it aroused in the observer.
Charles Darwin, without diminishing the accuracy of his scientific descriptions, describes the feeling of awe at the strength of natural powers in the southern archipelagos *"... □hite massive clouds were piled up against a dar□blue s□□, and across them blac□ragged sheets of vapour were rapidl□driven. The successive mountain ranges appeared li□e dim shadows□and the setting sun cast on the woodland a □ellow gleam, much li□e that produced b□the flame of spirits of wine. The water was white with the fl□ing spra□, and the wind lulled and roared again through the rigging: it was an ominous, sublime scene*." (Darwin.1845: 281).
In the texts of Darwin, the description of Chiloé's forest with its impenetrable thicket takes on epic proportions: "*the forest was so impenetrable, that no one who has not beheld it, can imagine so entangled a mass of d□ing and dead trun□s. I am sure that often, for more than ten minutes together, our feet never touched the ground, and we were fre□uentl□ ten or fifteen feet above it, so that the seamen as a □o□e called out the soundings. At other times we crept one after another on our hands and □nees, under the rotten trun□s.*" (Darwin.1845: 280-281).

1.2 Chiloé's missions in response to the territorial reality

From the seventeenth century onwards, the foundation of missions in Chiloé allowed to settle a cultural structure of European tradition while indigenous culture was strengthened as far as the inhabitants of the islands were integrated as actors in the colonization process; a process that depended on various circumstances including, among others, the structure of the landscape where missionary activity took place.

The first missionaries who arrived to Chiloé were mercedarios who took part in the expedition of Martín Ruiz de Gamboa. In the last decade of the sixteenth century Franciscans arrived and founded churches on the north bank of Chacao Channel. In 1595, with the arrival of Luis de Valdivia to Chiloe, begins the evangelizing action of the Jesuits, which extended to the archipelago of Los Chonos and the islands of Las Guaitecas because the missionary territory assigned to the order extended from the city of Osorno -in the territory Continental- the Pacific ocean and south, stretched to the Strait of Magellan.

Basically, Jesuits were in charge of the evangelization of the natives of Chiloe. They built wooden churches around the islands and defined a strategy, known as *misiones circulares* (circular missions), which consisted of annual tours to the places where there were chapels built to serve the people of Chiloe and other nearby islands. In addition to the construction of churches and chapels on the coast of the main islands and the circular missions of the archipelago, the activity of the Jesuits included annual visits to the missionary centres and the formation of Aboriginal catechists.

Through the system of *circular missions* -in force until today- it was possible to evangelize a complex territory with a population scattered over many islands. Though they worked only when the weather allowed sailing between the islands, *circular missions* were essential to colonize remote southern archipelagos. They made it possible despite the small number of missionaries, compared with the quantity and dispersion of the islands and the substantial indigenous population. The scattering, building traditions and lifestyle of indigenous people -*chonos* and *huilliches*-, moving between islands, served as guidance for Jesuit culture in their evangelization. Regarding the mobility of natives who inhabited the islands, the Jesuit Diego Rosales points out that *chonos* homes were easy to build because they were made from the bark of large trees that served as wall and cover as well (Rosales, 1877:151).

Through the observation of the characteristics that characterize the nomadic way of life of the people who lived in the archipelago of Chiloe, it is possible to conclude that mobility and dynamic adaption to the natural conditions of each island, in different seasons, allowed them to face the difficulties of the winter period as well as the geographical adversities, and to overcome the shortage of technical resources. However, high mobility and temporary settlements were not consistent with the Spanish permanent conquest objectives, which pursued to control the territory through the cities.

Starting from the missionary centre in Castro, the Jesuits undertook periodical explorations of the islands of Chiloe and other southern archipelagos, traveling to distant land in search of places to establish new missions. In 1624 the first *circular mission* took place, opening the tradition -repeated every year- of traveling to the islands to visit all the missionary centres. In each place, the missionaries stopped three to four days for evangelizing and to register births, deaths and marriages. This action made it possible to keep updated census of the indigenous population (Tampe, 1981:12-15). Periodical tours started in Castro, every September. In December, the missionaries returned to stock up on necessary and continue the journey towards the southernmost islands; they returned to Castro in late May, when the beginning of the rainy season prevented sailing through the channels. The mission of Chiloé became the most prestigious in Chile since the seventeenth century. After the expulsion of the Jesuits in 1767, missionary activity was resumed by the Franciscans, who covered a smaller territory by focusing on stable missions at Chiloé.

Urbina (1983:179) explains that the Jesuits had four *haciendas* with crops and livestock (cattle and sheep) that provided the College and the mission; they exchanged the surplus for goods from Lima in the annual fair of Chacao. They also had part of the income of *estancia* Guanquehua, which was purchased to support the Colleges of Castro and Arauco. Urbina (1983:179) explains that despite its success, this was the most difficult mission because of the dispersion of the population, the hardness of land routes and other dangers derived from navigating the archipelago; a fragmented territory with channels among the islands where strong currents and storms threatened the *dalcas.*

Circular missions used the *dalca* that belonged to the College de Castro and other two which belonged to the parishioners of every chapel. The crew of the main *dalca* consisted of two main missionaries, ten indigenous, a sacristan and a pilot; and it was driven by rowers Indians. The trajectory of the missions was scheduled at the College de Castro but its duration was variable and visiting time on each island depended on the number of inhabitants (Urbina, 1983:184-185).

In his travel journal from the mission of Cailín to the south of Chiloé, the Jesuit José García described navigation through stormy waters and a how a violent storm forced them to take refuge on a scabrous coast of an island without any port (García, 1875:8). Overland travel also had problems because of the

rough topography, lack of roads and constant rain. Very often, travels were made by the sea or by crossing the dense forests through muddy trails that were usually cut by flooding from rivers or from trees shot down by storms. Because of these circumstances Urbina (1983:179-180) explains that the missionaries should prepare for Chiloe to acclimate to environmental conditions, participating as assistants in the first *circular mission* in order to recognize geography, to study the indigenous idiosyncrasy and to train in difficult journeys by sea and land. The chart of the Missions of the Jesuits in the archipelago of Chiloé, dated 1762 (although it reports the *circular mission* from 1757 to 1758) shows, along with information about the mission and population statistics, the travel of the *circular mission* carried out by the chapels of the Chiloé archipelago shortly before the expulsion of the Jesuits and the declining of the mission to be transferred to the Franciscans.

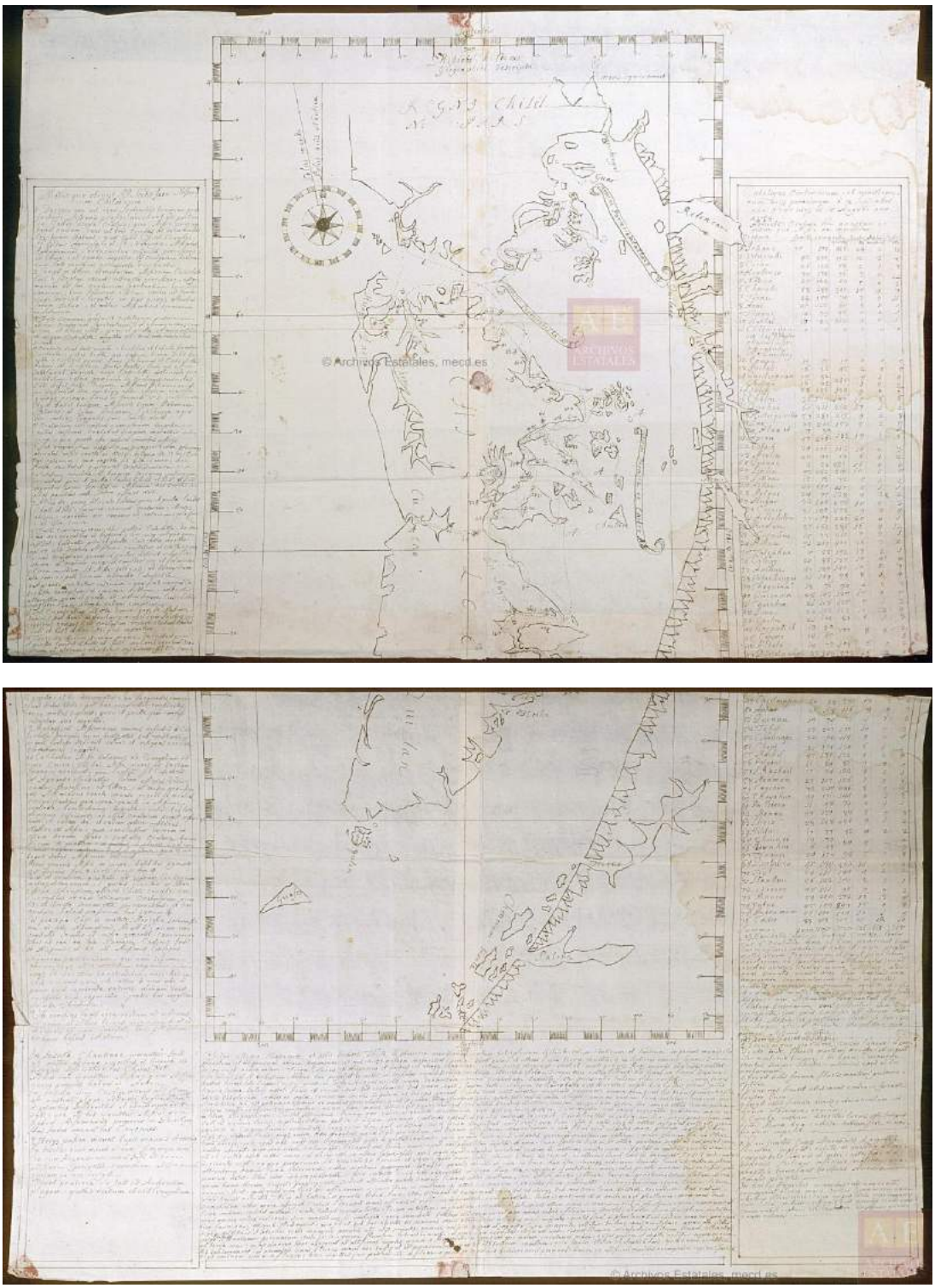

Fig. 1: *Plano de las Misiones de los Padres □esuitas en el Archipi□lago de Chilo□*. Archivo General de Indias. 1762

2. Churches as essential elements in the landscape of Chilo□

The mission system is a valuable example of adaptation to a territory where the practice of grouping indigenous in *reducciones* was impossible due to the way of life of the population. The interaction between the Jesuit evangelization culture and indigenous culture in the complex geographical context of Chiloé, created a unique landscape that crystallized in the places where the chapels were built.
The cultural landscape of Chiloé includes invariant elements that characterize every settlement integrated to the *circular mission*. The wooden churches with its tower and cross, the rooms of the missionaries or *casemitas*, the reception area outside the church, the pier or the beach, constitute an ensemble that organized the space of the settlement, enabling the traveller arriving by sea to identify the place. In the nineteenth century a cemetery was added.
Different authors describe churches as key elements of *chilote* landscape. According to Gonz□lez de Ag□eros (1791:85) "*lo □ue □nicamente vemos con inmediaci□n al mar son las Iglesias □ algunos ranchos □ue tienen prevenidos para alo□arse cuando vienen a misa*." Darwin explains that, during the travel by land to the Isla Grande of Chiloé, the chapels were the most prominent visual element of populations: "□ *e proceeded to the south generall□ following the coast, and passing through several hamlets, each with its large barn-li□e chapel built of wood*." (Darwin,1845:294).C□rdenas, Montiel and Hall (1991:162) refer to the chapels as organizational elements of the settlements, as well as geographical reference for people living around them. The chapels where the permanent place where religious practice, which previously had to be performed at the beach, took place.
The large size of the chapels, designed to house the population scattered around the settlement, along with the tower and the cross, enabled to make them visible from afar. They stood in contrast with the surrounding nature, featuring a symmetrical layout of the facades and a strict, austere and rigorous compositional order. This particular feature of the chapels, designed to be accessible and be seen from the sea, is a notable element of landscape assessment that sometimes cannot be appreciated when new access by land to the chapels have been opened.

2.1 Distinctive qualities of Chiloe's cultural landscape

Man creates cultural landscapes adapting to environmental conditions; unlike landscapes of artistic creation, cultural landscapes are always a collective creation (G□mez Sal, 2006:104). In this sense, Chiloe missions constituted the essential basis of a collective construction of landscapes which, furthermore, were places of emotional attachment to the territory. With missionary colonization, nature and landscapes of Chiloe ceased to be seen as expressions of a dangerous world to acquire the form of a known and even familiar landscape.
Inhabiting is to create habits and customs (Tr□as, 1991:47). It is also having a roof and a way of being that is revealed in certain habits (Masiero, 2003:20). From this perspective, the *circular missions* were a particular way of inhabiting, based on the repetition of the itineraries, that originated habits or customs adapted to the natural and cultural conditions of the archipelagos and transmitted the European order because the Jesuits, through the institution of *fiscales*, solved various problems of the indigenous population.
A mid-eighteenth century more than 70 chapels for the archipelagos of Chiloé, Chonos and Guaitecas Islands were distributed. According to Hanisch (1982: 65) in 1757 there were 76 chapels on Chiloé. Another antecedent states that the missionaries of Chiloé were over 72 chapels (Tampe, 1981: 25) and according Urbina (1990: 69) had Jesuit chapels in 74 of the 83 towns of Indians who had the late eighteenth century. According cones demographic background, in 1791 there were 25 inhabited islands in the archipelago of Chiloe; Moreover, Urbina (1983: 20) highlights a report indicates that in 1783 there were 29 inhabited islands. Despite this result, the Jesuits were accused of promoting the dispersion and not consider concentrating the population in towns (Urbina (1983: 48).
The chapels determined the breakpoints of *circular missions.* Missionaries ran through the channels, which were hard to navigate due to weather and strong currents. Colonial reports highlighted that the danger of navigating between the islands increased because they used light boats that could barely overcome the ups and downs caused by waves and wind strength.
Broken coastal geography and dense forests characterize Chiloe islands. They hampered exploration and settlement of the inland territory. This condition explains why the chapels were built up in littoral areas taking advantage of small beach areas or plateaux at the coastal hills. Because of its location on the edge of the islands, the missionary churches were visible from the sea, considered by Indians and missionaries as a landmark which organized the way of living and sea routes in the archipelago.
The original form of colonization introduced by the Jesuits transformed the archipelago into a territory symbolically ordered by a series of chapels that, in addition to their religious function, constituted a shelter from storms, places for pause and rest in the risky navigation channels, guiding references in the vastness and rooms of cultural encounter between Indians and missionaries.
Circular missions were crucial for advancing colonization, by easing the occupation of a distant and

unpopulated territory. They also gave rise to settlements whose population grew spontaneously around the churches. They were a cultural heritage that remains alive because the towns that developed next to the chapels still retain the procession esplanades using them as multipurpose public spaces.

3. Changes and threats in the contemporary landscape of Chile

Circular missions were essential to structure the occupation of the territory by combining the traditional way of living -expressed in building chapels- with periodical itineraries which were a form of nomadic occupation, similar the way of living of the indigenous peoples. They were a successful form of colonization that since the eighteenth century creates a new landscape that identifies Chiloe as a unique territory.

A quality of the missionary churches of Chiloe archipelago is that they were the only permanent cultural landmarks in the desolate southern territory for years. Their value, made of of cultural signs, is expressed primarily in the high towers that announce the presence of churches from afar; they are outlined in the seascape replacing the guiding role of the lighthouses and stand as symbols of evangelization and the spiritual realm but also as the main cultural references in the vastness.

However, the preponderance of the towers as basic elements of the cultural landscape of Chiloé faces threats as a result of constructions that alter the shape and meaning of landscape. The construction in the city of Castro of a large shopping centre with five stories high and 29,000 m2 has generated heated debate because of its proximity to the mission church of San Francisco de Castro, one of the churches which were declared World Heritage Site by UNESCO in 2000. The College of Architects presented a strong claim against this situation, recalling that his protest is consistent with the commitments that the Chilean government signed under the agreement by the declaration of World Heritage to 16 Churches of Chiloé.

Fig. 2: Panoramic view of Castro with shopping centre and the church of San Francisco

The World Heritage Committee discussed the condition of the heritage site during its 37th Meeting, and by Decision 37 COM 7B.94 (Phnom Penh, 2013) lamented the construction of the shopping centre, considering its impact on the environment of the church and the Castro landscape. The Heritage Committee World-ICOMOS decided to send Chiloe a joint Reactive Monitoring Mission to assess the overall state of conservation of the property, particularly issues relating to the definition of the characteristics of landscape environment and its link with the Outstanding Universal Value of the building. In addition, the mission took on the task of establishing adequate protection measures - including the revision of buffer zones and the adoption of regulatory rules- regarding the environment

of the Churches of Chiloe. Reactive Monitoring Mission World Heritage Site Churches of Chiloé (C 971) held from 2 to 7 December 2013 issued a report that was submitted to the State Party by the Director of the UNESCO World Heritage Centre on 17 March 2014. Among the major findings reported by the mission are:

- With regard to the characteristics of landscape environment, the State Party has conducted studies to define the appropriate demarcation of buffer zones. However, the definition of landscape environment in each of the components of the property and the adoption of buffer zones and regulatory measures remain urgent.
- They have made considerable efforts in the restoration and conservation of the churches, and they have established specialized teams in restoration.
- It is essential that the churches maintain their dominant presence in the landscape. This aspect, considered at the time of the nomination, was reaffirmed in the Declaration Retrospective of Outstanding Universal Value adopted by the World Heritage Committee at its 37th Meeting in 2013.

Furthermore, specific recommendations concerning the definition of landscape features environments buffer zones that are formulated include:

- Submit to the World Heritage Committee, by February 1, 2015 deadline, and to be reviewed by the bodies advisors- a minor modification of the boundaries of the property, in line with the procedures and requirements set forth in the Operational Guidelines, with the aim of producing a final proposal regarding the buffer zones and landscape environments of each of the components of the property. The documentation must include specific limits on drawings printed with the definition of the characteristics of each area, and the related regulatory measures to ensure adequate protection of the outstanding universal value of the property.
- These proposals should be preceded by detailed technical studies that consider the territorial values (landscape, geography, environment, coastline); located existing values built around the well and identified in an inventory; aesthetic issues (such as sight and mass construction); functional values, including the value of possible uses as well as intangible values and practices that ensure the continuity of the incorporation of good in the life of the community.
- Protect the surrounding areas, including the immediate areas of vernacular architectural styles, buffer zones and landscape environments composed of the natural landscape.
- Adopt as preliminary demarcation limits proposed by the CMN until they have completed these studies. The mission has made some technical suggestions are made in the report regarding the extension of certain areas, in order to consider the unique cultural landscape of Chiloé; tides, whose great variation becomes part of the economic survival of the community and visibility good, especially the preeminence of the church towers.

3. Conclusions

The landscape of Chiloé was a result of human activity linked to a unique process of evangelization in a territory with particular geographical and cultural features. The churches have morphological qualities and meanings derived from adaptation to harsh territorial conditions. These qualities transcend the historical moment of the foundation of the churches to project to the present day, where they persist as emotional anchors of identity. In Chiloé, churches are landmarks in landscape as well as location references in the complex geographic structure of the archipelago. Furthermore, they are the germinal nucleus of several settlements , social meeting places, forms built by the mixture of knowledge provided by the Jesuit missionaries chilotes and indigenous and lately they are the main references of the colonization process and signs of identity that are appreciated by the community.

Despite these values, the cultural landscape of Chiloé is threatened by contemporary urban development processes as shown in the construction of a shopping center that negatively affect the cultural landscape of Chiloé, specifically to the church San Francisco de Castro. The situation involves opening a public debate about the importance of cultural landscape as a heritage resource. It is also an expression of the need to define new legal and administrative measures to avoid the impacts of increasing urban development on the structure and meaning of the landscape.

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Landscape and criticality: a model to describe a territory

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Abstract
The landscape is the particular features of a given territory determined by its physical, human, biological and ethnic characteristics; it is indispensable by the observer and world how it is perceived and lived.
It is composed of different elements, they represent the spatial components. A useful model to conceptualize and to represent the elements of the landscape in a thematic map is the so-called patch-corridor-matrix model. This model divide the landscape into three elements; the extent and the configuration define the structure of the landscape: patch, corridor and matrix.
The evolution of a territory is a complex adaptive system and its structure and interactions with the environment cause predictable dynamics only through a careful study of analysis of the geomorphological and natural features of the places associated with an analysis of changes in the customs and habits anthropic. The complexity of the landscape mosaic is broken down into many landscapes as there are processes and organisms that characterize them. A landscape is not the sum of individual elements but the set of relationships, spatial and temporal, between the different components that evolve over time.
In this paper we propose an analysis of the above mentioned model in a district of Naples called "Pianura" through a hierarchical process of reading the mosaic landscape from macroscale, mesoscale up to element of detail.

Keywords: Landscape, complex adaptive system, urban model

1. Introduction
The landscape is the particular features of a given territory determined by its physical, human, biological and ethnic characteristics; it is indispensable by the observer and world how it is perceived and lived. A landscape is a complex system made up of interactions in turn more or less complex that go to make up a very structured network model.
The term landscape has had a major evolution over the years; Troll (1968) defines the landscape as an "overall spatial extent of the space experienced by man", Forman and Gordon (1986) define the landscape as a "heterogeneous portion of the territory composed of a set of interacting ecosystems that is repeated with recognizable structure" and the same Forman (1995) identifies it as a "mosaic of interacting ecosystems that is repeated with a recognizable spatial configuration over a wide area".
The study of the landscape cannot be compartmentalized within a specific discipline but must assume a holistic approach. A landscape study approach must therefore be integrated, whether it analyzes the perceptual quality of the landscape, or wants to scientifically analyse the ecological elements, considering all the elements (physical, chemical, biological and socio-cultural) as open sets, in continuous dynamic relationships.

2. The model
The scientific approximation to the landscape, and its subsequent development, is very little known and shared, since it is used in a narrow circle of naturalists and especially by environmentalists of the

landscape, but it is then clearly called into question when the theoretical-descriptive log is strictly operational, where it is required studies and evaluations belonging to disciplines that investigate the different “components” of the same landscape: geology, botany, ecology, history, urban planning.
The landscape can therefore be defined as a mosaic consisting of several ecosystems that are repeated in space with identifiable boundaries. The landscapes, seen as environmental mosaics, are formed by constricting agents (the trees) and drivers (processes). The whole is characterized by spatial, temporal and functional heterogeneity where the structural unit is the “Patch”. It is a structural unit of a heterogeneous system identified based on the differences that appear in a natural mosaic. Patches are relatively homogeneous environments that differ from their surroundings. They are dynamic structures identified in various spaces and time scales that differ depending on the perception of each organism.
The landscape is considered a “complex system of ecosystems”, which complement the events of nature and the actions of human culture.
The landscape is therefore not defined by a predetermined dimension but rather by a mosaic of polygons that interact between them in a significant way in relation to the phenomenon that we consider. The dimensions vary depending on the issue or problem.
The landscape can be broken down into 3 levels:

- Mosaic per square metre
- Mosaic per square kilometre
- Mosaic at a regional scale

The elements for the definition of the landscape are:

1. Structure: what the elements that make up the landscape are and how they are arranged (spatial configuration).
2. Function: what the interactions between the elements that make up the landscape are.
3. Composition: what types of land cover are present in the landscape
4. Changes: what the temporal dynamics of the structure and function are.

The landscape mosaic defines the landscape as a result of the relationships between the different pieces consisting of:

- geological coverings and distributions (abiotic)
- biological coverings and distributions (plants or animals),
- man-made coverings and distributions (populations, cities, industrial production systems, craft or agricultural).

It is then correlated to a total physical component of a landscape. The complexity of the mosaic is broken down into many landscapes since there are processes and organisms that characterize them.

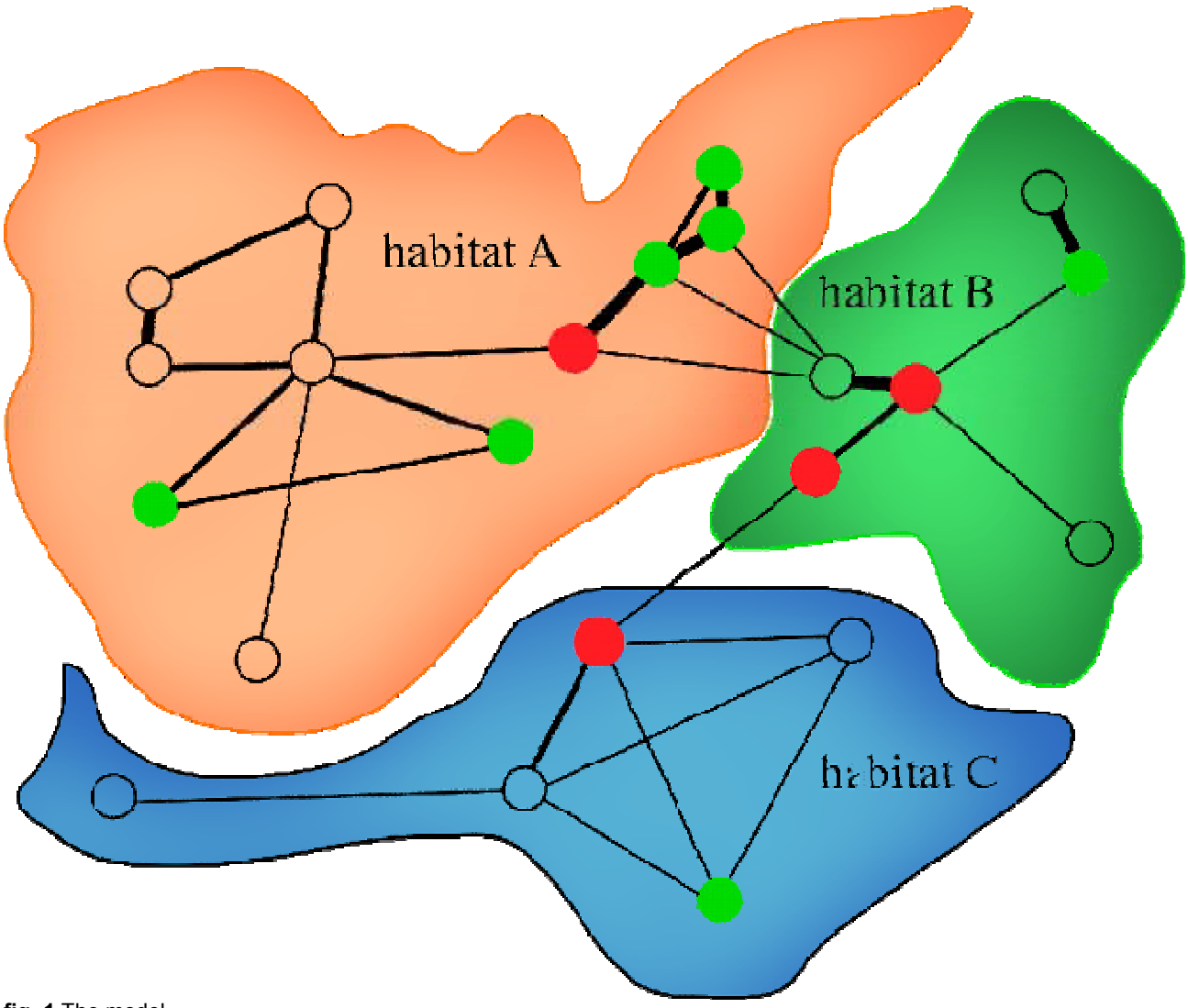

fig. 1 The model

A landscape is not the sum of individual elements but the set of relationships, spatial and temporal, between the different components that evolve over time. It is also composed of different elements, which represent the spatial components. A well-known and useful model to conceptualize and represent the elements of the landscape in a thematic map is the so-called patch-corridor-matrix model (Forman, 1995). This model involves the use of three elements of the landscape, the extent and configuration define the structure of the landscape: patch, corridor and matrix:

- Patch: non-linear portions of land area whose appearance differs from the surrounding environment. The patch is the smallest geographical unit which is uniform in at least one attribute. Patches are relatively homogeneous environments that differ from their surroundings (Foreman, 1995). They are dynamic structures that can be detected at various spatial and temporal scales that differ depending on the perception of each organism. The patch must be defined in relation to the phenomenon being studied. Patches, regardless of the phenomenon being studied, are dynamic and can exist at different scales, the contours of the patches make sense only if they refer to a specific scale;
- Matrix: a more extensive type of item, playing a functional role in the landscape. The matrix is a homogeneous mass which highlights small and well differentiated elements, or can be considered as a union of material that surrounds and envelops independent elements. It is one element of the wider, more connected landscape, and plays a dominant role in local functional dynamics (flows of energy, matter, species).
- Corridor: linear element or strip, which differs from the surrounding environment. It can also be understood as a linear sequence of patches. There are 3 types of corridors:
    - Linear corridors, in which the width of the corridor is too narrow to allow for the development of environmental conditions inside it;
    - To strip corridors, in which the width of the corridor is large enough to allow for the development to its internal environments;

- Flow corridors, which represent a particular category. The corridors can also be defined according to the function performed in the landscape.

The main functions of a corridor are:

- Habitat Corridor. It is a linear element that allows the survival, birth and movement of living beings and can be either a temporary or permanent habitat. The habitat corridors passively increase connectivity to key bodies.
- Corridor which facilitates travel. It is an element of the landscape that supports the survival and movement, but not necessarily the reproduction, between two habitat patches. This type of corridor facilitates connectivity within the landscape for key organisms.
- Barrier or Filter Corridor. linear element that prevents or hinders selectively flows of energy, nutrients and or species (the flows are considered perpendicular to the length of the corridor). This type of corridor decreases the connectivity for key species.

Corridors that have biotic and abiotic impacts on the surrounding matrix. They are linear elements that modify nutrient inputs, of energy and/or of the species in the neighbouring matrices and therefore does not change its functionality.

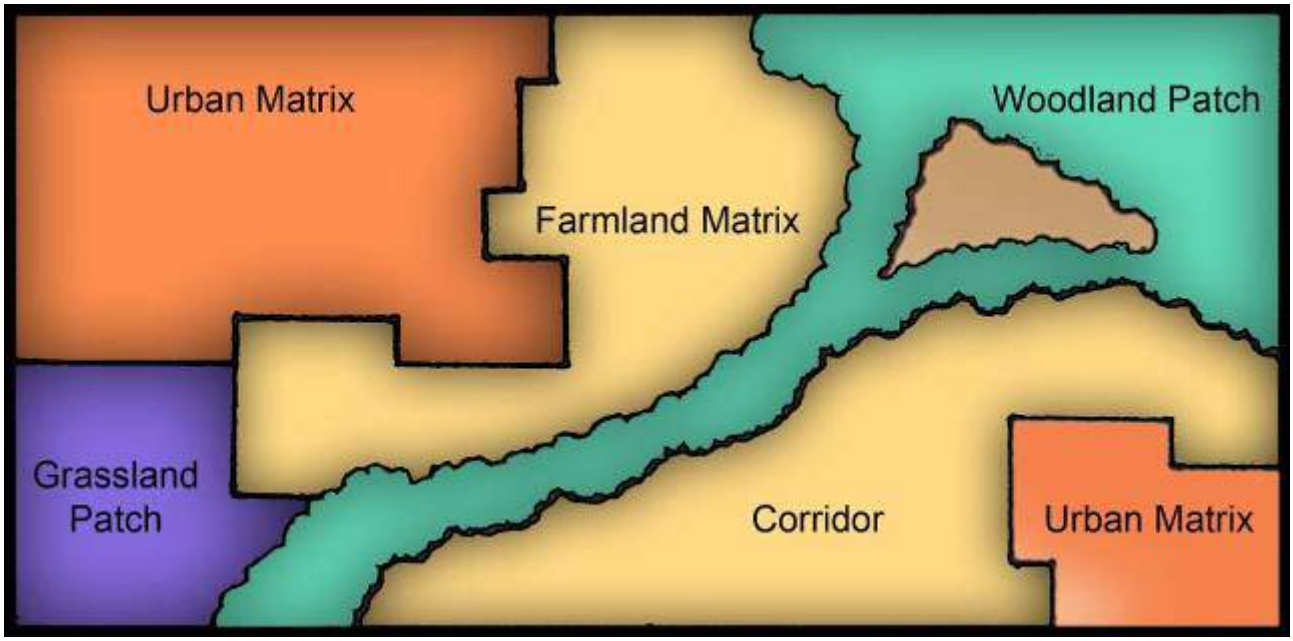

fig. 2 Patch - Matrix - corridor

3. rban model: Pianura

The scientific approximation to the landscape, and its subsequent development, is very little known and shared, si

The Pianura area was known in ancient times with different Latin names: “Planaria”, “Pianura”, “Planurium”, then it became, in the various vernacular forms, “Chianura”, “Villa Planuriae Majoris” and “Terra Plana” because it occupied a territory surrounded by hills. The territory was formed inside the volcanic area of Campi Flegrei, while the flat land was created by the waters of the surrounding hills, that for millennia continued to take away the land from the slopes. Pianura is a neighbourhood in the western suburbs of Naples, south of the Camaldoli hill, down to the vicinity of the “Montagna spaccata”, and was an independent municipality until 1926. There are historical artefacts that testify the Etruscan presence in the Pianura area at the time of their arrival in Italy. In the 1970s, in the cemetery of the neighbourhood, a necropolis of single and aligned horizontal graves was unearthed. The presence of settlements in the territory in Roman times is more probable: the Pianura valley represented a necessary step for land links with Neapolis, to arrive near the “Montagna spaccata”. The so-called “Montagna spaccata” is a cut made by the ancient Romans in the wall of a hill to create a paved passage.

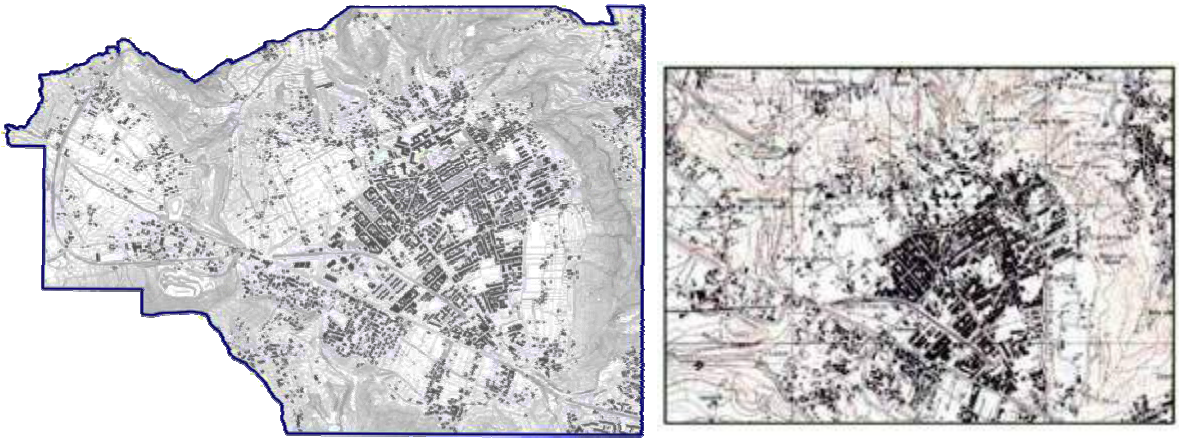

fig. 3 Pianura: Historical map

“Montagna spaccata”, of pre-Roman origins, connects the town of Pozzuoli to Naples. In historical times, the Pianura valley was supposed to represent a required step for land links between Naples, Pozzuoli and Rome. An actual village in Pianura seems to have originated around 1250, due to the extracting of piperno in the quarries in the area, some of which are still present today. Piperno soon became one of the materials used to build many Neapolitan buildings. At the beginning of the twentieth century, the redevelopment of the numerous parts of Campania hit by malaria was completed and this obviously favoured Pianura, whose population grew. The territory remained agricultural until 1926, when it was annexed by the city of Naples.

fig. 4 Pianura: landscape and urban area

Pianura is on the outskirts of Naples. Its name derives from the presence in the past of a flat plain surrounded by hills, which has unfortunately suffered many changes over the years because of unauthorized building leading to the loss of many agricultural areas and generating severe environmental degradation and landscape. Hence the decision to carry out a careful analysis of the area known as Pianura from a morphological point of view, from the past to the present, and then on to an anthropic study of the current development of the area, thus identifying the problems and possible interventions in order to distinguish and enhance the human and natural habitats.

fig. 5 Pianura: Patch and corridors

1) CONTEMPORARY URBANISATION
Urbanization has often occurred in a disorganised and illegal way, although it retains, in its topography, the traces of the old original nucleus of the farmhouse.
2) CONTEMPORARY AGRICULTURAL LANDSCAPE
It has generated a strong environmental degradation and landscape, with uniform and monotonous landscapes, erosion of the cultural characteristics and subsequent loss of recognition of places.
The urban settlement component of the area has a large number of modern housing units and several driveways that divide the area. It is worth noting the presence of some small green areas for cultivation.
The agrarian productive cropland component is divided into reordered and not reordered areas with different relationships relative to areas with arable crops, permanent meadows, vegetation residues, hedges, isolated trees, human settlements.

4. Conclusion

Having identified the perimeter area of the Pianura, a portion of the territory was highlighted and divided into homogeneous areas through the planning zoning instrument. The area under analysis presents highly inhomogeneous areas with a high residential density and small private green areas, others as public parks.
The area is characterized by vast agricultural areas. The result is an irregular design with the surrounding space. We can see how the advent of residential urbanization has clearly influenced the road layout of the area and the multiple layouts in disparate parts of the territory of the areas intended for green uses and those intended for agriculture.
In the neighbouring areas, land development has generated the conformation of a hilly area with some areas for cultivation and the presence of urban settlements. The demographic increase in the population has made it necessary to intervene in the construction of structures of public interest such as: a town hall, schools, sports fields, public parks and churches.
For the tertiary sector, there are some industrial activities and crafts: a mechanics, a supermarket, a wine cellar, a moving company, a marble-mason and a building materials company.
The most important area is “Via Montagna spaccata”, historical main road, it is an important strategic connection node between Pianura and several neighbouring cities. For its strategic position, it is necessary to build the railway in order to create a direct connection with the western hinterland of

Naples and Phlegrean through Soccavo, Pianura, Quarto, Licola and Cuma. The stations of the neighbourhood are three important stops: “La Trencia”, “Pianura” and “Pisani”; the railway is clearly visible from the topographic map where the tracks stop at a specific point and then they go underground until the “Montesanto” station.

fig. 6 Pianura: Patch and matrix

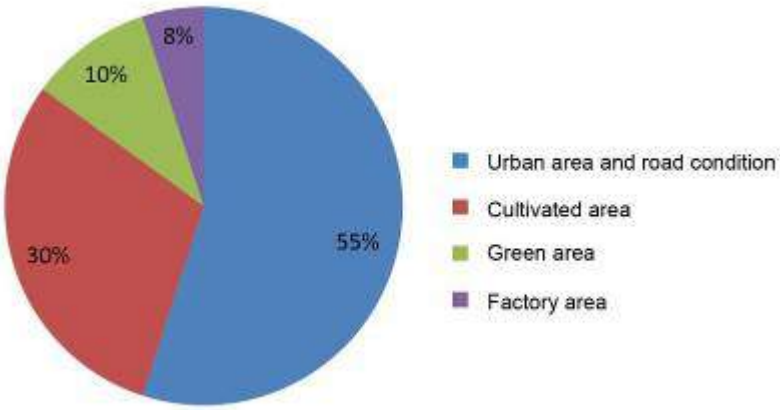

fig. 7 percentage of land subdivision

The growth in population density change the territory and we note an increasing development of residential construction and drastically reducing public parks and pedestrian walkways for public circulation. We analyze the Pianura area and we identify a possible action to be performed in order to improve the urban aspect of the place.

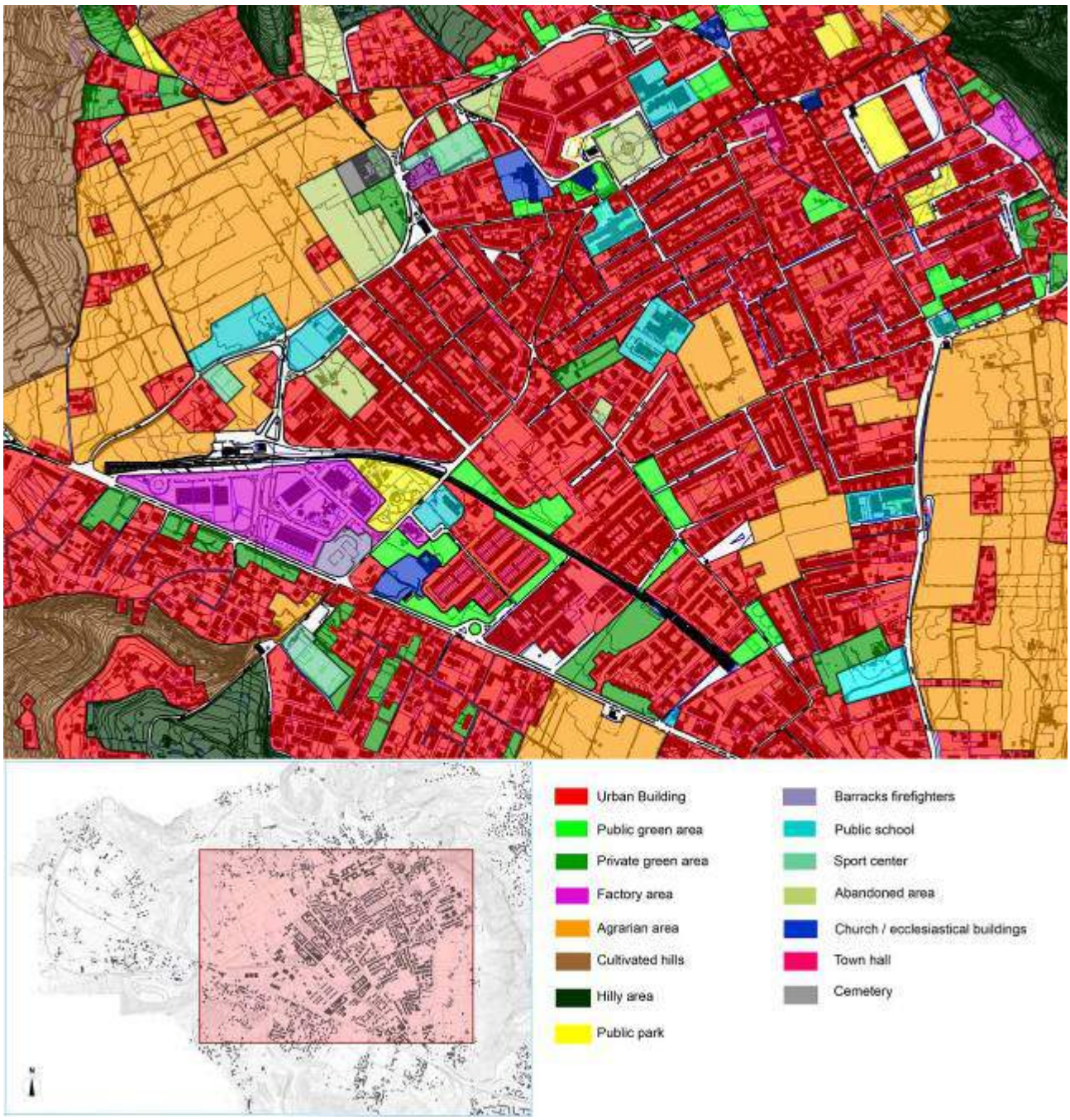

fig. 8 Pianura: land details

Corso Duca d'Aosta

The Falcone-Borsellino Park in Corso Duca d'Aosta has a configuration of a cross, with four major entrances at each end; it is located at the centre of the neighbourhood. Currently, the park is in a state of decay and we propose to redeveloped the area and brought back it to its initial state for the collective wellness.

Via Pallucci

The site on Via Pallucci is located in an abandoned area, very wide. We propose to intervene to give it a new use. Because the area is surrounded by agricultural land, the idea is to be able to create a "shared garden" for the education of adults, children and elderly in the care of a green space.

Via Colletore

The area is located in a green public park and it is situated on Via Collettore near the town hall. This zone is in a residential area and it needs a meeting place for the community. We propose to give it the function of a small public park with an adjoining square.

Via Giorgio De Chirico

The area is located in an abandoned area. The area is located between a primary school and an elementary school. For this we propose to introduce a public sports centre.

Strada Principale Campanile

This area is located in Strada Principale Campanile and in this area there is the presence of public green without any functions for the community. The project idea is to intervene on the surface and make it accessible to the citizens. We propose to realize a public park.

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The Unesco site of Berat in Albania: the protection and the enhancement of the heritage.

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Abstract
The city of Berat, UNESCO World Heritage Site in southeastern Albania, a World Heritage Site since July 2008, assumed different names over the centuries: Antipatreia, Pulkeropolis, Belgrade, and after the Ottoman conquest, Berat. In the characteristic architectural ensemble of buildings in the historic districts of Kala, Mangalem and Gorice, aspects and values of popular buildings are taken as literature references.
The district of Kala is 187 mt above sea level with an area of 9.6 acres on a rocky hill on the left bank of the Osumi River. It consists of the castle of Berat, built on an area of triangular shape, which is one of the greatest historical monuments in the Balkans.
The Muslim Quarter of Mangalem is a well-preserved area with characteristic buildings and charming narrow streets. The village was traditionally a bazaar area, residences of merchants and craftsmen and extends on the steep slope in the shape of a pyramid, the top of which lies the castle. The main feature is the number of windows: Berat, in fact, is known as the city of 1001 windows.
The Orthodox Christian neighborhood of Gorica, developed by the sixteenth century, stretches along the right bank of the Osumi River, and is connected by an antique bridge with 7 arches and a modern bridge, to the Muslim Quarter of Mangalem. Private homes have large gardens reminiscent of a more rural character of the village, keeping the silence and the slowness of the past.

Keywords: Unesco site, Berat, Albania, heritage

1. The reading of the territory of the UNESCO site of Berat
For a reading of the City of Berat - UNESCO site of the South - Eastern of Albania, since July 2008 a world heritage site - as "a rare example of a well-preserved Ottoman foundation cities", the benchmarks are the images of the urban layout , the analysis of a group of archival documents and the documented and peaceful coexistence of various religions from the past centuries until now. It is known as the city by 1001 windows and took different names over the centuries: Antipatreia, Pulkeropolis, Belgrad and, after the Ottoman conquest, Berat. To know the city of Berat and its territory means to browse the history of its people and its urban fabric that is acquire the social and architectural structures of the past and present and with more attention to what one preserved the heritage to be protected as the current mark for a desirable future cultural and social well-being. To acquire information and understand the value of human heritage, urban and monumental means to own the image of the city, its historical identity. For these acquisitions can be referred to the mediation of events related to each other in the language of living such as categories of space, time, and ethics of the inhabitants. The expressions are partakers of the nature and the landscape as a generator value, passing of ethics to aesthetics such as elements that allow you to build the beauty, or the beautiful in the relationship with the things.
The landscape "of the 1001 windows" is understood as a manifestation of the environment and building spatial reality it can be interpreted with the noble sense of vision that can be directed to the perception not only the shape but the color variations of the architectural material, light as a result of climatic changes and atmosphere. This research makes use of the two UNESCO selection criteria, that illustrate the characteristics of architectural, historical and religious. The old town is an exceptional

testimony of a now vanished way of life influenced by Ottoman tradition of Islam (criterion iii); The old town is a rare example of Ottoman town with typical buildings such as kule (criterion iv).

Fig. 1: The UNESCO site of Berat, the district of Kala

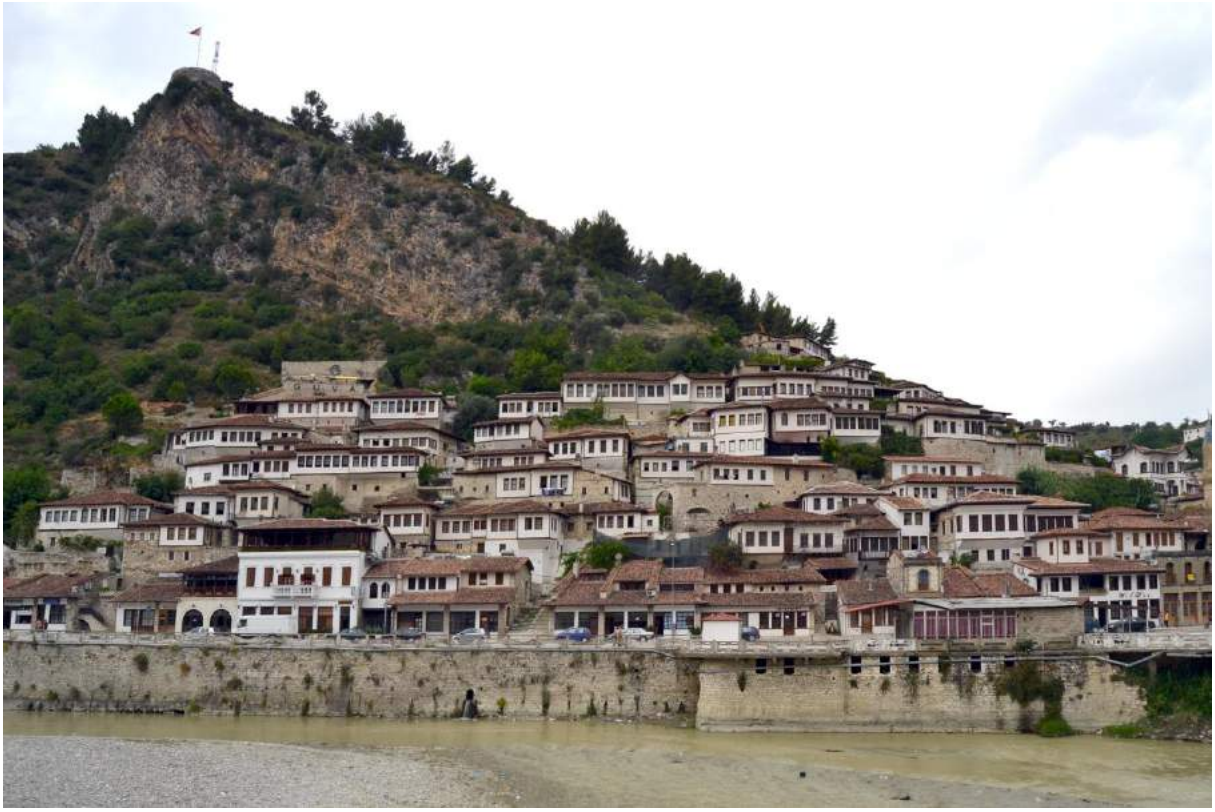

Fig. 2: The UNESCO site of Berat, the district of Gorice

Fig. 3: The UNESCO site of Berat, the district of Mangalem

The Albanian national cultural heritage has always been protected by specific legislation, but only in 1948, was approved by the Communist government's first legal instrument on the protection of so-called cultural monuments. On the basis of a cataloging made in those years in the whole of Berat region are numbered, including churches, mosques, houses, bridges and castles, about six hundred architectural heritage. Also, to outline a path of Berat Urban Environment observations with some considerations based on the multidisciplinary study expressions are needed starting from the architectural elements that make up the urban environment related to the spatial location.
In this context buying significant importance the interpretative visualization of the geometric forms of the city of Berat, interpretation passing through the graphical representation, the photographic study and archival documents on the basis of natural values. Are readings of places and architectural works that refer to the territory or to the knowledge of geography, of agriculture, of anthropology. They stand out fruitful of appropriate knowledge to be perceived and documented through the multi-dimensional representation of places and architectural continuity in the experience of the territorial lived.
The different formal and aesthetic aspects of the city of Berat, propose researches of historical caliber of the relationship between residential and religious buildings, in the geographical context of the south-eastern Albania creating and peculiarities to the natural landscape and built. Founded the roots of representations of the natural environment in the cultural life of the region dotted with smaller architectures with prevalent religious vocation, pursuing an analytical knowledge through discovery. To graphically document the above subject, the images they compare aspects of nature in the urban and religious context of the World Heritage site.
The city of Berat - crossed by the Osum River that is born from the mountains of Vithkuq to 1050 m high - has a unique cultural heritage and the year 1961 was proclaimed “City – museum”. Anciently called Antiparea by Polybius and Titus Livius, it is now known as “the city of a thousand windows”, because, in the bend of Osum there are typical white stone buildings with red roofs and many windows; aspects that have made known the city center, as “the city of a thousand windows”.
Albania's civil architecture has a historical documentation not completely appropriate; hardly ever appears in the history of Ottoman texts, despite, for centuries constituted a fragment of the great multi-ethnic Ottoman Empire. It is characterized by persistent religious plurality, reflecting the typological wealth and the many incentives that context. History, religion, economy, customs appear as written in the landscape determined in the archaic patterns of a now obsolete agriculture, which divides the territory into separate fields with hedges, alternating rows of fruit trees, interspersed with some small vineyard landscape dotted by minarets and great crosses, characterized, especially in the inland areas, by some historic centers, upright in their most ancient part.

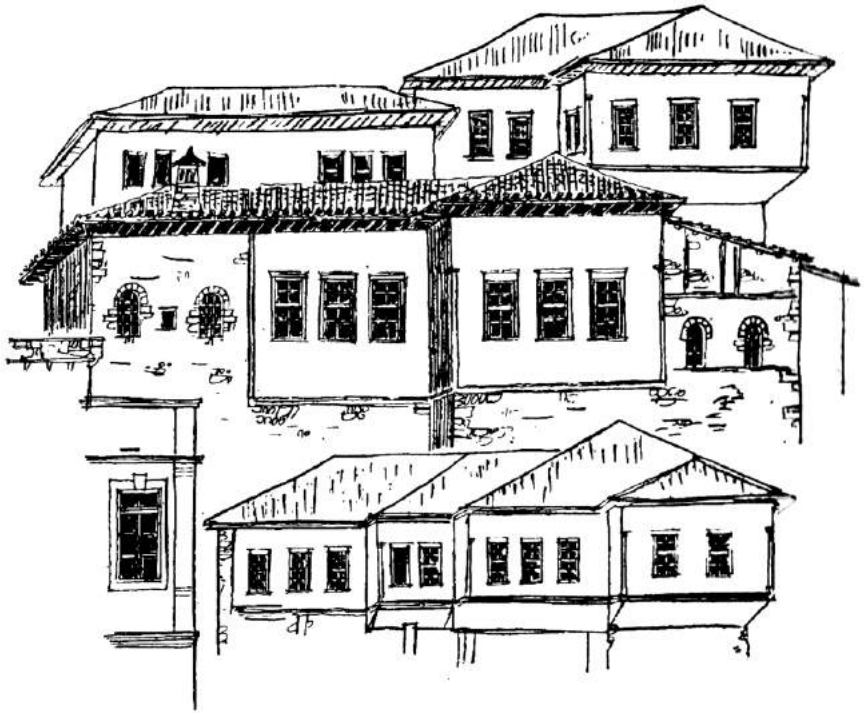

Fig. 4: The UNESCO site of Berat, the drawing of the building typologies

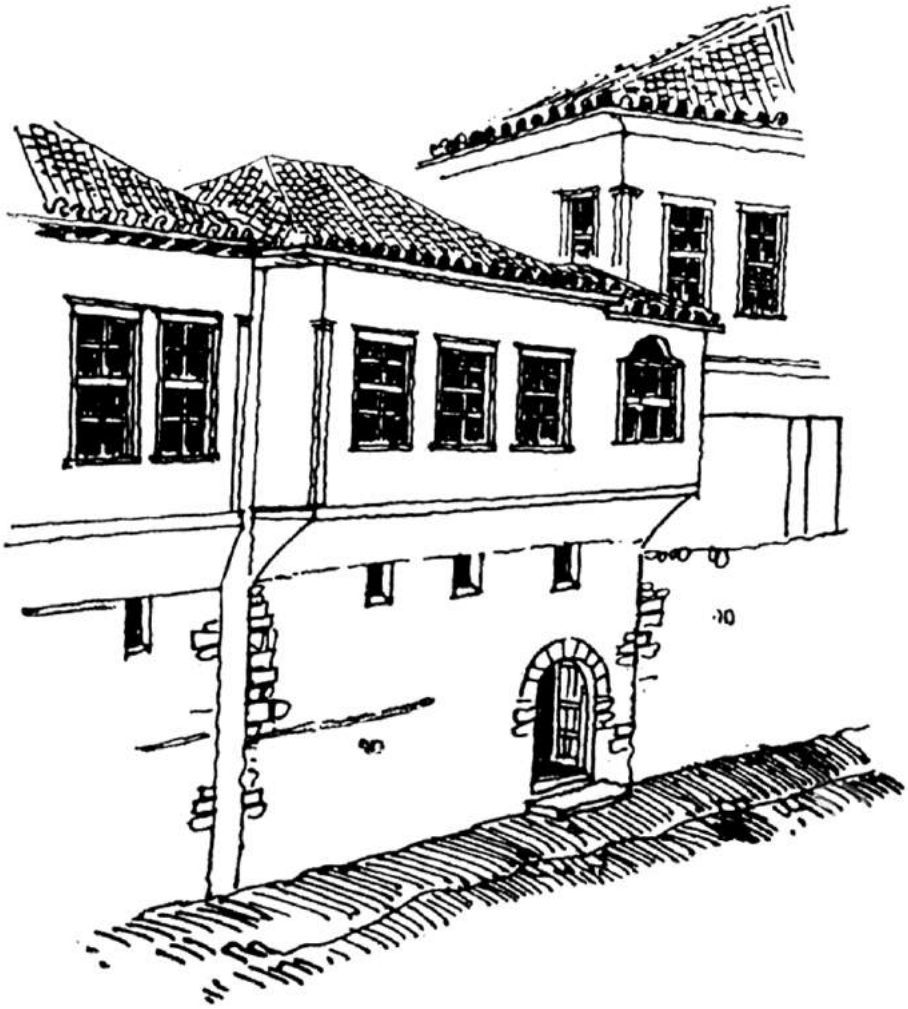

Fig. 5: The UNESCO site of Berat, the drawing of the building typologies

Fig. 6: The UNESCO site of Berat, the drawing of the building typologies

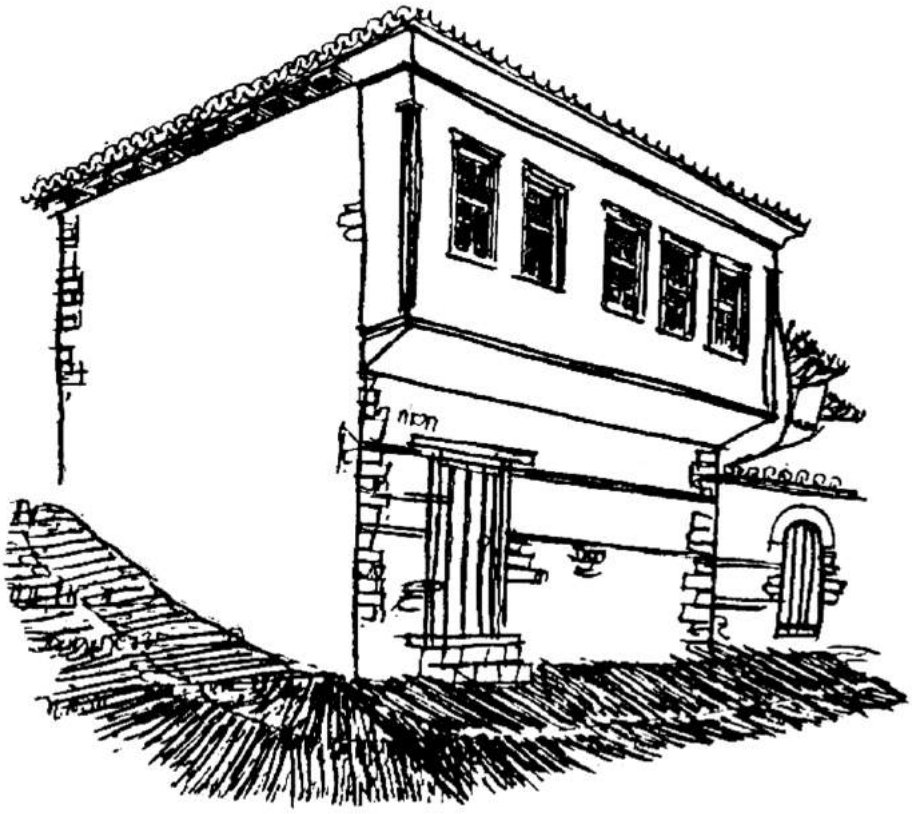

Fig. 7: The UNESCO site of Berat, the drawing of the building typologies

Fig. 8: The UNESCO site of Berat, the drawing of the building typologies.

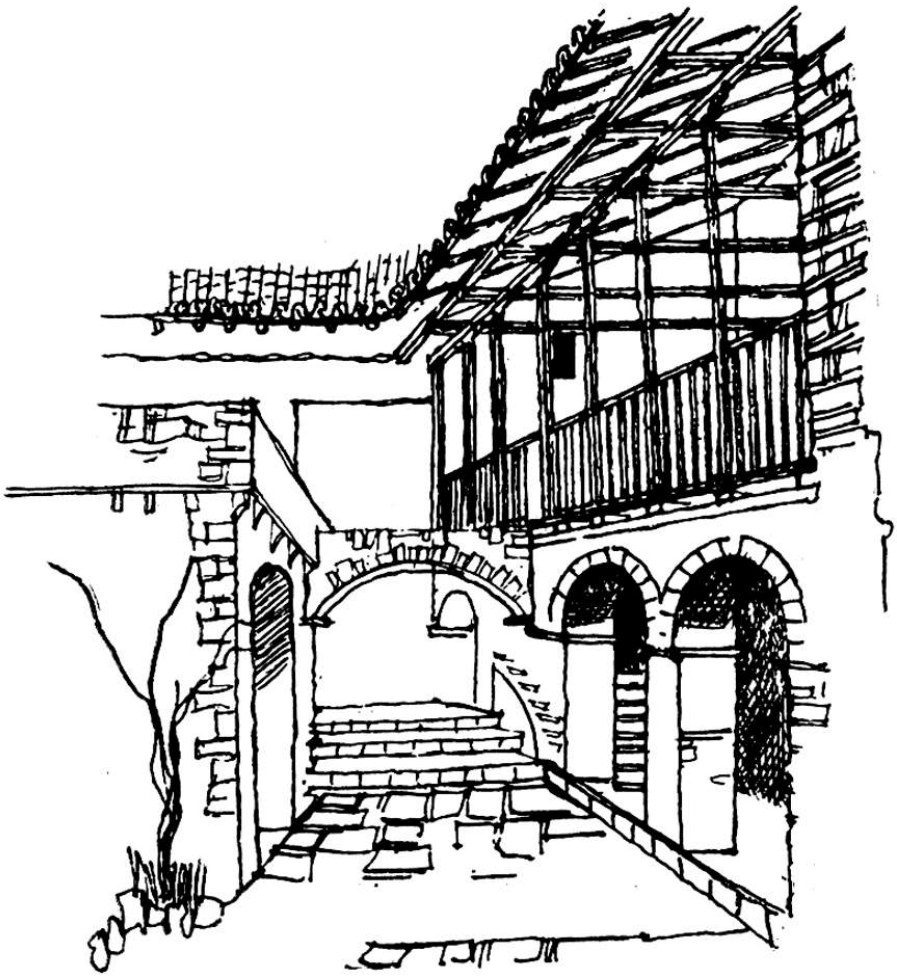

Fig. 9: The UNESCO site of Berat, the drawing of the building typologies

Fig. 10: The UNESCO site of Berat, the Cathedral of the Assumption of Saint Mary

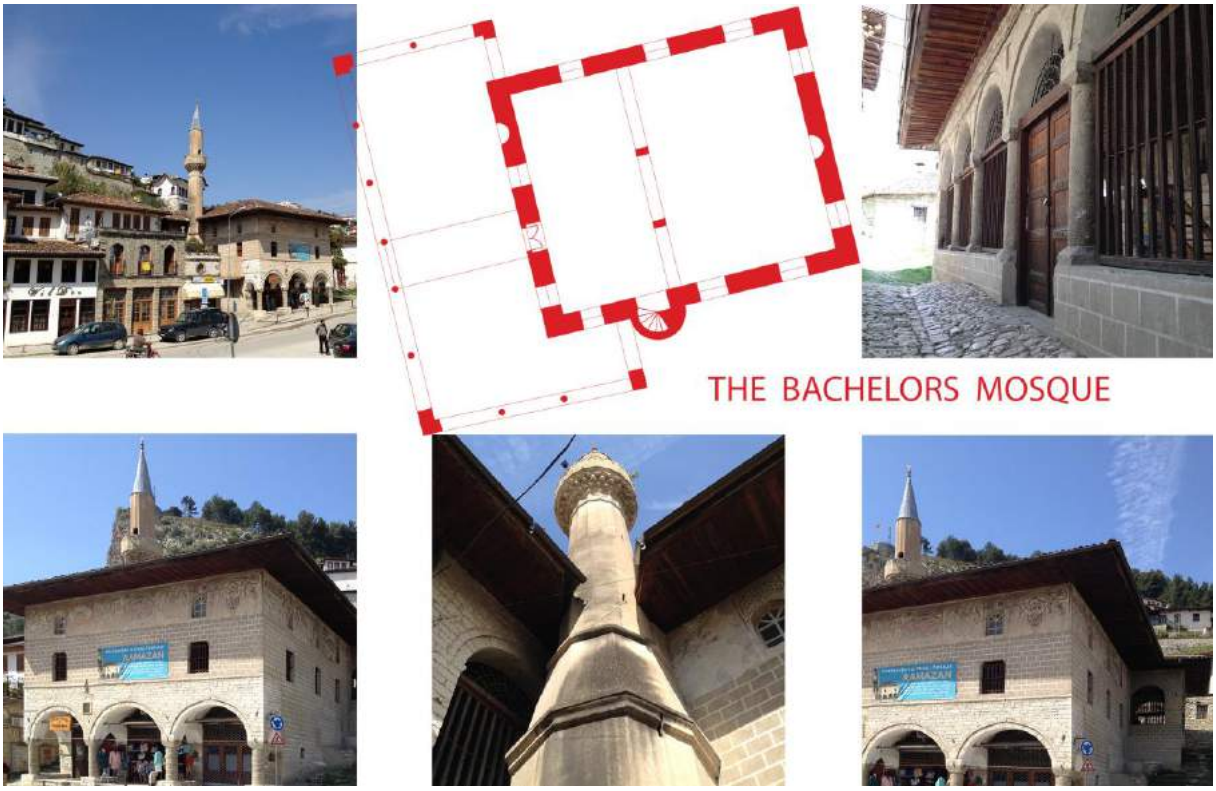

Fig. 11: The UNESCO site of Berat, the Bachelors Mosque

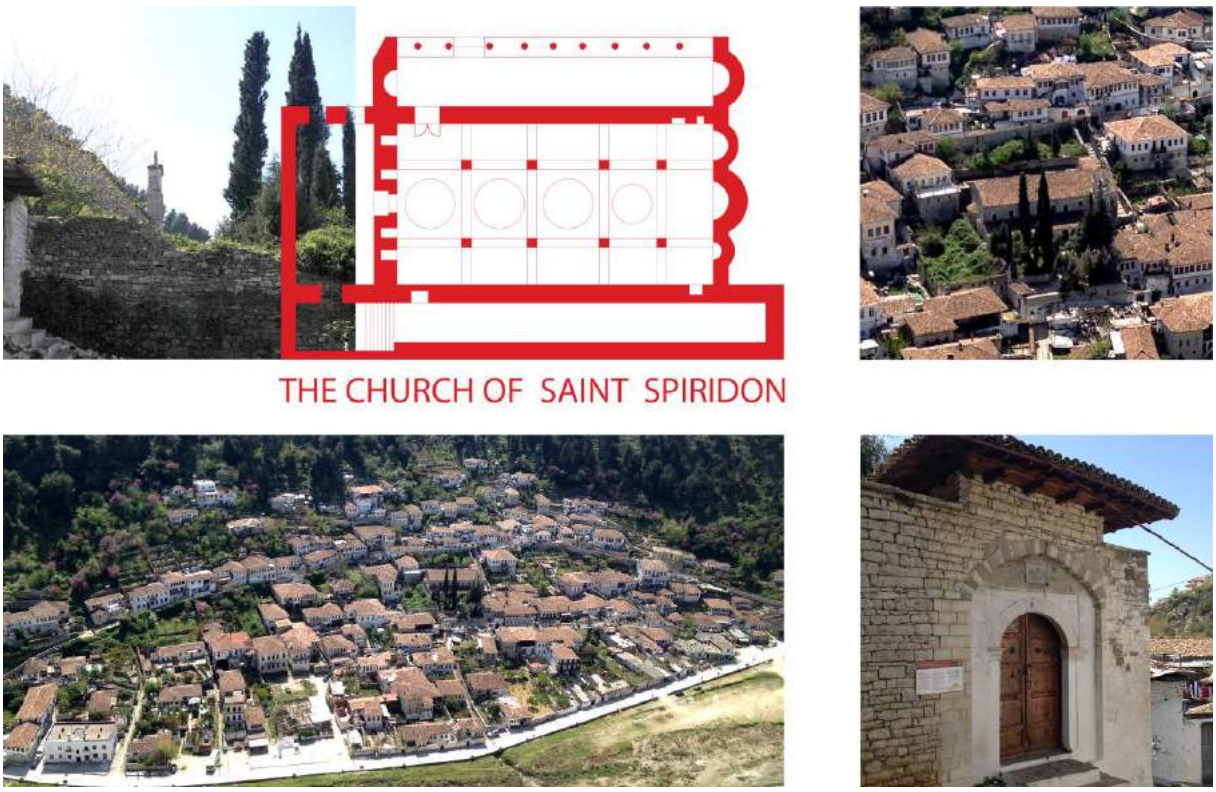

Fig. 12: The UNESCO site of Berat, the Church of Saint Spiridon

The city of Berat is relevant to its nineteenth century houses preserved and restored over the last thirty years of the twentieth century. The three oldest districts, Kala, Mangalem and Gorice, on the hillside, they are also developed in the plains, along the Osum River. They are similar to the type of housing but different position: Kala, inside the fortress walls, on the high of the hill, Mangalem, along the hillside, toward the river, and Gorice, the Christian Quarter, in the plains beyond the Osum River, wedged between the mountains, and shortly sunny in the winter.
The strong sense of religious tolerance is the specific feature of the Albanian nation; originated from secular coexistence of different faiths, Catholics and Orthodox Christians, Muslims and Bektaschi that gave rise, over the centuries, at an extraordinary example of cohabitation and mutual respect, the remarkable phenomenon interest in the costume of the European continent.
The Kala district, with about thirty churches and the remains of two mosques, preserved - almost unique case in the Balkans - almost intact its character, with narrow streets defined by the boundary walls of the gardens and the white ones of the houses, with their protruding parts, wooden windows and widely. Another detail of singular chromatic beauty are the roofs with reddish tiles, with a low pitched. The district is located 187 m above sea level with an area of 9.6 hectares on a rocky hill on the left bank of the Osum River. It is made up of the castle of Berat, built on a triangular-shaped plain, it is one of the greatest historical monuments in the Balkans. The 24 towers of different shapes and sizes, surround the gigantic walls of Hellenistic foundation and then medieval. The sources date back to about 200 C, after the fire of the fortress by the Romans and the subsequent reinforcement of the structure, in the fifth century by the Byzantine Emperor Theodosius II, and rebuilt in the sixth century under the Emperor Justinian .
The second quarter, the Muslim quarter of Mangalem, is a well-preserved area with distinctive buildings amid charming narrow streets. Particularly compact, the unit set of houses, whose base, stands the Mosque of Bachelors. The village was a bazaar area, residences of merchants and craftsmen, and extends on the steep slope, forming the shape of a pyramid, on top of which is the castle. The main feature is the numerous windows. There are some mosques including the Lead Mosque, the Mosque of the King, the Mosque of Bachelors and Alveti Tekke.
The Orthodox Christian district of Gorica, Berat third quarter, if it is developed from the sixteenth century and extends on the right bank of the Osum River, and is connected by the old bridge to 7 arches and a modern bridge, the Mangalem Muslim quarter. The private homes have large gardens that recall the primitive character rural character of the village.
The urban center of Berat has a small proportion houses and are, therefore, less costly maintenance; also it appears as a whole enough preserved, with several homes even within the Fortress. In the district Mangalem a part of the commercial structures have been rebuilt to use by residents, while in flat Gorica district homes, around the restored church, appear today occupied without too many

alterations. The site Unesco City museum since 1961, while retaining some religious buildings, Christians and Muslims, restored, is famous for its white houses, arranged in tight rows, small, shimmering glass, which have earned him the nickname city of a thousand windows.
Architectural types are not monumental, yet all the houses look very attention to detail. Frequently is the building outside staircase and there are two lateral wings. The buildings have been cataloged as monuments in two categories: the first category belong the buildings that need a complete preservation, often destined to become museums; The second category includes the buildings of which is preserved intact only the exterior, while the interior can be partially adapted to the needs of modern life. The configuration process of the city of Berat started in 1961. The first decade was occupied by operations of “rescue” of increased risk buildings, even static; the second decade of the individual monuments recovery work; while, from 1980 to 1990, operations have been extended to all cataloged monuments. We were initially investigated the static conditions, and implemented some consolidations: only later we moved to the conservative method of restoration of monumental buildings (the Lead Mosque in 1979, and the Mosque of the King in 1981).

Fig. 13: The UNESCO site of Berat, the drawing of the building typologies

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Landscape Districts along the "Via Francigena in the South": the Monti Lepini area

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Abstract
Nowadays the cultural attraction and the power of tourist routes in local development have available evidence. The Great cultural routes of the Council of Europe are particularly important for their high value in cultural, religious, environmental and landscape fields. The "Vie Francigene" are included among these.
In Italy, the measures and the specific actions taken with regard to the "vie Francigene" are however remained so far isolated and still fail to guide, towards coherent strategies of trans-municipal scale, the regional policies of Authorities concerned.
Relating to territorial research, one of the most interesting topics is precisely the identification of the "area of relevance" of a single "cultural asset". This issue directly refers to the concept of landscape and involves a particular attention to territorial cultural identity issues as well as to the assets of the "Minor Heritage".
The paper presents a method aimed to identify the boundaries of these "areas of relevance". This method, inherently interdisciplinary is based on the study of tangible and non-tangible features of landscape. In particular, the idea of "landscape district", regarded as "an area presenting «not conjunctural» coherent features which are useful to identify Communities and Territories that share same issues and potentials", is applied.
The method is presented through its implementation in a design exploration (operational projects).

Keywords: Landscape, Territory, Landscape district, Planning, Historical Heritage

1. Preamble
The relevance of tourist routes as cultural attraction elements and local development factors is nowadays an acquired fact. From the European experiences of Gro□glockner Hochalpenstra□e, to the National Tourist Routes in Norway, or to the Deutsche Alpenstrasse, or even in Italy, to the experience of VEnTO.
The Great cultural routes of the Council of Europe are particularly important for their high value in cultural, religious, environmental and landscape fields. The "Vie Francigene" are included among these.
In Italy, the measures and the specific actions taken with regard to the "vie Francigene" are however remained so far isolated and still fail to guide towards coherent strategies of trans-Municipal scale the regional policies of Authorities concerned.
These remarks clearly show that in our Country an administrative reorganization of Local Authorities is nowadays an urgent matter to face up to. The deep changes in territorial structure, as the full-blown urban sprawl, the de-industrialization processes or the new daily transfer phenomena would require new administrative framework.
Conversely the implementation of the recent law (L. n. 56, 2014/04/07 - "Legge Delrio"), that redraws boundaries and local administration skills, wearily goes on between political difficulties and the contradictions of the legal provisions.
□et the scientific debate on the subject is broad and has long term roots.

Among the others we can quote the words of Lucio Gambi: "Today's Italian situation [AN: Gambi writes in 1995] shows us […] a society that radically changes, but which has to deal with a territorial design of political institutions that is broadly preserved unchanged. As regards the organization of space, this is one of the greatest contradictions, one of the most negative misunderstandings of our times (GAMBI L., 1995)".
Therefore, the institutional upgrade of Local Authorities is a mandatory requirement to cope with the deep underway territorial changes.
Based on the awareness that Local dimension is largely inadequate to deal with the enhancement of landscape and cultural asset's mosaic, as well as it is inadequate to tackle a proper management of systemic phenomena of environmental emergencies and functioning of services with specialized status, a new research project has been started. This research, disregarding the "calcified" (GAMBI L., 1995) administrative boundaries, tries to explore the conditions and the methods aimed to identify a "distribution area" that can be identified as "an area presenting «not conjunctural» coherent features which are useful to identify Communities and Territories that share same issues and potentials".
These areas, identified through a method based on the study of tangible and non-tangible features of the landscape (VALLEGA A., 2008) and therefore through a method inherently interdisciplinary, have been named for the sake of brevity "landscape district".
Therefore, the idea of "landscape district" takes shape with the declared intention to disregard the Local administrative organization in the area. The "landscape district" is proposed as a useful tool to the redefinition of territorial boundaries and it is oriented to the preservation and the putting in value of landscape features.
Indeed, relating to territorial research, one of the most interesting topics is the identification of the "area of relevance" of a single cultural asset: an area that can be actually useful to asset's conservation both in term of its physical elements than in term of its signification. This issue directly refers to the concept of landscape and involves a particular attention to territorial cultural identity issues as well as to the assets of the "Minor Heritage".

2. Case-study

In the study exposed in this paper, the method is presented through its implementation in a design exploration (operational projects) aimed to the identification of the "landscape district" related to the three tracks of “Via Francigena in the South” which involve the Monti Lepini area.
To the “Vie Francigene” has been acknowledged the credit to provide to the crossed territories the great opportunity to affirm, in the widest sense of the term, the cultural identity of Europe understood both in its significance of local identity than in its meaning of inter-national joint element.
This occurs in particular through the enhancement of the monumental and artistic heritage related to them.
The idea of this research takes shape just from the interest to identify the elements and the strategies for the reinterpretation and the restoration of this "via", with the aim to regain the concept of "street-territory", i.e. the unavoidable link between road and environment, typical of the "vie Francigene".
In detail, the examined Francigena tract has not been yet the subject of specific insights and the ancient route, in many of its parts, has been nowadays included in the ordinary mobility network.

3. Method

The method has been developed, for the first time, during a research required by an Institution of national level to the University. Subsequently it has been deepened through its application on different study cases both in teaching and research activities carried on by a specific research group.
The identification of "landscape district" areas takes place through a method that is freely inspired to the research of Olinto Marinelli (MARINELLI O., 1917) and Aldo Sestini (SESTINI A., 1963).
The method “submits” to landscape complexity and to its hypertext structure (VALORANI C., 2006), avoiding the temptation of an alleged "objectivity": a pervasive classification is avoided and instead is preferred the increase in value of territorial specificities as well as of the “excellence”.

3.1 Identify the center

The proposed method starts from the perception that the Community (established or not) has of its territory. It focuses the attention on territorial elements, the signs, that are clearly able to arouse an acknowledgment from the Community.
Signs that in the “collective imaginary” have a "predominant” role (VALORANI C., 2006).
We have to imagine many different “points of access” to the landscape through which it is possible to proceed to the full exploration of its complexity.
These access points may refer to different matrices: natural identity (vegetational or geomorphological), shape and patterns of built environment (ancient or current) which have testimonial evidence meaning, agricultural systems that are the main characterizing features of the area. But the list may expand.

To be considered as “center” of the district the sign must be able to arouse “attachment” (GIANI GALLINO T., 2007) in the local Community and, at the same time, it must be recognized by the enlarged Community.
Its identification is done by querying the Communities through their witness forms: whether they are historical sources or contemporary communication media.

3.2 Perceive the area extent

The next step is the definition of the minimum extent of the “district”.
This area may be identified starting from those parts of territory which are significantly influenced, and simultaneously evoked, by the “iconema” (TURRI E., 1979). The area’s boundaries have to be drawn in a way that they will be relevant also for the evolution of the iconema significance.
Even in this case it is necessary to renounce to a predetermined approach and instead developing a receptive listening.
If we look to the territory starting from the concept of landscape we are in front of different territorial circumstances which require that the phenomena’s reading has to be marked by a high multi-scale and multi-disciplinary flexibility.
We can mention, for example, two opposite cases that precisely require the flexibility of approach above described.
In the former example infrastructure of trans regional scale, such as the track of a disused railway, interferes different environmental units.
On the contrary, in the latter example, significant changes, such as urban sprawl phenomena, affect portions of a single great extent environmental unit.
Therefore, the outcomes, in terms of “size” of the possible landscape districts, may be very different.
The first reference criterion, for the identification of the area, foresees to incorporate the full physical extent of the identity element.
Only in cases of elements with outstanding extent (for example the “Vie Francigene”) it will be necessary to use additional criteria designed to split into coherent parts the element.
However, the operation of incorporating the full physical extent of the identity element is not exhaustive. Indeed, considering the physical element in itself still does not give us back a portion of territory that is significantly relevant for its preservation and enhancement.
So it will be necessary to proceed by putting the physical element in the focus of attention and observe it in its systemic connections with the other significant territorial features (belonging to different matrices).

3.3 Explore the edges

For this purpose, the observations derived by querying the tangible features (VALLEGA A. 2008) must be completed by more traditional cognitive contributions arising from systemic study of the tangible features.
Preliminarily to the study, it is useful to imagine our Country split into two major categories of land use: mainly settled (divided into residential / production system, agricultural system and relational system) and mostly not settled (natural and naturalized territories).
These land use systems are often territorially discontinuous and lacking in “exact” boundaries.
Nevertheless, the system core area retain well-defined features. This allows to adopt specific cognitive and design tools different from each other.
Each of these land use systems can be observed according to many different features.
Among the main features that describe tangible aspects are to be investigated: the physical configuration; the ecosystemic role of different portions of the area; the framework of the functions and the activities; the history of settlement transformations that led to current arrangement; the socio / economic parameters that represent the area.
Among the main features that describe intangible aspects are to be investigated: the semiotic identity value of the witnesses elements (point of view of the "outsider" observers) and the semiotic social value of the physical features as they are actually perceived by the Community established in the area (point of view of the "insider" observers) (COSGROVE D., 1990).
The outcome is a model for the reading and the interpretation of the territory (especially useful for landscape purposes) that is organized in a matrix of the knowledge which considers two dimensions: systems (column) and readings of features (raw).
It is a "readings/analysis machine" for territorial systems that can be sailed as is needed. It has the benefit of placing different partial readings in a coherent framework.
In this way the reading of the various territorial systems enables us to identify some useful information to trace the borders of the “periphery” of the “landscape district”.

3.4 Identify the boundaries

However, the application of the method to different case studies shows that the criterion of the system boundary, because of the multi-scale characteristic of territorial phenomena, can not always be decisive. Therefore, it is useful to associate to this criterion also the one on the visual boundaries.
The visual boundary is here meant as an element connected to the phenomena structuring the area. In this sense, the visual boundary remains the same also when you "imagine" the area through your own mental synthesis of different views (SERENI E., 1961).
The delimiting of the area will make use, for example, of limits that can be easily integrated in the structure of the “mental image” (L□NCH K., 1960). So borders will be recognized in the physical form of territorial phenomena of different matrix, recalling here among others the concept of ecotone (FARINA A., 2015), may be more or less defined.
Finally the landscape district boundary will then be identified as a significant summary of the various “area of relevance” borders defined in the reading of the area features, in its tangible and intangible aspects, and in the investigation of its visual boundaries.

4. Conclusions

By anticipating the conclusions here, before the detailed presentation of the case-study, it can be said that the applied experiments have shown that the concept of "landscape District", in its tangible and intangible dimensions, is a flexible tool to be applicable to study-cases with different scale: trans-regional, trans-municipal, sub-municipal.
Finally it should be noted that the concept of landscape has always had an important political dimension. A dimension that is rooted in its etymological origins (LUGINB□HL □., 2009) and that it was confirmed in the political role that the "landscape" has had in the history of art (VALORANI C., 2014).
The idea of "landscape district" is, then, a flexible tool with a distinctive political value and could be suggested to the decision makers as a useful instrument to answer to the evidence they will soon be called to solve.

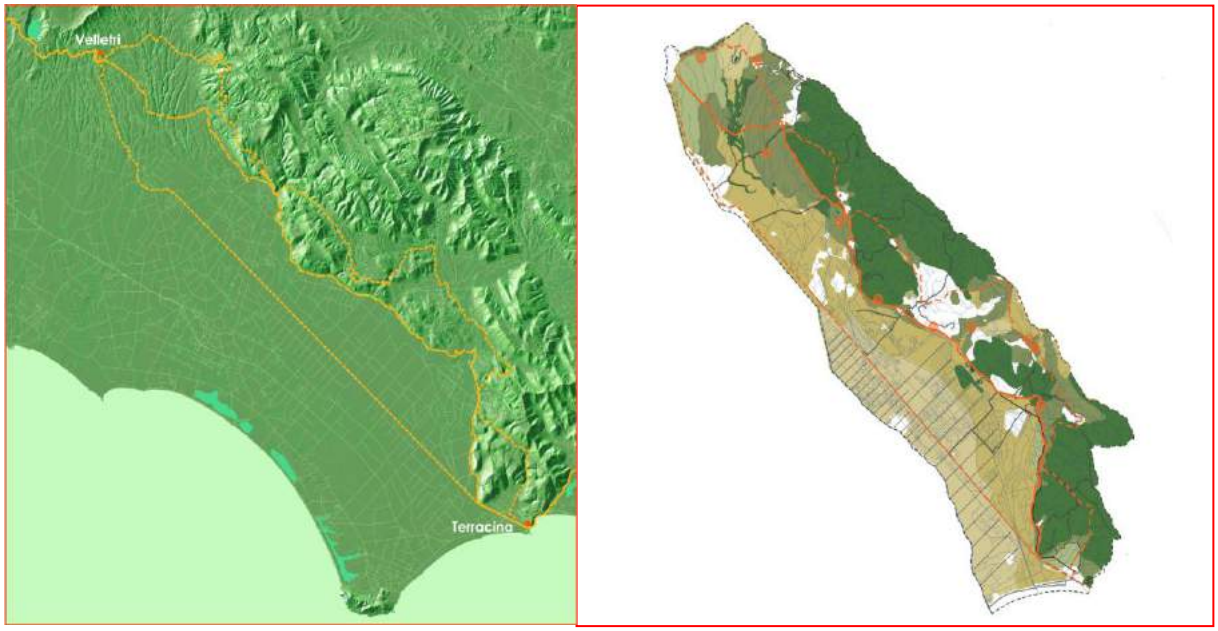

Fig. 1: On the right: the different "Via Francigena" tracks between Velletri and Terracina. On the left: in the "landscape district" are identified different actions: - punctual (transformation of old stations and rail toll in accommodation facilities and sale of local products); - linear (network of cycle lanes); - areal (identification of a specific operating regulations for non-urbanized areas).

5. Report on case-study - “Via Francigena in the South”: the Monti Lepini area

5.1 Introduction

The “via Francigena” was the most important route of the Middle Ages. Pilgrims, crusaders and merchants travelled along its tracks in a constant trade between East and West.
The succession of explorers’ testimonies and the features still present along the track, made the “Via Francigena Pedemontana”, in the Monti Lepini area, one of the possible routes of the “Francigene in the South”, as an alternative to the “via Appia”.

In the Middle Ages this path linked Rome to the South. In fact, it joined the city of Velletri, situated on the Colli Albani, to the city of Terracina, on the coast, with a track that skirts the footpaths of the Monti Lepini-Ausoni.
Today this ancient road could represent a great attraction for this area. It's an articulated track, which can be interpreted in many different ways and could promote new links between territory and tourism.

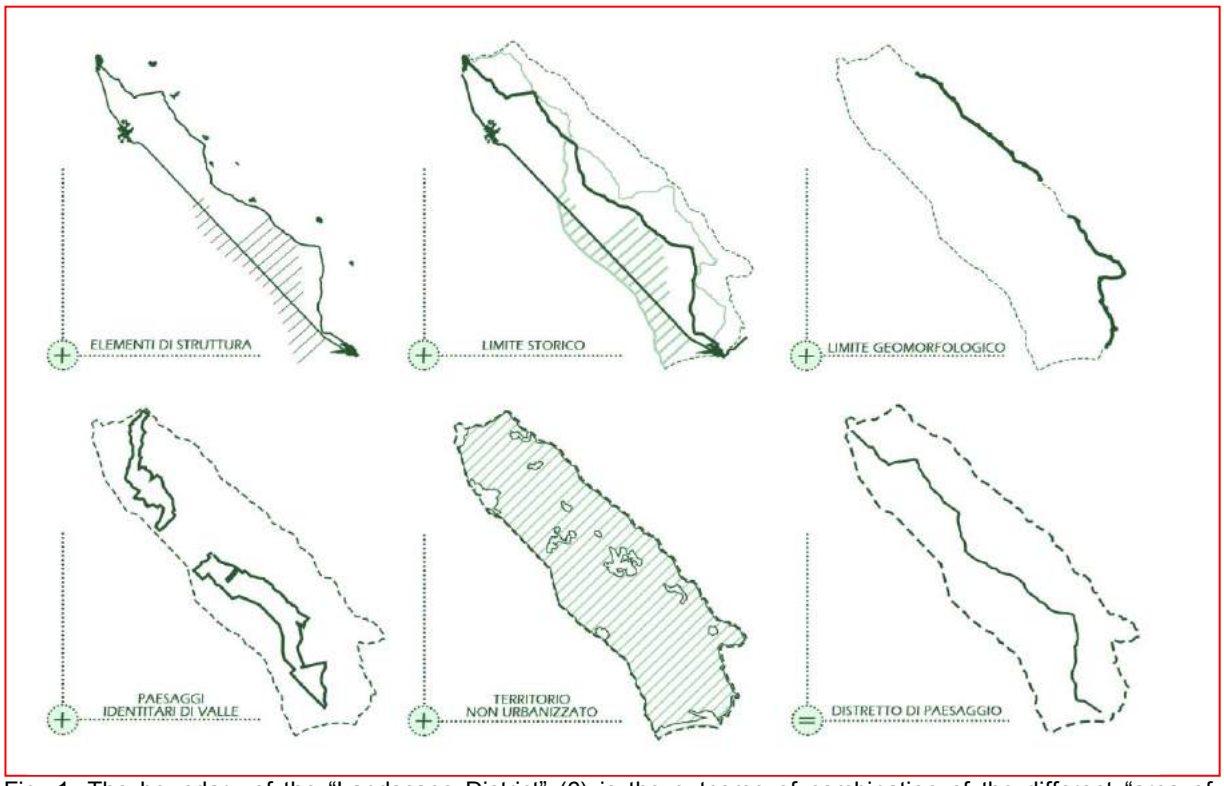

Fig. 1: The boundary of the "Landscape District" (6) is the outcome of combination of the different "area of relevance" borders emerged in the interdisciplinary readings: territorial structural elements - starting points of readings (1); historical road systems border (2); geomorphological features border (3); "identity landscapes" border (4); urbanized areas are subtracted from the district (5).

5.2 Boundaries of the "Landscape district"

The Landscape district area, that includes the tract of "Via Francigena Pedemontana" in the Monti Lepini area, was defined by considering the unitarity of this track and the significant elements that emerged in the interdisciplinary readings.
This area has a great extent, nevertheless, it presents homogeneous morphological and ecological features. For each thematic reading a different "area of relevance" boundary of was defined. The combination of these identifies the border of the Landscape district.
The main aim of this perimeter is to overcome administrative limits in order to preserve and to increase the value of the Francigena.
The representative signs of this area (territorial structural elements) are the starting points through which the "landscape district" is defined. They are: the "Via Francigena Pedemontana", the "via Appia", the "Pianura Pontina" and its drainage system, the medieval cities and the historical-monument heritage close to the "Via Pedemontana".
The borders of different "area of relevance" emerged from the readings are: historical, geomorphological and a border that includes the "identity landscapes".
The historical border includes mainly the "via Francigena Pedemontana", the "via Appia" and the Sisto river. These are linear signs with different structure but closely correlated. The "Via Pedemontana" is a Volscian track older than the Roman "Via Appia". They both joined the ancient town of Velletri to Terracina. The "via Pedemontana" skirts the foothills of the "Monti Lepini-Ausoni"; instead, the via Appia crosses the "Pianura Pontina". During the centuries the "via Francigena" had to replace the "via Appia", that was unusable because of the swamp, and was accessible only at seasonal intervals. It was before the drainage measures (1795). Nowadays, the "Migliare di Bonifica" regular pattern, aligned along the "Via Appia", and the drainage system are linear elements, which structured the Piana Pontina area. Also, some historical and architectural sites near these routes, belong to the historical component. They are specific signs of the area, called "iconemi", as such as: towers, castles, churches, stations and bridges.

The geomorphological border is identified in the second ridge of the Monti Lepini-Ausoni, which has been chosen to include the medieval cities directly in front of the “Agro Pontino” and linked to the director foothills of the “via Francigena” through detour roads. This border is also a visual limit because, the Monti Lepini-Ausoni and their highest peaks are a backcloth for all the pianura Pontina.
Finally, the “area of relevance” of some “identity landscapes” is included in the Landscape district: “Valle del Teppia” and “Località di Fossa”. The latter are areal signs laying in the foothills area and they are mainly marked by agricultural features. In their perimeter there are also some SIC, that represent excellence element for the area.
Otherwise the urbanized areas have been excluded from this Landscape district.

5.3 Objectives and intervention strategies

After defining the boundaries of the Landscape district it was possible to establish the aims and the intervention strategies. Among the main ones is possible to highlight:
- To develop new forms of tourism in the area and promote exchanges between different transport types through a cycling district (cycle routes accessible from roads and railways) useful to the local Communities and occasional users.
- To integrate the small Municipalities in a touristic paths system through the increase in value and preservation of historical monument heritage. This system is composed by the “via Francigena Pedemontana”, that is the main route, and a series of secondary routes which connects the natural and cultural heritage and the economic activities in this area.
- To promote the agricultural activities and local products. The system of cycle routes could be an opportunity to promote local economy, through its integration in a system of accommodation facilities and sale of local products.
- To protect and to preserve the natural areas and to increase their value through the system of cycle/pedestrian paths.

5.4 Division in homogeneous areas

In order to increase in value the landscape of the area surrounding the Francigena's tracks, a framework of use rules for the non-urbanized areas has been built.
The preservation of non-urbanized areas, according to their high value in terms of environmental and of attachment of established communities, has been recognized as an integral and significant part of the landscape protection actions.
Through a precise reading of actual land uses, the non-urbanized area close to the “via Pedemontana” was divided in homogeneous zones, that have comparable features in terms of land use and physical layout: natural areas and agricultural areas.
The action for natural areas, as woods and riparian vegetation, are aimed at their protection and safeguard.
The actions for agricultural areas are aimed to preservation of traditional agricultural landscapes and to encourage agricultural activities. These safeguard measures are put into place also through support policies to local farms.
In detail, it should be noted that the Landscape district is characterized with traditional agricultural landscapes (PAT). This area, the foothills of Monti Lepini-Ausoni, is a significant transition zone that connects the regular geometry of the Pianura Pontina landscape, to the marked slope of the Mountain landscape. In this area the crops depend on the morphology of the land: arable crops are grown in the plain and permanent crops on mountain sides.
The “via Pedemontana” is the connection element between this two different landscapes that are both identitary for this region.

5.5 Network of pedestrian and cycle routes

In the "landscape district" a network of pedestrian and cycle routes is defined along the “via Pedemontana” track. The latter is the main route, and a series of secondary routes are spread in all the district. The main features of this network are:
- <u>Defining of a system of links between valuable elements</u>. The network connect many “excellences” of the area, as such as: historical monument heritage, medieval cities, natural areas of significant value and traditional agricultural landscapes.
- <u>Continuity of the path</u>. The paths ensure the fewest possible of interruptions as well as the lowest number of tracts that have to be built ex-novo.
- <u>Safety of the path</u>. The pedestrian and cycle routes cross urban landscapes, agricultural landscapes and natural landscapes. All the designed solutions propose the cycle/pedestrian path in its own lane to ensure the safety of the users.
- <u>Interconnection and accessibility</u>. The routes network is not addressed only to those who wish to cycle all of its length. It is designed in order to allow intermodal exchange and fulfill some tract of the path also by train or boat. The paths unfold close to the railways Roma-Napoli and Terracina-Fossanova and the project foresees the reopening of the tract of the latter one, which now is disused.

- Thematic paths. The routes are organized into different interest themes. To each of them, the project gives information relating to: length, advisable time for its journey, difficulty of the track, sites of interest located along it.
In detail all the cycle/pedestrian network can be as follows broken down:
- Around 40□ crosses natural landscapes, connecting parks, ZPS and SIC.
- Around 8□ crosses landscapes with mixed features: agricultural and natural ones. This is the case of "Valle del Teppia" and drainage landscapes.
- Around 6□ crosses agricultural landscapes, as such as: arable crops in Pianura Pontina, olive groves and vineyards on Monti Lepini sides and mixed cropping in "Valle del Teppia".
- Around 24□ crosses the foothills of Monti Lepini-Ausoni and 21□ crosses the drainage landscapes.

5.6 Project solutions

The total length of paths network is 318 Km and 80 km of them is taken by Via Pedemontana. Compared to the current state, the network of cycle/pedestrian routes requires restoration in order to be usable with comfort and safety.
To fulfill the issue highlighted specific design interventions are defined based on three different infrastructural situations that can be encountered: - tracts that require changes to become usable. This is the case of streets with sidewalks, which could be used as cycle/pedestrian paths; - tracts that require few adjustments, like renovation of the road pavement and a cycle path in its own lane; - tracts that need important interventions, as the widening of the road.
According to these situations and to the road type a "standard solution" has been proposed.
In summary it may be said that around 50□ of cycle routes cross roads outside urban areas at local level. These routes don't have heavy traffic, and to become useful they require a cycle lane inside the road. Around 10□ of cycle routes cross roads outside urban areas at provincial level. These routes have a heavy traffic with a lot of non-usable tracks. To become useful they require a cycle lane inside the road. Around 3□ of cycle routes is designed near urban roads. So they require a cycle lane inside the road. Around 4□ of routes require minor changes. This is the situation of urban street with sidewalks, which could be used as cycle lane. Around 8□ of cycle routes cross local roads in the foothills area. They have small roads and require the widening of it in order to become useful. At least, 25□ of them is already usable with comfort and safety because of existing paths.
In all these cases the solutions require simple measures for the implementation with controlled expenditures, because the measures are repetitive and the projects could be coordinated by more administrations.
Flanked to these linear measures, some punctual solutions are be defined along the "via Pedemontana", that is the backbone for all the services in the area.
The "via Pedemontana" also represents an opportunity of development for local economy, thanks to the transformation of disused railway stations of Velletri-Terracina, into accommodation facilities and sale of local products that in this way can be promoted.
Therefore the main aim is to increase in value the resources already available as a growth factor for the settled Community.

Authorship

Carlo Valorani is the author of paragraphs from 1 to 4
Elisa Marcozzi is the author of paragraphs 5

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Social housing: Scandinavian *New Empiricism* and Italian *Neorealism*. Relationships and influences

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Abstract
It is the aim of the paper to analyze some social housing projects in Northern Europe and in Italy during the second postwar period, when the housing crisis offered architects and urban planners the chance to experiment new social building models. The design of Italian public spaces and residential buildings, in line with the requirements of the *Ina-Casa Plan*, which was adopted in 1949, looked at Northern Europe experiences as contemporary models able to provide modern houses and neighborhoods. A historical analysis of the most significant Swedish and Danish cases has offered new and interesting suggestions for mutual relationships between some experimental districts linked to the Scandinavian *New Empiricism* – such as Brøndbyparken in Denmark, Vällingby and Gröndal in Sweden – and the social housing linked to the Italian *Neorealism*. On one hand, the schemes of Italian popular neighborhoods (for example, the Tiburtino in Rome) recalled the landscape of Danish working-class villages and was inspired by the Scandinavian urban model, based on democratization of city services and attention to the people's psychological needs. On the other, the concept of some modern districts near Stockholm was influenced by the Mediterranean tradition.

Keywords: Social housing, New Empiricism, Neorealism, postwar districts

1. Architectural culture of the Postwar period (Elena MANZO)
The main city trials were performed around new housing models which became a discussion topic at the end of the Second World War. The post-war reconstruction programs associated the concepts of functionality, standard and infrastructure with those of global space and landscape, suggesting new social building models able to provide modern and healthy accommodations and better lifestyles for thousands of families. Italy looked carefully at these models in order to find relief from the war.
In relation to this topic, the models will be discussed hereunder with a particular attention to the most significant examples of public residential buildings. To this end, the Scandinavian experience was particularly interesting: the design of new popular districts in the northern countries – already started in the Twenties and Thirties with a careful attention to the environmental aspects and comfortable lifestyles connected to the traditional building – was the main aspect of typical architectures realized in the Forties and Fifties.
Interest in nature, use of local building methods and attention to the people's psychological needs were an original synthesis, different from what was produced in other European countries. This ensured that the northern cities became examples of a modernity able to represent a new society.

2. Swedish and Danish *New Empiricism*: models and cases (Ilaria PONTILLO)
The Scandinavian architectural production – already known all over the world thanks to the 1930 International Exhibition in Stockholm which offered an original interpretation of the Modern Movement - strongly affected the European postwar projects through reports on the most important international

reviews [1]. In particular in June 1947 the English review "*The Architectural review*" paid attention to the tendency to humanize the theories of the International Functionalism where rational principles and psychological aspects met up. Soon after, the English reviewer Eric de Maré gave expression to it through the word *New Empiricism* in an article published on the same "*The Architectural review*" in 1948 which described Sven Markelius' [2] country house in Kevinge [3]. He illustrated its features in a «reaction against strong formal positions» and in «the sense that buildings are purpose-built for human beings rather than to be conformed to a cold logical theory», in a constant empirical search of new housing solutions.
To this term, a new expressive vocabulary, a new modus operandi, free from the dogmatism and the rational strictness, was defined and based on the design of real spaces concretely structured on human scale and in close contact with the homemade tradition and the surrounding natural space.
Even though every Scandinavian country contributed to the history of architecture in this period, it would be necessary to deal with emblematic Swedish and Danish examples in order to delineate this work.
On the one hand, Sweden, isolated and independent from Europe talked down by the war, and indifferent to the reconstruction plans, set, at the end of the 1940's, the most original program of urban reconstruction and realization of new popular districts supporting the principles of the New Empiricism movement; on the other hand, Denmark soon reacted to the sufferings of the occupation regime through a search of lodging themes and urban growth based on the interesting association of modern technology, traditional building systems and natural landscape, able to show a very original aspect of the Swedish New Empiricism [4].
The districts analyzed went beyond the building stiffness through the contemporary version of historical residential structures.
The isolation from Europe allowed Sweden to strengthen its connections with the local architectural history, contributing positively to the postwar urban planning [5]. The idea of district as a means for achieving control over the city development and the neighborhood unit theory aimed at realizing housing estates designed for the social interaction with schools, nurseries and green spaces [6].

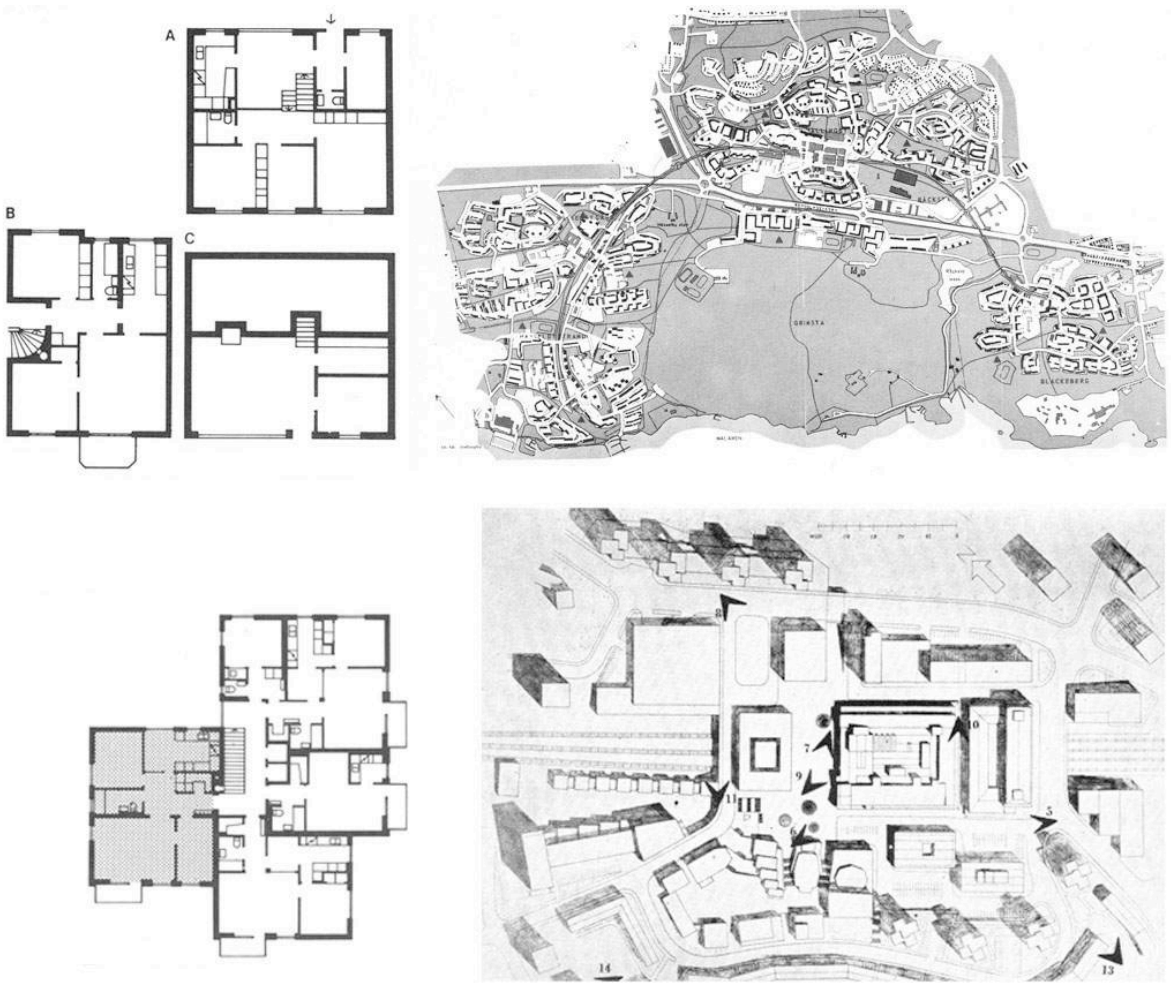

Fig. 1: Sven Backstrom, Leif Reinus. Vällingby district, 1952-1956.

Sven Backstrom and Leif Reinus, owners of an architecture company based in Stockholm since 1936, were some of the most important international representatives [7]. They contributed to define a new national architecture through the realization of Gröndal and Vällingby districts.
Gröndal district was realized between 1944 and 1946 and had innovative star-shaped houses gathered together in order to form internal courtyards. This form allowed the long and narrow blocks to obtain the best possible lighting; Vällingby district, realized in 1954 and included in the general plan of Vallinsgby's satellite cities planned by Sven Markelius, had accommodations for about 25.000 people in different flats - from the traditional triplex houses to towers spread out over ten or eleven floors - gathered around the centre with play grounds and parking areas.
In Gröndal and Vällingby districts the constant attention given to the natural environment allowed the designers to create new building types and elaborate innovative schemes of urban agglomeration far from the dogmatic Functionalism and focused on the hand-built production and people's psychological needs.
In Denmark Kay Otto Fisker [8], an important exponent of the housing politics, rendered the *existenzminimum* in Brøndbyparken in Brondby, included in the program of urban development called "*Five fingers*' Plan" edited for Copenhagen in 1925 and approved in 1947, whose aim was to extend the capital in five directions [9]. It consisted of multifamily housing blocks structured according to the principles of the international Functionalism (common areas and lodges built on human scale and in relation to the social activities for people) and arranged as the Danish rural houses with pitched roofs and reduced height. Brøndbyparken was a perfect synthesis of modern technologies, local forms and respect of the environment; this research introduced other important examples such as Voldparken district, realized by the same Fisker between 1949 and 1951, and Bedalsparken district, realized in 1949 by the architect Erske Kristnensen in the south-west of Copenhagen [10].
Bedalsparken district was a big residential area with more than a thousand lodges, shops and open areas; the uniform disposition of the blocks, with living rooms and balconies pointed towards the sun, associated, in forms and materials, the principles of the modern living ease with the traditional national building.

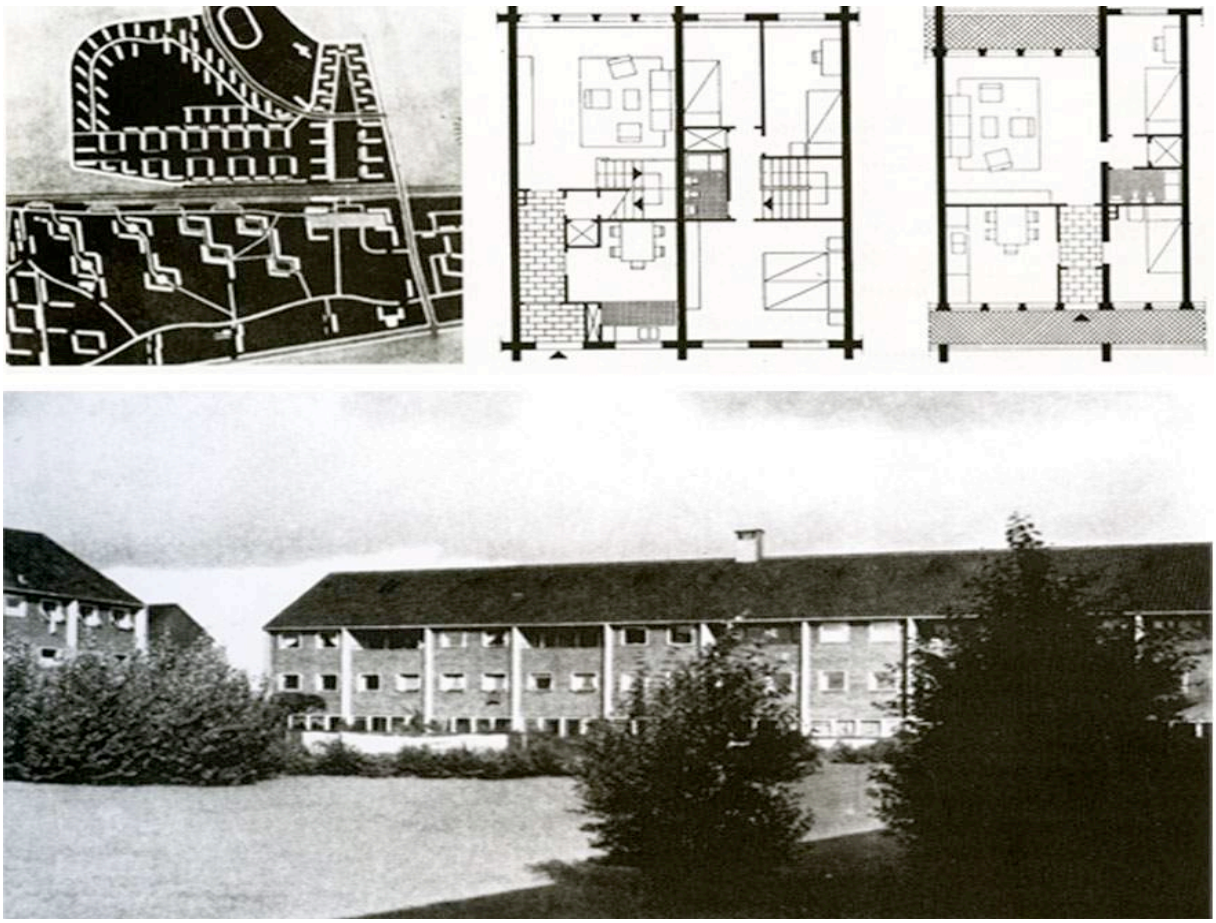

Fig. 2: Kay Otto Fisker. Brøndbyparken district, 1943.

3. **Italian reconstruction and Neorealism districts** (Michela RUSSO)

The first main artistic and political-ideological links between the Scandinavian countries and Italy were already established before the Second World War by Giuseppe Pagano and Ernesto Nathan Rogers, some of the most activist Italian architects [11]. As an extension of their experiences, at the end of the 1940's the northern European districts became an important discussion topic and an interesting democratic housing model; the architectural and urban reviews defined the district dimension as the minimum executive and planning unit related to some main services which guarantee an organized community. To this end, they illustrated some of the best experiences realized in Sweden and in Denmark on reports [12].

In this way, they strongly affected the contemporary Italian projects which aimed at mediating the metropolitan impact of a rural population moving towards the cities and building a new and better society far from Fascism.

In 1949 with the Ina-Casa plan the Italian architects experimented new models of urban agglomeration and were prone to preserve the traditional house with the rational use of the technical innovation at the same time. Therefore, the fusion between rural and vernacular architectural features and the standardization of the building elements, successfully started in Scandinavian countries more than ten years before, was experimented in Italy too [13].

With the general political change, the common aim for an innovative architectural culture distanced from the monumentalism and able to express folk values in human forms as Cinema and Literature already did, was diffused in the Italian society; the Architecture witnessed the birth of the Neorealism too [14].

As for the New Empiricism, the Neorealism did not aim at expressing a new planning ideology created by a group, but was an incisive critical definition used to indicate a research based on a new rationality whose aim was to recover the traditional figurative systems and to realize the psychological aspects in an urban environment where the new society could freely identify itself.

Milan and Rome – the first one continued the pre-war rationalist architecture, while the second one leaned towards the *organic* architecture – represented two different stances on the research of a new national architecture; in this context, La Martella in Matera and Tiburtino in Rome would be two important new realistic districts in Roman style.

La Martella, planned by Ludovico Quaroni [15] in Matera in 1951 in range of the Sassi's redevelopment project supported by Adriano Olivetti, was conceived as an autonomous village [16]. It had a central unit designed for the Church and common facilities and from this point the roads branched off with the houses deployed along the contour lines and gathered together in order to form building curtains. These structures proposed the neighborhood unit based on the Sassi's model. The project represented new realistic forms and proposed itself as a new suburban space model which gave form to modernity, continuity and tradition.

La Martella probably established a more evident contact with the Scandinavian experiences with a global interest for artifacts, landscape and urban context than Tiburtino.

Tiburtino district in Rome, another important example of the Italian Neorealism, planned between 1950 and 1954 by Ludovico Quaroni and Mario Ridolfi [17], became, with its vernacular register (pitched roofs, long windows with external shutters, connecting landings for the lodges), a necessary reference for other Italian popular districts [18]. It consisted of different buildings (tower buildings, terraced buildings, line buildings) - irregularly placed and in contrast with the rigorous rationalistic bearings – so as to recreate the spatial continuity of the pre-industrial city. Furthermore, it combined materials and languages of the popular housing tradition in order to create more human spaces. Although an independent urban unit was created following the example of the historic villages, the Tiburtino seems to be disconnected to the rest of the city today.

Although the experimentation of building typologies, the use of traditional architectural language and the attention towards the human psychology were the main elements of the Scandinavian New Empiricism influence in Italy in the 1950s, the Italian designers of that period made the mistake of transposing the Swedish and Danish housing models inside a weak social, political and urban context.

The fact that Italy, on the one hand, Sweden and Denmark, on the other hand, had two different ways of dealing with the national art history and comparing the architectonic culture with the urban planning was the main reason of these mistakes.

In fact, having some variations, in Sweden and Denmark the passage from the Neoclassicism in the 1920s to the Rationalism in the 1930s and to the New Empiricism in the 1940s and 1950s occurred with smooth transitions. During the post-war period, the previous architectonic tradition was proposed again in contemporary forms through the use of local themes, building materials, the relation between a built context and natural context and the awareness of the associated life.

On the other hand, Italy, whose aim was a new completely different society far from Fascism, researched a new architecture characterized by tradition and progress and different from what was produced and theorized during the war.

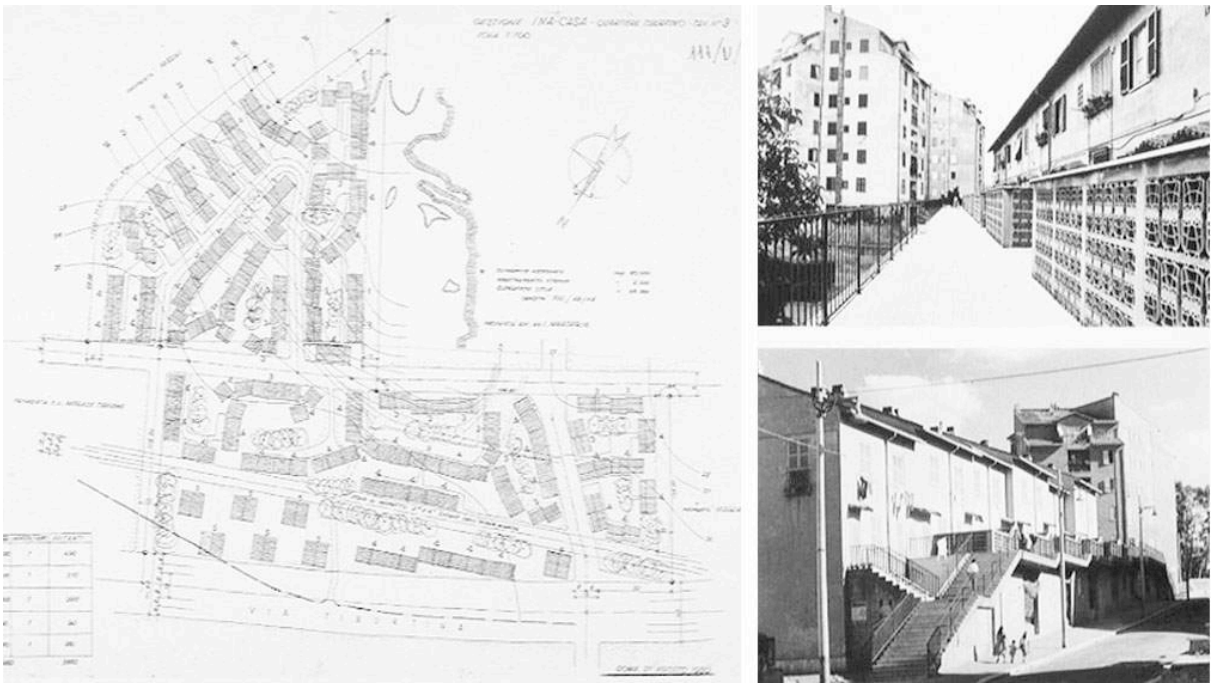

Fig. 3: Ludovico Quaroni, Mario Ridolfi, Carlo Aymonino, Mario Fiorentino. Tiburtino district, 1949.

In an historical period marked by the disappearance of a national architecture, the *neorealist* architects tried to reproduce planning forms that often gave factitious and random results in Italy unlike the Scandinavian political and social situation.
In fact, Federico Gorio wrote on Casabella-Continuità in 1957 that the Tiburtino «come fatto architettonico (è) meno interessante di quanto non lo sia come espressione di un momento e di un atteggiamento culturale, per le ragioni e I modi che lo hanno determinate e per le conseguenze che esso ha prodotto» [19].
Finally New Empiricism also represented in Scandinavian countries an important moment of interaction between building design and urban planning. This allowed the popular districts of the 1950s to be part of a systematic plan for the city reorganization. For this reason, they were not considered as autonomous entities totally taken out of the urban context.
In Italy, while the cities branched out because of the Ina-Casa and the private speculation, the urban planning control allowed by the National Law in 1942 had not yet come during the post-war years, compromising the integrity of urban areas. This situation revealed a lack of urban and architectural commitment in the building process. Although the Neorealism districts enquired into a high building quality, they ended up becoming isolated contexts inside the cities, without infrastructural works.
At the end of the 1950s Quaroni critically defined Tiburtino district as "*a quite modest thing*". His words also motivated the substantial difference between the capacity of the Scandinavian New Empiricism to set itself up as a new international architectural tendency in the post-war period and the development of the Italian Neorealism as local tendency: «nella spinta verso la città ci si è fermati al paese (…) Nel volere dare un linguaggio italiano alle esperienze e agli insegnamenti dell'urbanistica svedese siamo arrivati a farli parlare architettura in romanesco» [20].

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The Universit of Aversa celebration of the wedding procession of Charles of Bourbon and Maria Amalia of Saxony

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The many expressions of cultural renewal promoted by Charles of Bourbon, King of Naples from 1734 to 1759, still characterize the identity of various cities and regions of Southern Italy. On the occasion of the third centenary of the birth of their first king, numerous public administrations and scientific institutions in Southern Italy have organized studies to honor his memory. It is known that in the field of architecture, Charles was the promoter of interesting and artistic architectural complexes, such as the royal palaces of Portici, Capodimonte and Caserta. However in the architectural culture of the eighteenth century, it should be highlighted that, in addition to the permanent works, the composition of ephemeral architectures represented an important showcase for the most famous artists, such as Ferdinando Sanfelice and Luigi Vanvitelli. In this context, this paper describes and comments the feast of June 22nd, 1738, commissioned by the "Università" of Aversa and organized by the architect Paolo Posi to celebrate the wedding of Charles of Bourbon and Maria Amalia of Saxony.

Keywords: artistic culture, ephemeral architecture, eighteenth century.

1. The Ephemeral Architecture in the Neapolitan artistic culture in the 18th century

Prior to discussing the celebration offered by the Università of Aversa to honor the wedding of Charles of Bourbon and Maria Amalia of Saxony, it is worth highlighting the importance of Ephemeral Architecture in 18th century Neapolitan artistic culture. Wrongly considered for a long time as a minor architectural expression, ephemeral appliances represented an extremely fertile ground upon which to develop new solutions, that talented architects would then adopt in their permanent buildings.
Conveniently, studies carried out by the architect and set designer Franco Mancini in the 1960s have classified the vast production of celebrative appliances realized during the viceroy period as well as the Bourbonic reign, giving the scientific community an extended and varied repertoire that can be still expanded with new acquisitions [3, 5]. As Mancini has showed, during the 18th century the most relevant architects working in Naples – from Fredinando Sanfelice to Luigi Vanvitelli – tested themselves with the construction of arcades, machines, fountains and fireworks, destined to last for the short time of the commemorative celebration [3, 5].
It is worth mentioning, among many other celebrations, the "rinomata fiera" organized by the city of Naples in July 1738 to celebrate the royal wedding, since it was contextual with the parade organized on the same occasion by the Università of Aversa, that is the object of this essay. The rich temporary fair set up in Naples, in the area called Largo di Castello, next to the bastions of Castel Nuovo, is documented by a printed booklet featuring drawings of the machines and the appliances invented by Ferdinando Sanfelice [1]. The architect set up a rectangular plant complex, divided by orthogonal axes so as to define the halfway spaces for shops, that were also built along the perimeter fence. The most relevant elements of the architectural ensemble were the scenographic arches built on the entering of the fenced area, the doors adorned with diamond shaped ashlars, the composite columns, the mixtilinear gables and the symmetrical system of five fountains placed at the centre of the composition.
The similarity between this temporary pieces and the architectural elements used by Sanfelice in his permanents buildings – Mancini for example has recognized in the fair's entrance doors an evident

recalling of the typical building portals designed by the architect, especially the similarity between these and the entrance of the Pignatelli-Monteleone building located in Calata Trinità Maggiore – confirms the theory of a significant relationship between the two genres, apparently distant but close in reality [3]. Concluding, it is important to remember that the fair of 1738 was enjoyed so much by Charles of Bourbon that it was repeated yearly.

2. The celebration organized by the Universit of Aversa

After celebrating the proxy marriage in Dresda on the 9th of May 1738, the young queen, accompanied by a following of more than two hundred people, entered the Kingdom of Naples on the 19th of June at Portella, at the border with the Papal State, where she was received by Charles. During the wedding trip, the royal couple was honored with celebrations organized by the cities that were crossed by the impressive procession. The celebrations lasted until the 3rd of July and were concluded in Naples with the foundation of the Reale Ordine di San Gennaro, the most prestigious chivalry order in the kingdom. The Università of Aversa participated in the celebration, disposing a “sontuoso apparato” on the occasion of the passing of the wedding procession through the city at 21.30 on the 22th of June. Unlike the mentioned event in Naples, there are no drawings of the one set up by the Università of Aversa, but there are related narrations and documents reporting the stages and describing the ephemeral structures designed by the architect Paolo Posi [2, 10].

The architectural appliance was set up in Via Nova, corresponding to modern day Via Roma, in the section from the ancient Porta di Capua, also known as Porta di Moccia, due to it being adjacent to the same called palace, to Porta del Mercato Vecchio, before the crossroad between Via Roma and Via Cavour (according to the present names). The entire itinerary of the procession inside the city walls measured, according to the ancient sources,1700 Neapolitan spans, little less than 450 meters [2]. The procession, coming from Capua, entered the city passing under «[…] un bellissimo arco trionfale così ben disposto, ch’era una meraviglia di vederlo» adorned with 40 musical instruments [2]. From there, the street was decorated with a line of one hundred arches on each side, interrupted in the square in front of the church of "San Pietro a Majella", on the eastern side of the street [2]. In the church square a semi-circular stagewas set up, like a theatre, reserved for the city authorities [2, 10]. By the description of "dottor fisico" don Lazzaro Basile, reported by Gaetano Parente, the structure of the temporary site included a crown-shaped canopy, with the portraits of the kings [2]. Shortly after, past the monastery of San Carlo Borromeo, there was «[…] una altissima colonna sopra la quale si vedeva la persona del Re con altri cori di musica» [2]. The procession left the city passing through...«[…] un altro arco bellissimo colla figura d’un Imeneo sopra certe nuvole con due corone» [2]. Ending the urban transit, the procession flanked the Savignano district, which «[…] imbiancato e pulito ed apparato […] faceva bellissima veduta»[2].

Knowledge of the places makes it possible to locate with a good amount of precision the position of the ephemeral architectures realized for the event [10]. The first triumphal arc was placed in front of Porta di Capua, that was demolished in 1840, next to the crossroads between Via Roma and Via Gaetano Andreozzi (according to the present names). Just after that, along via Roma, the street borders were decorated with a double line of arcades, interrupted near to the place of Madonna di Casaluce and near to the little open space on the side of San Carlo Borromeo monastery, where the modern day Via Guglielmo Sanfelice converges.

In these two open spaces, respectively on the eastern and the western side of the road, there were the stage built like an amphitheatre, in the front of the current church of San Filippo e Giacomo, that was being restored at the time, and the column dedicated to the king, placed approximately in the same spot of the current statue of the centaur made with iron rods, in the intersection of the two roads. Lastly, the setting up was concluded by an exiting triumphal arch, decorated with the depiction of Imeneo, the wedding god, placed in front of the civic door of Mercato Vecchio, demolished in 1834-35 [10]. Traces of this ancient door were found on the external walls of Maddaloni-Pagliuca palace, a building attached to the Angevin walls, substantially restored between the end of 19th century and the beginning of 20th century [10].

Having established the itinerary and individuated the positions, we can have an idea of the ephemeral architectures realized by Paolo Posi without even the related drawings, since many drawings executed by the architect in similar occasions are conserved. In particular, many drawings of the architectural trimmings commissioned by Lorenzo Colonna, ambassador for the King of Naples at the Papal State, are very well known. Especially the appliances realized from 1751 in occasion of the annual celebration of Chinea, that was held in Rome every 29th of June [8].

The celebration of Chinea was held to commemorate the annual tribute paid to the Pope by the King of Naples, originally established in 1266 as a payment for the acknowledgement of the title of *Re Siciliae* to Charles of Anjou from Pope Clement IV. However, Charles of Bourbon did not want the ceremony to be interpreted as an act of submission to the pontiff. On the contrary, he transformed the occasion to show the King of Naples’ power in the heart of Rome – the celebration was held outside

Palazzo Farnese – in concomitance with the celebration of Saints Peter and Paul.
As previously mentioned, Chimea's temporary trimmings were commissioned for many years to Paolo Posi, architect of the Colonna House, who designed lively ephemeral architectures, preserved by a large number of incisions conserved in public and private collections. Through these illustrations, that represent similar constructions, it is possible to imagine the form of the triumphal arches, of the side arcades, stage and memorial column realized to celebrate the passing of the royal procession through the city of Aversa.

3. Brief profile of the architect Paolo Posi

Born in Siena, but educated in Rome, Paolo Posi (Siena, 1708 – Rome,1776) showed his talent from the beginning, obtaining the first prize in the second class of architecture in the Concorso Clementino in 1728 (*e ae uo* with Tommaso Asprucci) with the design of a convent for thirty religious people. Specialized in the design of "bizzarri catafalchi", "finte facciate festose", "macchine de' fuochi artifiziali", he showed in his operas an evident continuity with the architecture of Roman Baroque in the age of Bernini and Borromini, inherited from his master Filippo Barigioni [6, 12].
Due to the great vivacity of his architecture, he failed to meet the approval of his contemporaries, with preferred artists being able to differentiate themselves from the Baroque influence. It is probably due to his extremely elaborate style that the biographer Francesco Milizia defined him as "talent grande, senza buona architettura" [6, 12].
In Campania, we can find him in Aversa between 1736 and 1738 with the architect Filippo Barigioni and the sculptor Pietro Bracci, to realize the cardinal Innico Caracciolo's funeral monument in Saint Paul's Cathedral [9, 13, 14]. In 1739, he designed under the commission of cardinal Giuseppe Spinelli the restoration of the apse of Naples Cathedral, executed by the Neapolitan architect Filippo Buonocore, and in 1741, and the choirstalls of the cathedral of Benevento [7, 11]. In Aversa, in addition to cardinal Innico Caracciolo's funeral monument and the celebration that is the object of essay, he realized the altar of the chapel present in Cesare della Valle palace, who was at the time one of the "Eletti" of the "Università" [10].
Martino Innico Caracciolo, his first commissioner, assigned him the construction of the "Case de' Projetti" in the cities of Narni and Viterbo, between 1739 and 1742. From 1751, he designed the architectural trimmings for the celebration of the Chinea annual tribute, as architect of the Colonna family [6, 12].
From 1754 to 1769, he worked on the restoration of cardinal Prospero's Colonna Sciarra palace in Rome. In 1768, he was awarded the prestigious assignment of "architetto soprastante" of the Fabbrica di San Pietro, earlier occupied by Luigi Vanvitelli, that would have left the position to one of his assistant architects (Carlo Murena or Ermenegildo Sintes) [6, 12]. The hostility showed towards him by Vanvitelli, like he did towards Ferdinando Fuga, has to be interpreted as a statement of his abilities [4]. It is largely known that Vanvitelli used to attack the colleagues that he considered dangerous because very capable, while he ignored the mediocre ones.
Among his works, it is worth recalling the restoration of the Porta Romana in Velletri (1766) and the restoration of the Pantheon (1744), commissioned by Pope Benedetto XIV, that caused remarkable damage to the monument changing its attic [6, 12].
The architect Paolo Posi died in Rome on the 3rd of January 1776 and was buried, upon his will, in the church of Sant'Alessio [6, 12].

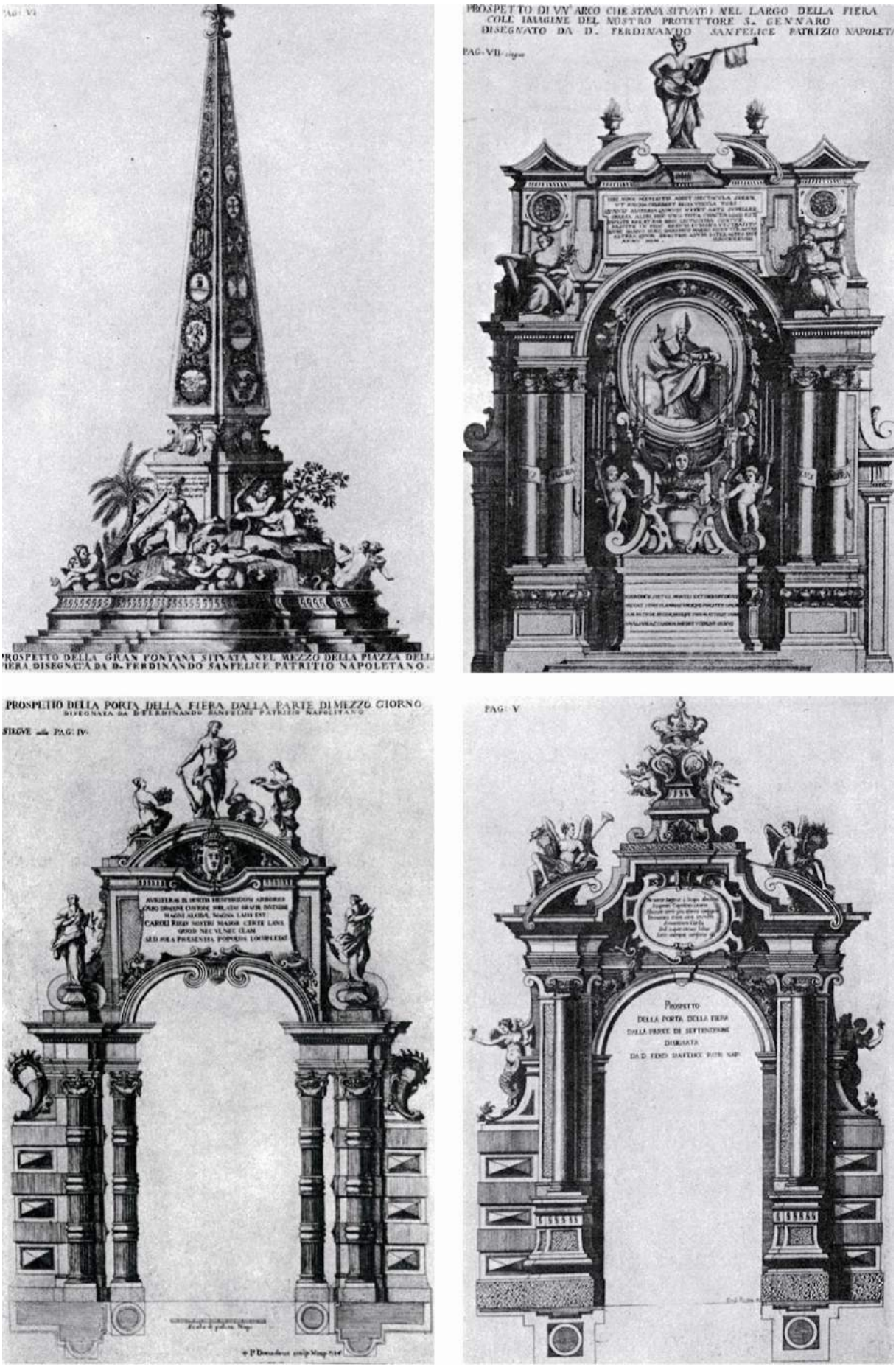

Fig. 1-4: Ephemeral architectural elements designed by Ferdinando Sanfelice for the "rinomata fiera" organized by the city of Naples to honor the royal wedding in 1738.

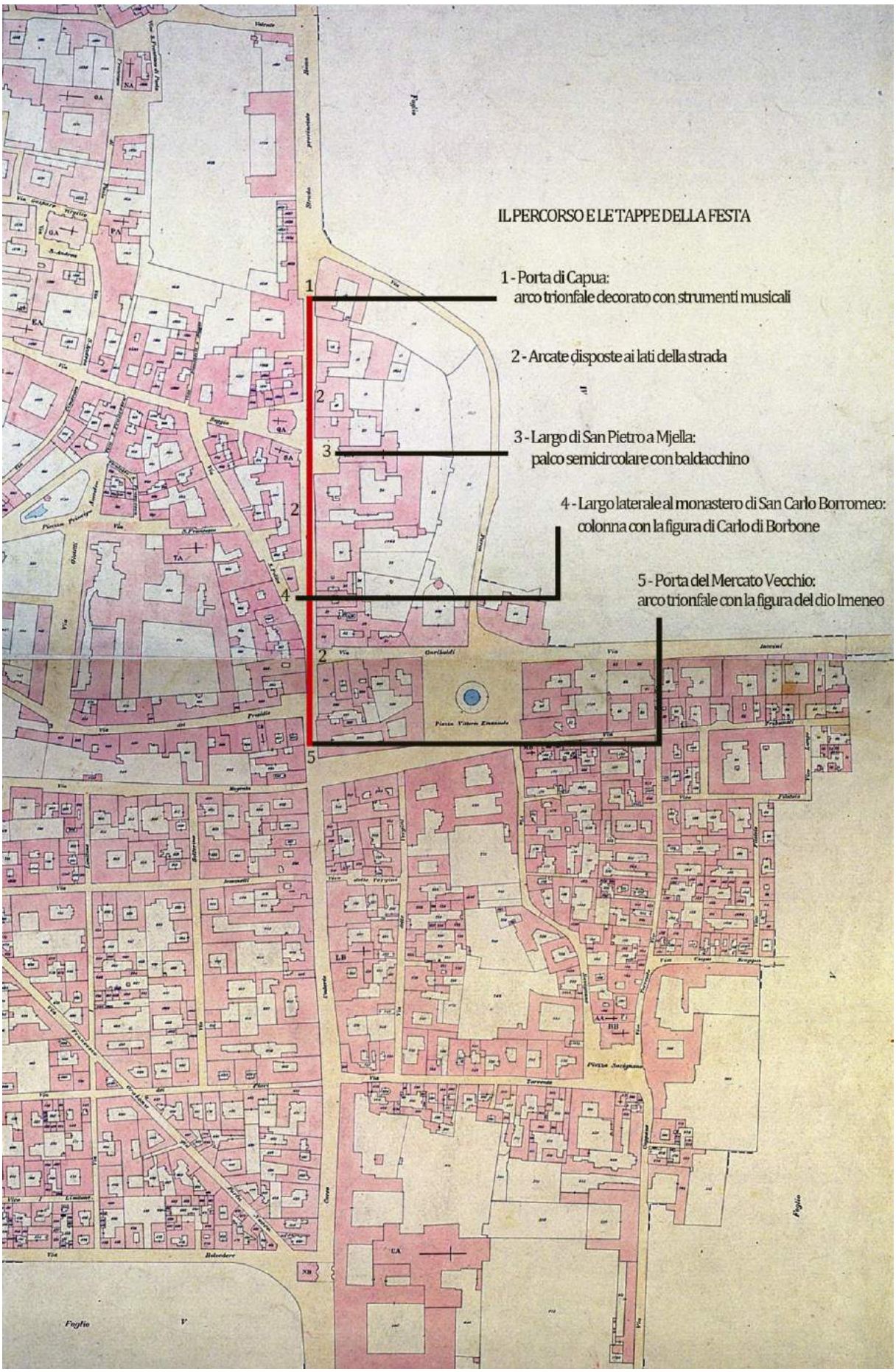

Fig. 5: The stages of the procession organized by the Università of Aversa to honor the royal wedding in 1738.

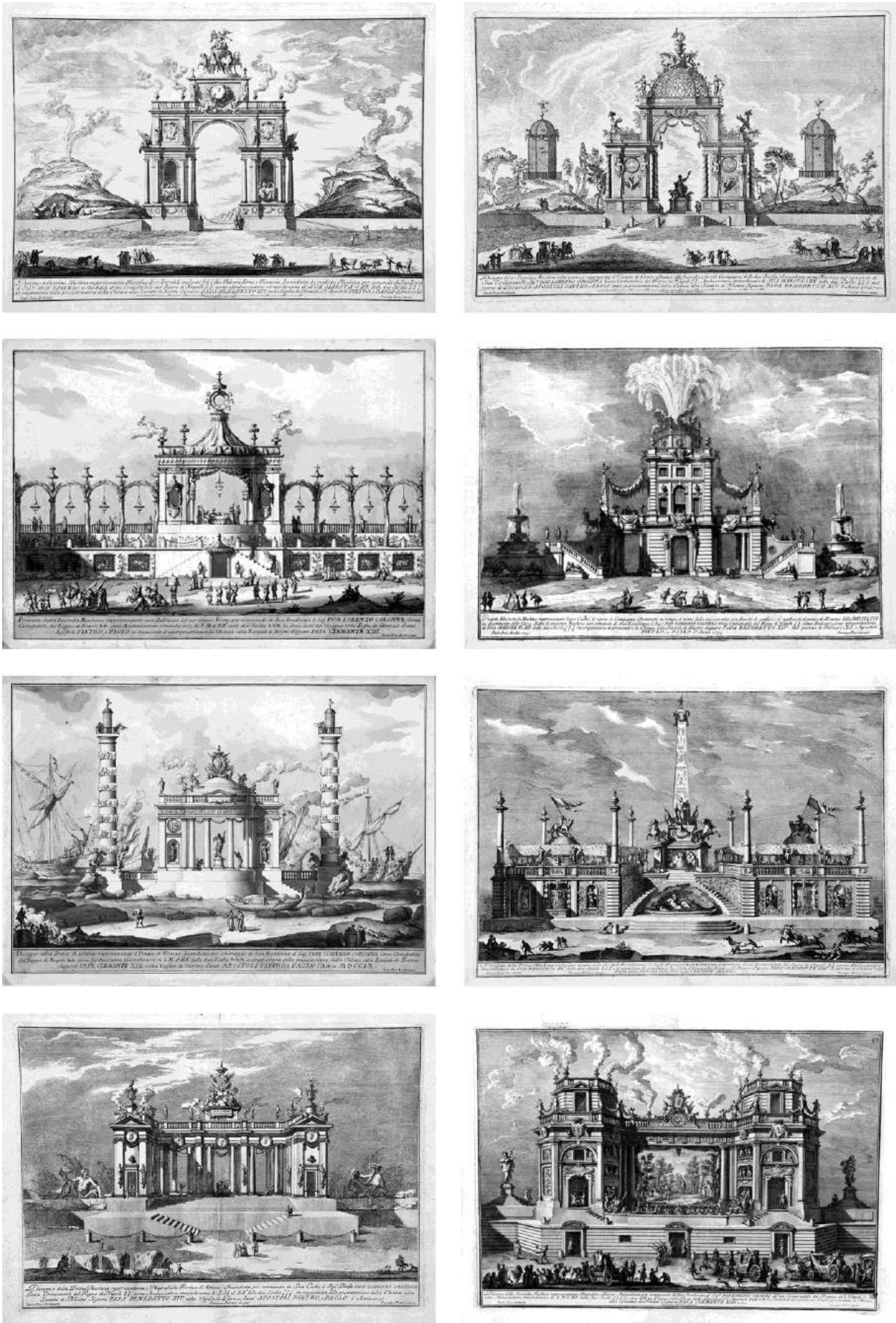

Fig. 6-13: Ephemeral architectural elements designed by Paolo Posi to honor the celebrations of the “Chinea” in the fifties of the eighteenth century.

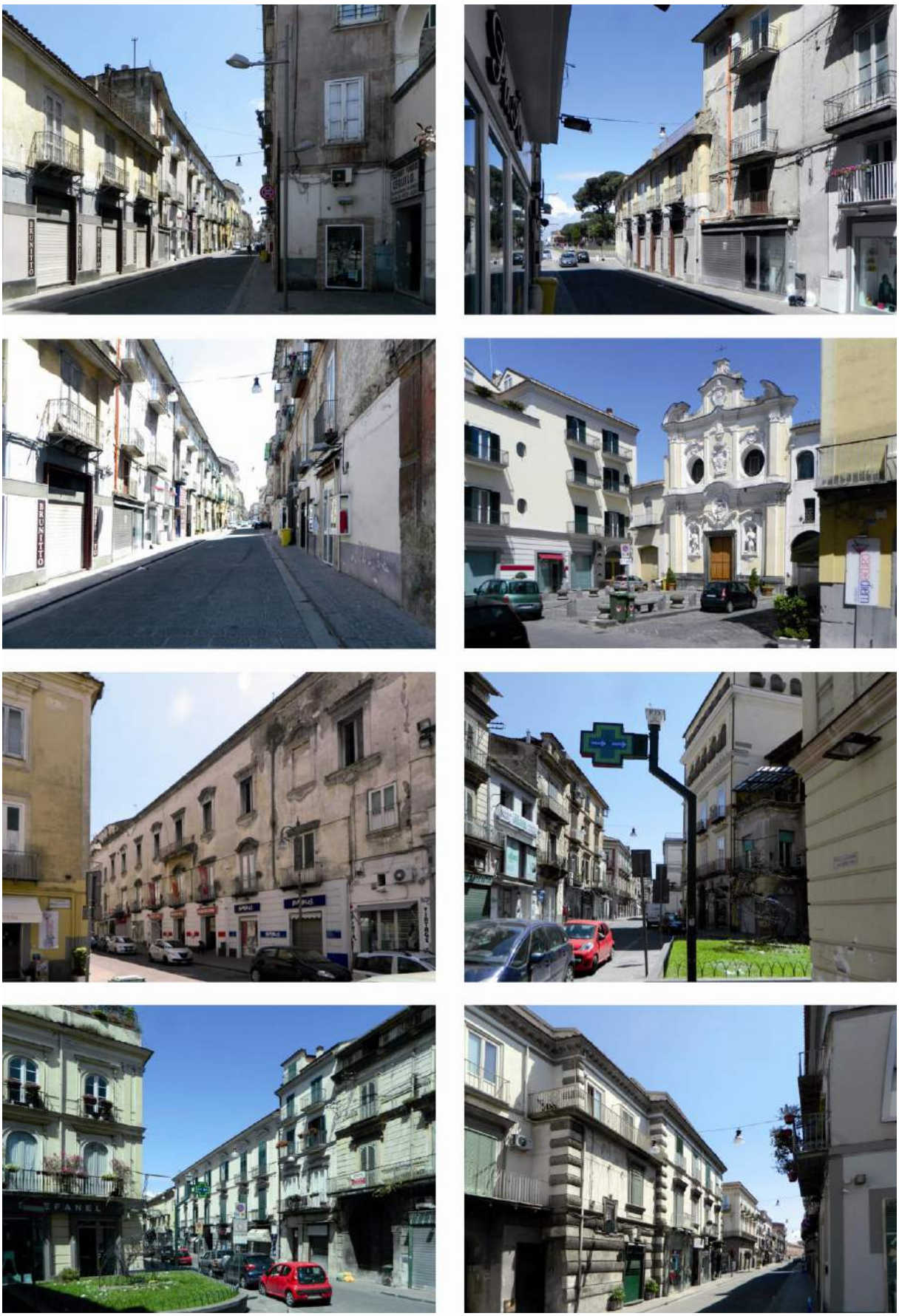

Fig. 14-21: The current status of sites of the royal procession of 1738 in Aversa.

4. The description of the celebration in G. Parente, *Origine e vicende ecclesiastiche della Città di Aversa*, Napoli 1857-58, vol. I, pp. 415-417.

Sontuoso apparato per il passaggio del nostro Re con la sua nuova Regina sposa figlia del Re di Polonia (□).

Nelle ore □1.□ passò per Aversa (□) il Re di Napoli e Sicilia Carlo Borbone figlio del secondo letto di Filippo □uinto con Elisabetta Farnese, colla sua sposa (□) figlia del Re di Polonia Augusto □.do e sua moglie era figlia di Giuseppe sovrano austriaco figlio di Leopoldo Re de Romani e Imperadore. Detta sposa era di anni 1□ e mesi, bellina, di color bianco bianco, un poco di labro austriaco, spiritosa. Io la viddi meglio dell'atri a causa che ero in un palchetto, ove mutò li cavalli al galesso. Fu complimentata dal Sig. D. Manuele Pacifico e D. Giovanni □□16□Lucarelli, vi fu il vescovo D. Nicolò Spinelli col suo Vicario. Ritrovandosi in □uesta Città un Ingegniere Sinese allevato in Roma nella professione, per mettere il tumulo dell'Emmo. Caracciolo vescovo di d.a Città come si vede nella cappella del SS.mo della Cattedrale, fece l'arco trionfale, cioè il disegno e tutto quello che figura ora sulla porta di Capua detta volgarmente di MOCCIA, un bellissimo arco trionfale così ben disposto, ch'era una meraviglia di vederlo. Su detta porta vi erano da □0 strumenti musicali, poi seguiva una bellissima arcata (1) fatta di rilievo, ove nella cima di detti archi rappresentava trofei; a tutti i lati dell'archi suddetti si leggevano diverse bellissime scrittioni. Al largo di S. Pietro a Ma□ella si vedeva il Seggio delli nobili di d.a Città colli ritratti de' Regnanti, sotto una gran corona che formava dosello□a canto S. Carlo si erigeva una altissima colonna sopra la quale si vedeva la persona del Re con altri cori di musica; all'uscire dell'altra porta un altro arco bellissimo colla figura d'un Imeneo sopra certe nuvole con due corone□ tutto il Borgo di Savignano imbiancato e pulito ed apparato che faceva bellissima veduta□uscito dalla Città cominciava uno s□uadrone di Cavalleria, che terminava alle porte, cio□ a Capodichino, indi cominciava ala fanteria che arrivava sino alle porte del palazzo, ove si ritrovò tutta la Nobiltà, Ministero e Generalità che riceveva detti Signori Regnanti: e cos□furono condotti alle sue stanze che si diceva esser così bene addobbate che non v'era principe Sovrano che l'avesse meglio: d.a Regina andava vestita con abito verde tutto ricamato, ed al collo una collana di grandissimo valore: l'ingegnere chiamato sig. Paolo Posa (□).
Il motto che stava all'arco fuori la porta di Capua scritto a lettere d'oro in un gran cartellone che dimostrava essere di porfido:
SALVE O REGIS FILIA U□OR REGES PARITURA MARIAE AMALIAE REGINAE AVERSANI CIVES OBSE□UIA PLAUSUS VOTA (□).

(□) □ui termina il MSS. dell'Anonimo Aversano. Tenendo alla mia premessa (nella Prefazione) per riempire l'ingrata lacuna, ecco un brano analogo di altra inedita cronichetta, testé citata, del dottor fisico D. Lazzaro Basile□ed intercalata nel testo.
(□) il d□□□ di Giugno 17□□.
(□) Maria Amalia □ alpurga.
(1) Erano cento archi per lato, e altrettanti dall'altro, tirando per 1700 palmi fra la porta di Capua all'altra di Mercato vecchio. Le dipinture furono eseguite da Donato Coda.
(2) Allievo dell'Ill. Filippo Barigioni architetto.
(□) Per altri particolari e per le altre □ iscrizioni, tralasciate dal cronista Basile avendo egli dato giusta preferenza alla pi□ bella, chi abbia vaghezza, riscontri la relazione stampata con □uesto titolo □Breve ragguaglio delle pompe festive fatte nella città di Aversa in occasione del passaggio delle Maestà del Re e della Regina, Napoli 17□□, presso Francesco Ricciardo stampatore del Real Palazzo□. Edizione rara. □uelle iscrizioni, vi leggo, che furono composte dal Can.co Onorato (uomo di molta erudizione, e di bella fama, ora □uasi ignorato presso di noi) gli altri poetici componimenti dai maestri del Seminario. Eletti della città a □uel tempo erano a □uel tempo erano: D. Francesco Pacifico□D. Cesare Duca della Valle□D. Biagio Arciero□D. Giuseppe Dati.

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Confined Impinging Jets in Porous Media

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Abstract
Impinging jets are adopted in drying of textiles, paper, cooling of gas turbine components, freezing of tissue in cryosurgery and manufacturing, electronic cooling.
In this paper an experimental investigation is carried out on impinging jets in porous media with the wall heated from below with a uniform heat flux. The fluid is air. The experimental apparatus is made up of a fun systems, a test section, a tube, to reduce the section in a circular section. The tube is long 1.0 m and diameter of 0.012 m. The test section has a diameter of 0.10 m and it has the thickness of 10, 20 and 40 mm. In the test section the lower plate is in aluminum and is heated by an electrical resistances whereas the upper plate is in plexiglass. The experiments are carried out employing a aluminum foam 40 PPI at three thickness as the test section. Results are obtained in a Reynolds number range from 5 00 to 1 500 and wall heat flux of 510 W/m2, 765 W/m2, 1020 W/m2 and 1400 W/m2. Results are given in terms of wall temperature profiles, local and average Nusselt numbers, pressure drops, friction factor and Richardson number.

Keywords: Impinging jets, Reynolds number, Richardson number, Grashof number

1. Introduction
Aluminium foams with high thermal conductivity is an effective method of heat transfer enhancement due to their low weight, good strength, rigidity, damping of vibrations and noise, shock resistance [1]. In several applications in the literature, the metal foams were used in heat exchangers because of its high transfer capabilities. Boomsma et al. [2] carried out an experimental analysis on open-cell metal foam. They used as compact exchangers. Their results show that metal foam heat exchangers have thermal resistances that are almost one-third of the available conventional heat exchanger. Metal foam have a high ratio between surface area and pressure drop, and with uniform lower density. The pressure drop is lower than in ceramic structures when considering the unit of volume [3]. Leong and Jin [4,5] carried out and an experimental investigation on oscillating flow through a rectangular channel filled with open-cell metal foam. They analyzed aluminum foam of 10,20 and 40 PPI as the porous media shown data on pressure drops and velocities. They show that the oscillating flow features in an open-cell metal foam were governed by the kinetic Reynolds number Re based on a hydraulic diameter and the dimensionless flow displacement amplitude ADh. Subsequently, they used the porous media to obtain the heat transfer performance of metal foam heat sinks subjected to oscillating flows of various frequencies. Their results shown that for length-averaged Nusselt number for both oscillating and steady flows, higher heat transfer rates could be obtained when metal foams have subjected to oscillating flow. A one dimensional numerical analysis of heat transfer of metal foams has carried out by Dukhan et al. [6] that have considered only one pore density, 10 PPI. This analysis showed that the temperature decreases exponentially along the foam in the flow direction. Feng et al. [7] have carried out an experimental and numerical investigations on finned metal foam and metal foam. They have analysed an aluminium foam of 96.3 porosity and 8 PPI with four 2 mm-thickness plate fins. Their results were shown in terms of heat transfer and pressure drop. Experimental results show that under a given flow rate condition, as the foam height increases, the heat transfer of metal foam heat sinks decreases monotonously whilst that of finned metal foam heat sinks first increases and then slightly decreases. Jeng and Tzeng have investigated numerically impinging cooling of metal foams under a confined slot jet. Subsequently, the same authors have

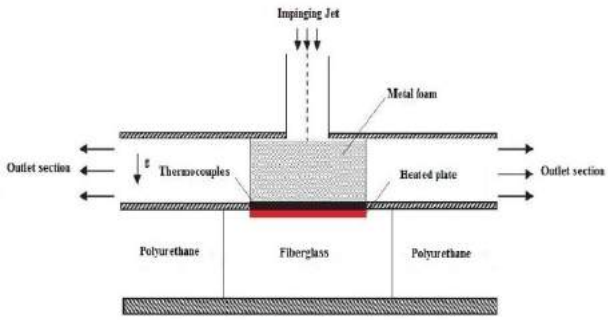
carried out an another study considering foam tip bypass flow, both experimentally and numerically [8-10]. Kim et al. [11] have analysed experimentally heat transfer of aluminium foams under multi-air jet impingement, while, Kuang et al. [12] have investigated the effects of foam height and jet to foam distance on heat transfer of metal foams under an axial fan flow. Marafie et al. [13] have carried out a numerical analysis of the non-Darcian effects on the mixed convection heat transfer in a metal foam block with a confined slot jet. Their results show that the Nusselt number increases with decreasing dimensionless height of the foam block up to 0.05, below which the Nusselt number decreases. Shih et al. [14] have investigated experimentally the heat transfer characteristics of aluminium foam heat sinks with restricted flow outlets under impinging jet flow conditions. They have noted that the increase of the Nusselt number of the aluminium foam heat sink with the decrease in the flow outlet height is caused by the reduced convective resistance at the solid-gas interface through the increased velocity near the heat generation surface. Di Bella et al. [15] have realized a flow visualization study of the jet dynamics in a round jet impinging on a foamed aluminium porous media. They have found that the penetration of the impinging flow into the porous media is significantly affected by permeability. As permeability decreases, flow deflection off the impact surface of the foam increases, approaching the fluid dynamics behaviour of impact on a solid cube. Rallabandi et al. [16] have studied the heat transfer enhancement in rectangular channels with axial ribs or porous foam under through flow and impinging jet conditions. They have noted that the porous media shows a more significant increase in heat transfer coefficient for both channel flow and impingement cases. Imraan and Sharma [17] have carried out a CFD analysis of jet impingement heat transfer in a frost free refrigerator. They have investigated for Reynolds number in the range of 1 000 and 12 000. Their results show that the slot jet impinging on a circular cylinder in a confined space yields heat transfer rates that are between those for the corresponding uniform cross-flow and slot jet impingement on a non-confined cylinder. Huang and El Genk [18] have carried out an experimental analysis on heat transfer of an impinging jet on a flat surface to determine the values of the local and average Nusselt numbers, in particular for low values of Reynolds number and jet spacing. The main aim of this experimental analysis is to analyze the flow and the heat transfer features of an impinging jet with aluminium foam of 40 PPI, wall heated from below with a uniform heat flux (fluid is air). The aim is to obtain values of friction factor and heat transfer for three different configurations. The metal foam analysed are 10, 20 and 40 mm thick. It was investigated with Reynolds number ranging from 500 to 1 500; wall heat flux of 510 W/m2, 765 W/m2, 1020 W/m2 and 1400 W/m2. The results show wall temperature profiles, air temperature, local and average Nusselt numbers, pressure drop, friction factor and Richardson numbers.

1.2 Apparatus

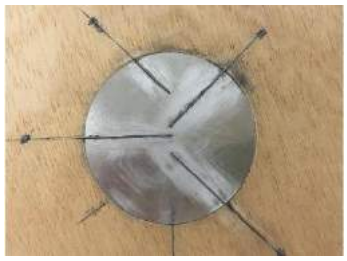
The experimental apparatus includes the test section, instruments and air facility. Air from the laboratory room is set into the operators by means of a fan system upstream positioned. The air enters into a power supply circuit channel. To control the flow rate a vale was positioned, with rotameter Krohne type VA40S the flow rate was regulated (Fig.1a).

The flow enter in the outlet duct with a diameter of 12 mm and 1 m long. In the second part the jet impinges the metal foam superiorly and inferiorly confined by two plexiglass plates 4 mm thick. The metal foam has been positioned on an aluminium plate (3 mm thick) heated from below by means of an electrical resistance. To reduce heat losses, a polystyrene block and fiberglass is affixed to bottom face of heated plate (Fig. 1c). Temperatures were measured by thermocouples (type J). An Isotech instrument mod. 938 ice point, with an accuracy of 0.04 C and 50 channels, was used as thermocouple reference junctions. The thermocouples had been calibrated before their installation. 5 thermocouples were deployed along the diameter of the aluminum plate and 2 in the outlet section of impinging jet to measure the air temperature of jet (Fig.2). An AGILENT 34980A multifunction measurement unit and a computer were used for the data acquisition. The porous media that filled the test section is aluminum foam of three different geometric specifications: 40 PPI with thickness of 10,20 and 40 mm. The range of the Reynolds number varied from 500 to 1 500. To acquire the data of pressure a digital manometer tube has been used.

a



b



c

Fig.1 Experimental apparatus: a) fan system; b) sketch of impinging jet of metal foam; c) thermocouples position

1.3 Data redaction

In this paper, the tests has been effected to vary Reynolds number 500 – 1500. The average and local Nusselt number were determined as functions of parametric values of the Reynolds and Richardson numbers (or the Grashof number).

$$Nu_i = \frac{q_c D}{(T_i - T_o)k_{air}} \tag{4}$$

the subscripts i indicates the axial location at which the temperature is being measured. T_o is a reference temperature to form the temperature difference. It is the temperature of the air inlet of the heated test section. This reference temperature is a known quantity. It is convenient to use it in the evaluation of the present Nusselt number results in order to obtain the heat transfer coefficient. The average Nusselt number was evaluated as:

$$\overline{Nu} = \frac{\int_0^D Nudx}{\int_0^D dx} \cong \frac{\Delta x}{D}\sum_{i=1}^{n} Nu_i \tag{5}$$

Where D is length of the test section, n is number of the temperature measurements points on the surface, Δx is the spacing the two thermocouples.

The Nusselt number results will be plotted as a function of Reynolds, Richardson and Grashof numbers, defined:

$$\mathrm{Re} = \rho V D \mu^{-1} \tag{6}$$

$$Gr = g\beta(T - T_0)LH^3\nu^{-2}$$

(7)

$$Ri = Gr\,\mathrm{Re}^{-2} \tag{8}$$

Therefore, it has been evaluated the pressure drop ΔP at upstream and downstream of the test section and then it has been evaluated the friction factor with the equation:

$$f = \Delta P(\rho V^2 0.5)^{-1} \tag{9}$$

To evaluate the improvement due to the presence of the metal foam, it is necessary a quantitative methodology. In this work, EPR has been evaluated comparing the performances of surface with and without foams:

$$EPR = \overline{Nu} Nu_s^{-1} \left(f f_s^{-1} \right)^{-0.33} \tag{10}$$

With Nu_s and f_s is average Nusselt number and friction factor of the smooth surface respectively.

□.1 Uncertaint□

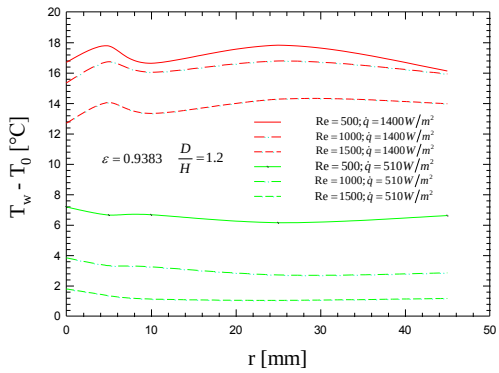
Analysis of the uncertainties on the measured parameters are shown in Table 1.The uncertainty of Nusselt number, Reynolds number, friction factor and EPR have been evaluated with the Kline and McClintock [19] methodology. It has been estimated that the uncertainty of the Nusselt number is 2.48□, the Reynolds number is 4.26□, EPR is 4.85□ and friction factor is 3.13□.

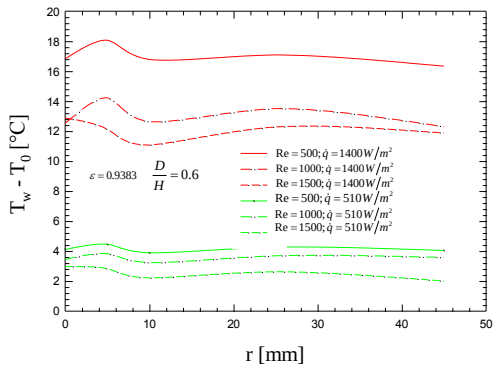
Table 1. Uncertainty of the measured parameters.

	Instrument	Range	Uncertainty
Temperature	ThermocoupleCuNi - Fe J300-1	-210 to 1200 □C	□0.3□
Air Pressure	Digital manometer "Fluke 922 Airflow Meter"	□4 000 Pa	□1□ □1 Pa

1.4 Results

This experimental investigation has been carried out with air. The results have been presented as a function of Reynolds number and thermocouples position.





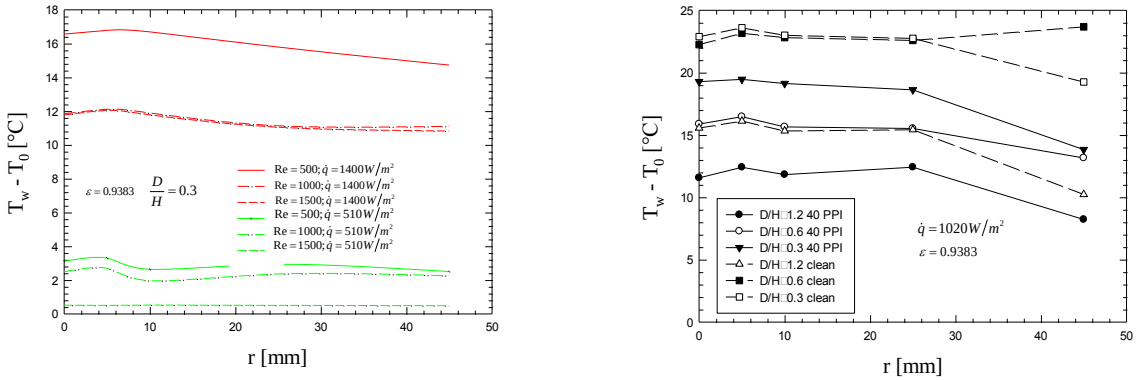
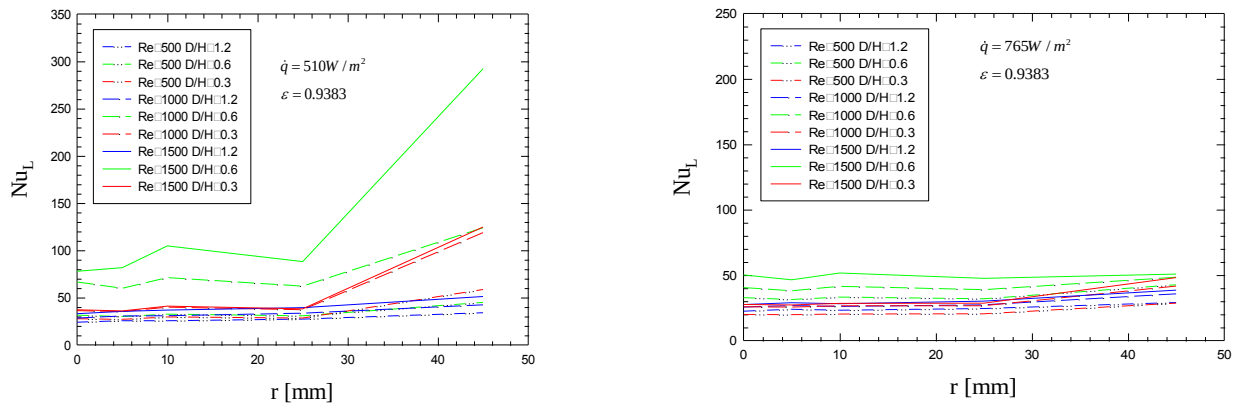
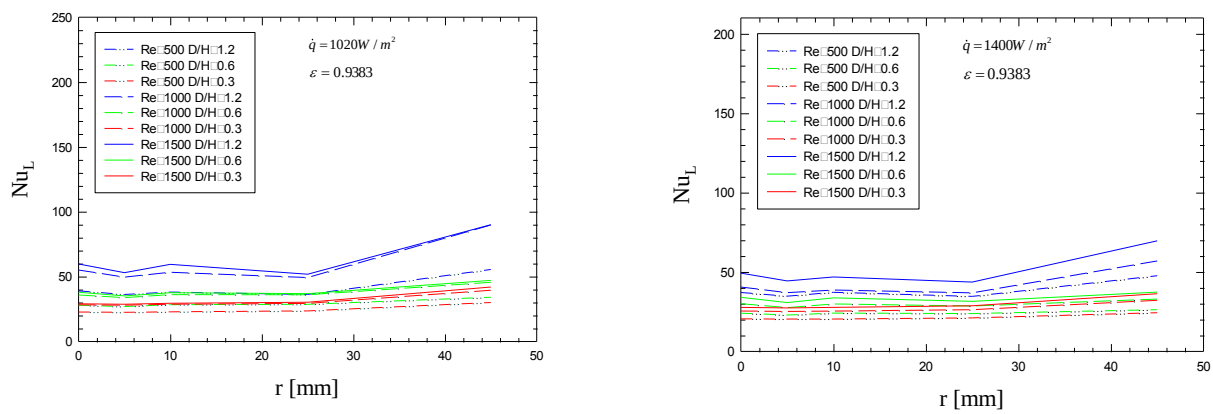


Figure 2 Temperature profile: a) D/H □1.2; b) D/H □0.6; c) D/H □0.3; d) comparison between case clean and with metal foam.

The temperature profile at three different configurations and a comparison of temperature profile between case clean and case with heat flux at 1020 W/m^2 , is plotted in fig. 2 (a-d). These graphs shows that the ratio D/H it is important, in fact, at low values of D/H the metal foam has been produced a minimal variation of the temperature profile at Reynolds number equal to 1000 and 1500. Besides, the metal foam has been generated a ΔT equal to 5-7 □C between case clean and with porous media. Fig. 3 (a-d) compares local Nusselt number as a function of abscissa r for different configurations. Fig. 3 show that the convective heat transfer increases with the mass flow rate, in fact, the local Nusselt number is higher for higher values of Reynolds number. Therefore, for $\dot{q} = 510 W/m^2$ and for r □45 mm the convective phenomena are predominant on those conductive.



a) b)



c) d)

Figure 3. Local Nusselt number: a) $\dot{q}$ □510 W/m^2; b) $\dot{q}$ □710 W/m^2; c) $\dot{q}$ □1020 W/m^2; $\dot{q}$ □1400 W/m^2

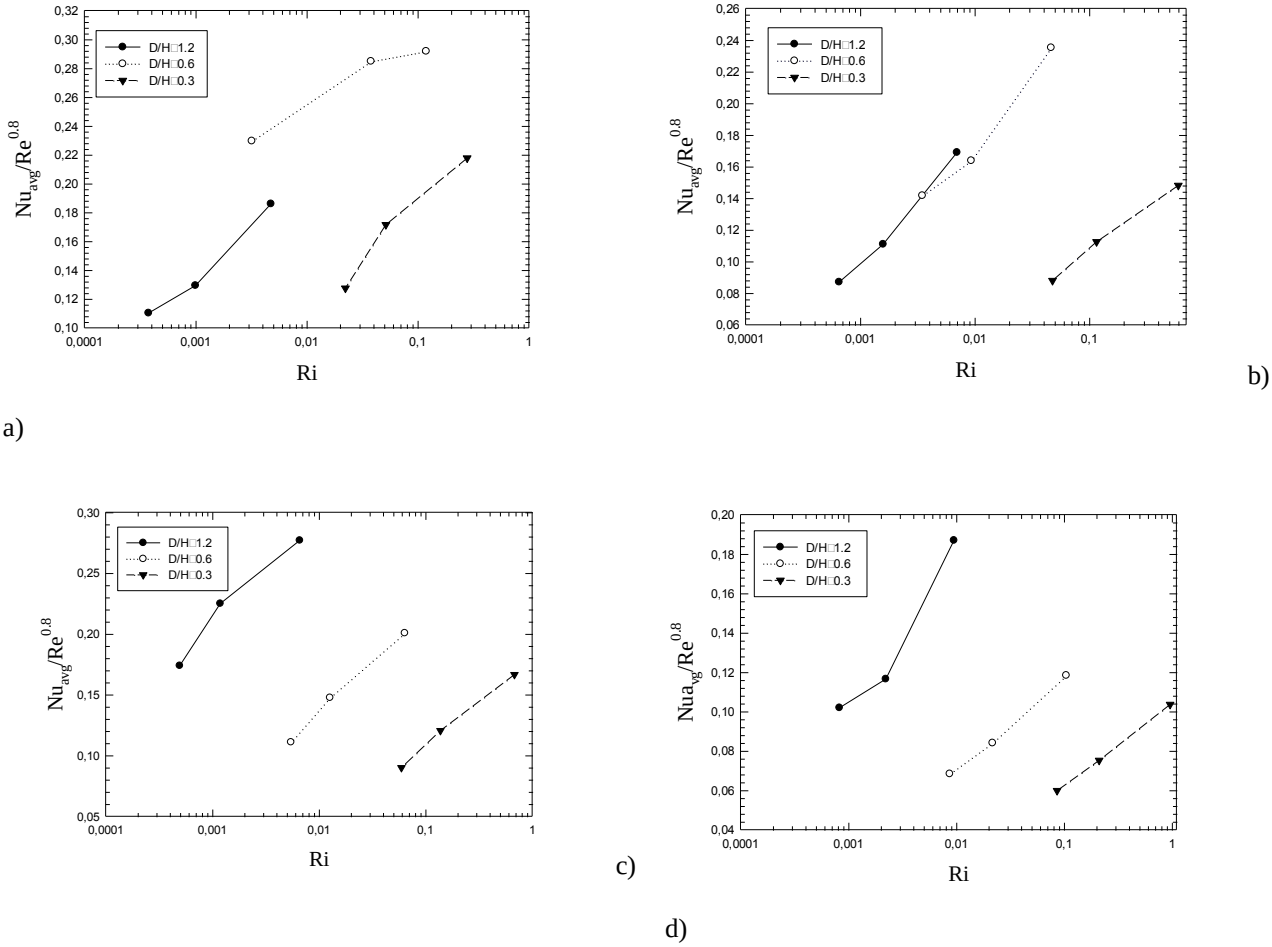


Figure 4. Trend of the ratio Nu/Re as a function of Richardson number for three different configurations**:** a) $\dot{q}$ □510 W/m^2; b) $\dot{q}$ □710 W/m^2; c) $\dot{q}$ □1020 W/m^2; $\dot{q}$ □1400 W/m^2.

Fig. 4 (a,d) shows clearly that increasing the Richardson number the ration $Nu_{(avg)}/Re^{0.8}$ grows. It is observed that increasing the Richardson number, there is more predominant the potential energy than kinetic energy. In addition the ratio $Nu/Re^{0.8}$ increases because the Nusselt increases or the Reynolds decreases. But if decreases the Reynolds number, the Nusselt does not increase, thus decreasing both, with a greater decrease of the Reynolds. The prevalence of the energy potential shows that the natural convection is more developed than forced in accordance with numerical analysis. Figure 5 (a-b) shows pressure drop and the friction factor as a function of Reynolds number. It is evident an increase of pressure drop increasing velocity of the flux. An increase it occurs overall, with metal foam. Higher value is 101 Pa and 1500 Re, it occurs with metal foams because the viscous forces and the form resistance increase. While, the friction factor is a function of pressure drop, but the air velocity grows faster and then the trend of friction factor decrease with Reynolds number. The values higher occur for Reynolds number equal to 500 occur for metal foam.

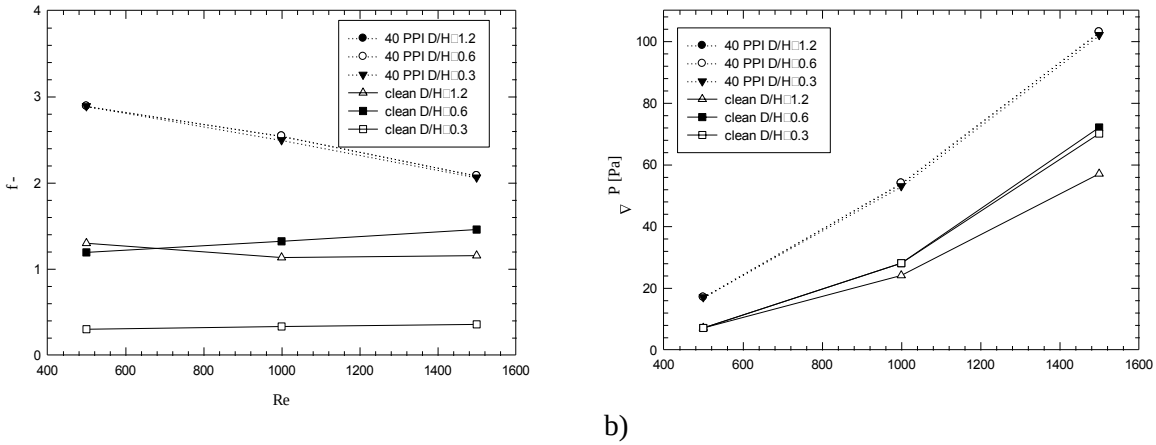


Figure 5. a) Friction factor as a function of Reynolds number; b) pressure drop as a function of Reynolds number.

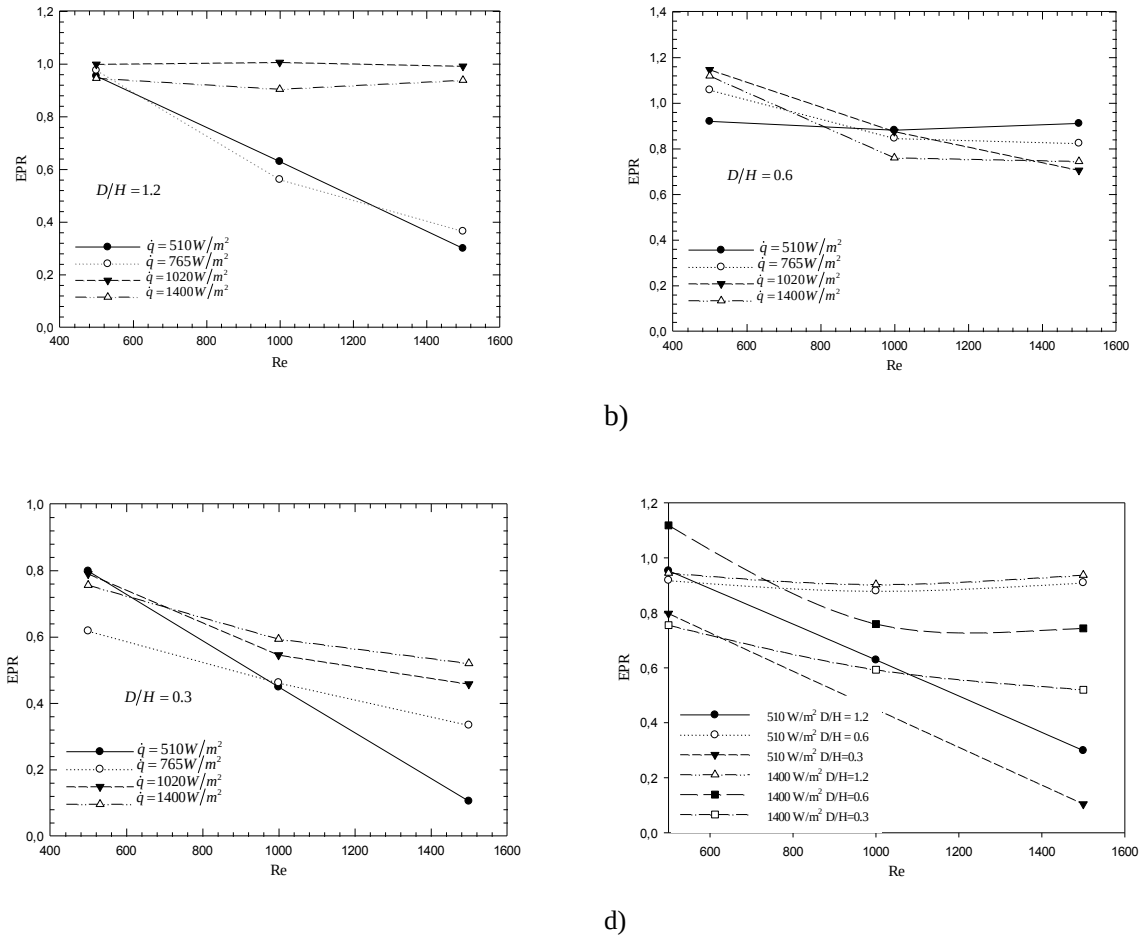


Figure 6. EPR as a function of Reynolds number: a) D/H □ 1.2; b) D/H □ 0.6; c) D/H □ 0.3; d) comparison between two different heat flux.

Figure 6 shows the trend of EPR as a function of Reynolds number and the ratio D/H. It has been demonstrated that the higher efficiency is for higher values of heat flux for all configurations. Besides, the ratio D/H □ 0.6 has higher values of EPR at lower values of Reynolds number, instead, for higher values of Reynolds number, the EPR decreases.

1.5 Conclusions

Main conclusion of this experimental investigations are:

- It was possible to observe the increase of the convective heat transfer with metal foam to vary of the Reynolds number. The main result which has been achieved consists that at the lower values heat flux (510 and 710 Wm^{-2}) the local Nusselt number is higher at abscissa r □ 45 mm and metal foam 20 mm thick, while at higher values of heat flux (1020 and 1400 Wm^{-2}) the local Nusselt number is higher at abscissa r □ 45 mm and metal foam 10 mm thick.
- The values of EPR have been demonstrated that metal foam 20 mm thick have an efficiency higher of metal foam 10 and 40 mm thick at lower Reynolds number. At lower values of Reynolds number the metal foam 10 mm thick have an efficiency higher of those with larger thickness.

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Evaluation of earthquake damage scenario of churches at regional scale Experiences in Abruzzi and perspectives in Campania

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Abstract
In the paper a synthesis of the main results of an activity carried out in the immediate aftermath of the 2009 L'Aquila earthquake are firstly presented. They concerns a stock of 64 three nave churches belonging to both the L'Aquila and Sulmona-Valva dioceses in the Abruzzi region. Such an activity was addressed towards the damage classification and evaluation on the churches, taking into account the most recurring failure mechanisms due to both the global structural response and the local mechanisms involving specific macro-elements. The evaluated damage frequencies, organized in terms of Damage Probability Matrices, permitted to calibrate suitable predictive model for reduction of seismic risk that are able to forecast typical damage scenarios that could be expected on similar churches in case of future earthquake events. Then, the plan of a trial step in progress, based on the application of the above predictive model on a larger stock of churches belonging to the Campania region and in particular to the Caserta district is presented. Differently from the Abruzzi, such a territory is characterized by both an high density of population and a very large number of churches, with a significant seismic risk. A preliminary introduction regarding the main dioceses of the Caserta district is given and the perspectives of such an activity are illustrated.

Keywords: Churches, Damage scenarios, Earthquake, Seismic risk, Seismic Vulnerability.

1. Introduction
Earthquake occurrence may represent a chance to recognize the structural fragilities of existing built environments. Very often it allows to realize that significant actions should have been preventively assumed in order to limit damages and losses by achieving an acceptable level of the seismic safety of existing buildings. From this point of view, the lesson learnt after the 2009 L'Aquila earthquake stimulated the several figures involved in the management of the seismic risk of the Italian territory (i.e. technicians, politicians, etc.) to do a valuable step toward more resilient communities to challenge future seismic events. To achieve this goal, it is extremely important to get a quantitative evaluation of both the occurred damage scenarios and related losses.
The wide activity carried out by the authors in the aftermath of the 2009 L'Aquila seismic event focused the attention on the three nave churches in Abruzzi region, which suffered the effects of the earthquake [1]. In particular, a detailed survey of the main architectural characteristics and structural elements has been done on both L'Aquila and Sulmona-Valva dioceses. Moreover, Damage Probability Matrices have been defined (DPMs), based on frequencies of occurred damages on the

churches, taking into account the most recurring failure mechanisms due to both the global structural response and the local mechanisms involving specific macro-elements.

2. Main architectural features of churches in Abruzzi

L'Aquila is the most important city of the Abruzzi, being the capital of the region, as well as the most politic and cultural centre of the whole regional territory. Its administrative boundaries extend over about half of the region (Fig. 2) and they cover three ecclesiastical areas, namely the dioceses of L'Aquila, Avezzano and Sulmona-Valva. The architectonic identity of the cultural heritage of the region is marked by significant stratifications, as several reconstructions and restorations were carried out following the earthquakes occurred in the past, such as those of 1461 in L'Aquila, (magnitude X in the Mercalli-Cancani-Sieberg, MCS), 1703 in the north of L'Aquila (X MCS), 1706 near to Sulmona and 1915 in Avezzano (XI MCS).

In the L'Aquila and Sulmona-Valva dioceses more than 640 churches have been identified (Fig.1a). Among them, about 12% is represented by the three-nave typology (Fig.1b), while the foundation period is homogeneously distributed between XI and XVI centuries (Fig.1c). On the other hand, the rebuilt period is strictly connected with the main eighteen century earthquakes (1703 and 1706). In this period some churches have been transformed by introducing typical Baroque sail dome and lavish decorations; also, many churches (about one third) were partially or completely rebuilt (Fig.1d).

The investigated churches have been classified according to their foundation period. In particular, three homogeneous classes of churches have been defined: *medieval* (20%), *post medieval* (20%) and *hybrid type* (60%) churches. The *medieval* typology developed throughout the region since the 11th to the 14th century. The main architectonic peculiarity is the poorness of the decorations, a typical characteristic of the religious buildings built in this period in the central part of Italy (Fig.2a). The *post*

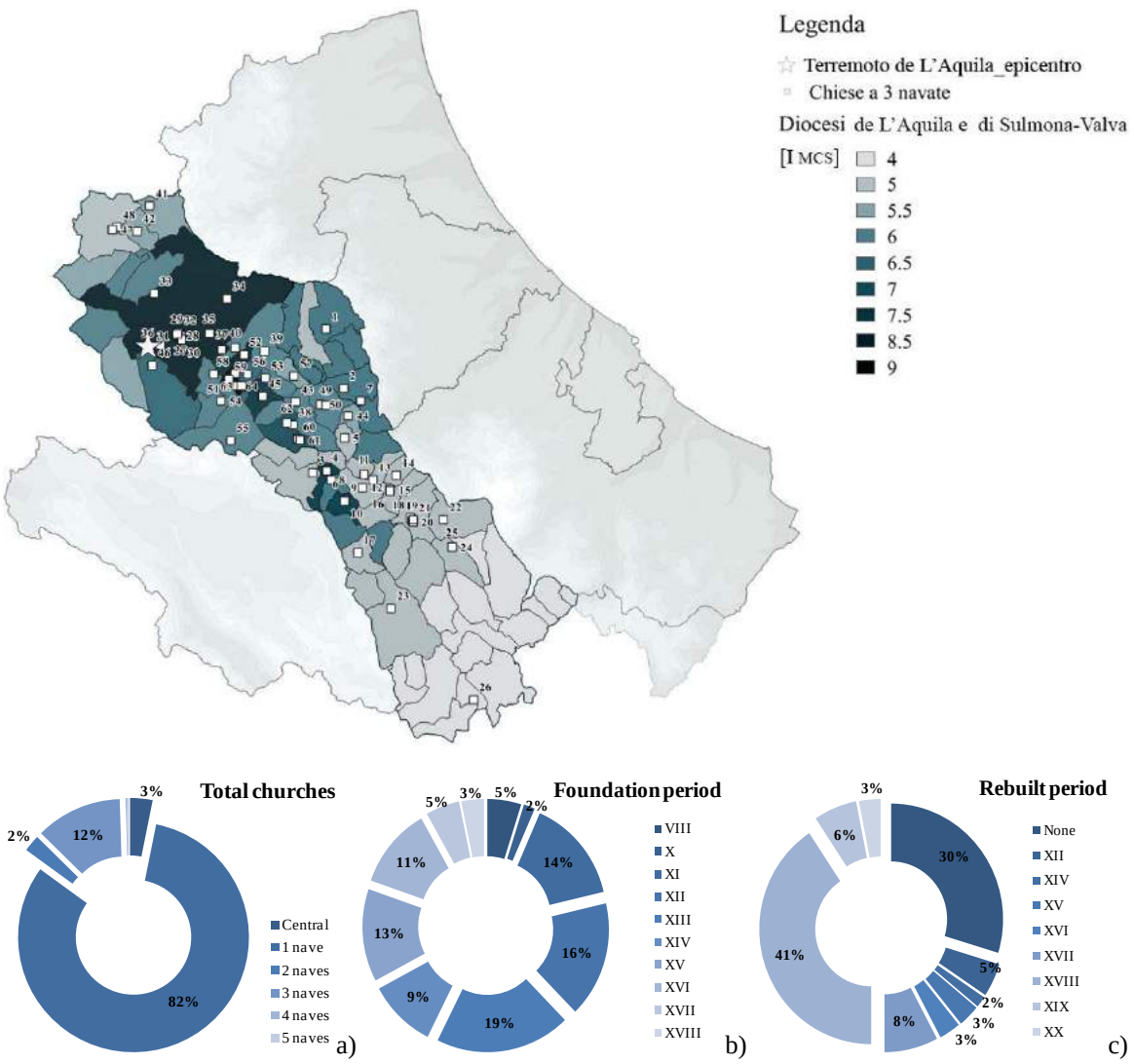

Fig. 1: a) Map with localization of churches in L'Aquila province. b) Churches typologies belonging to L'Aquila and Sulmona-Valva dioceses, c) foundation and d) re-built period.

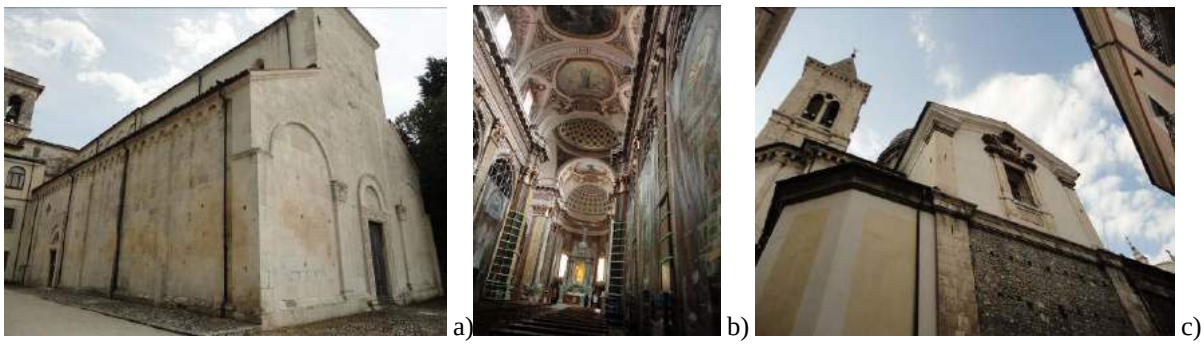

Fig. 2: a) St. Pelino church in Corfinio (SPE), b) Madonna della Libera church in Pratola Peligna (MDL) and c) Santissima Annunziata church in Sulmona (SSA).

medieval churches, built between the15th and the 17th centuries, were originally characterized by the typical layout of the Renaissance period, represented by the Latin plan covered by arches, barrel vaults and a dome (Fig.2b). The first two types are characterized by a layout that has remained substantially unchanged, while the latter, the *hybrid type*, is characterized by miscellaneous elements to be attributed to constructive practices dating back to different historical periods (Fig.2c).
Considering the architectural characteristics of churches (Fig. 3a), the 59% of the samples under investigation has a Basilica layout, characterized by a rectangular plan, a central nave taller than the lateral aisles and the absence of transept. The 38% of churches has a Latin cross layout, with a transept crossing the main body. Finally, only the 3% has a commissa crux layout, with a T-shape plan characterized by the absence of presbyteries and apses.
Heavy thrusting roofs (i.e. barrel and cross vaults) are present in the 60% of the analyzed cases (Fig.3b), whilst light elements (i.e. visible timber truss and coffered ceiling or flat soffits) can be observed for the 30% of selected churches.
Façades (Fig.3c) are often characterized by different structural (masonry texture) and architectonic features with respect to other macro-elements, as they were usually erected after the construction of the main body of the church. For the same reason, generally, they are not effectively connected to the transversal walls, except in cases in which iron longitudinal ties are present, thus resulting more susceptible to develop out-of-plane mechanisms. The most frequent façade layout is the salient façade (56%), which is characterized by a gable roof with tympanum on the central nave and two rakes upon the aisles. Façades with horizontal cornice, where the different height of the naves is concealed by a rectangular layout, characterize the 34% of the surveyed cases. They appear to be the most vulnerable typology, as the triangular elements at the top of both sides result very prone to develop overturning mechanisms due to the lack of restraining elements. On the other hand, enclosed façades (2%), which are confined at one or both sides from other bodies, such as bell towers, certainly are less vulnerable.
In order to define a correlation among dimensions and proportions, some geometric ratios have been defined and analyzed, such as the plan width-to-length ratio, the façade height-to-width ratio, the nave length-to-total length ratio and the central nave width-to total width ratio.
The results allow to state that the churches of the analyzed stock have a width that, in the majority of cases, is in the ratio of about 0.4÷0.7 to the length. Indeed, there are some cases where the aforementioned values are exceeded, but this is mainly due to the either the absence or narrowness of apses and presbyteries. Moreover, independently from the period of erection, the height-to-width ratio of the façades is always larger than 0.4 and in the majority of cases ranges from 0.6 to 1. As for the ratio between the length of the nave and the total length of the church, values of 0.5÷0.7 are

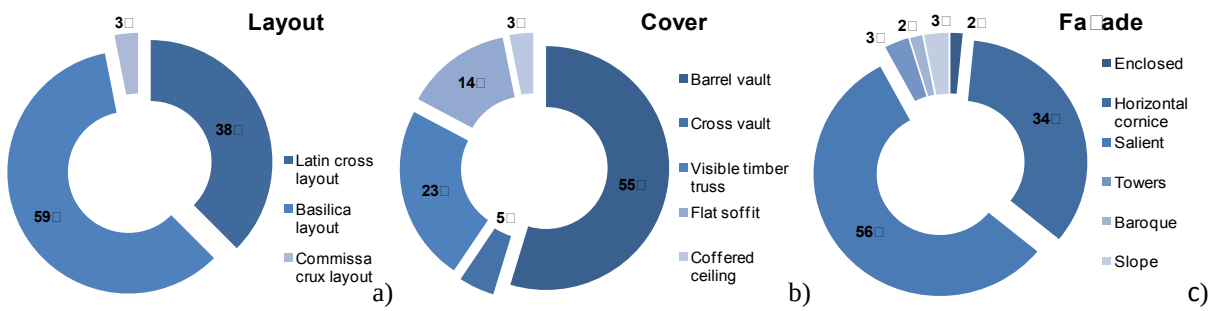

Fig. 3: a) Layout configuration, b) nave roofing system and c) façades of the studied churches.

Fig. 4: a) Façade rigid overturning and b) Top corner overturning in the St. Gemma Curch in Goriano Sicoli, c) Apse overturning in the St. Eusanio Martire in Sant'Eusanio Forconese.

ordinarily recognizable. Therefore, when the system of transept-presbytery-apse is present (ratio equal to 1), the nave length is about half of the total length.
Finally, it must be highlighted that the ratio between the width of the central nave and the total width of the church ranges from 0.4 to 0.5; therefore the aisles width is generally one half of the central nave width.

3. Observed damage to churches after earthquake in Abruzzi

3.1 General

For the whole group of churches a detailed observation of occurred damage has been carried out and an identification of specific local mechanisms permitted to evaluate recurring failures for each macroelement (i.e. façade, apse, transept, dome, lateral walls, arches and vaults, bell towers and covers). It needs to be underlined that the sample of structures suffered different seismic intensities (from IV MCS to IX MCS). The expected damage is generally consistent with the real one, except in some cases, as for example for the St. Gemma church in Goriano Sicoli [2], where the subsoil condition caused site effects which provoked a larger damage.
Out-of-plane mechanisms represent the most dangerous source of vulnerability of this building typology. They can develop when masonry walls are not correctly endowed with well dimensioned ties. For the churches under investigation, three main out-of-plane phenomena have been recognized: the rigid façade overturning (Fig.4a), the façade top-corner overturning (Fig. 4b) and the apse overturning (Fig.4c).
However, in the majority of cases, the most recurrent damage type is represented by cross diagonal cracks due to second mode (in-plane) mechanisms. They have been frequently observed on lateral walls, bell towers and domes (Fig.5a), in case a poor masonry fabric was adopted.
The main damaged buildings resulted to be the vaulted system type, where fractures along both the diagonal directions and the circular spring-lines have been highlighted (Fig.5b). Different types of damage have been observed at the top of the barrel vaults (Fig.5c), where longitudinal cracks along the key-stones often recurred in a more or less extended way according to the presence of ties in the orthogonal direction. On the contrary, lower damage levels have been revealed on the cross vaults, where some fractures developed about the diagonal directories only. With regard to pillars, vertical cracks due to crushing phenomena have been sometimes observed, as in the case of St. Gemma church in Goriano Sicoli.
They have been probably induced by the increasing compression stresses, due to the earthquake vertical component.
Heavy sliding damage has been detected on the churches where reinforced concrete roof or beams have been built in recent years without an effective connection with the vertical walls (Fig.6a). This obsolete practice provoked also the damage of the arches (Fig.6b), because of the increased outward

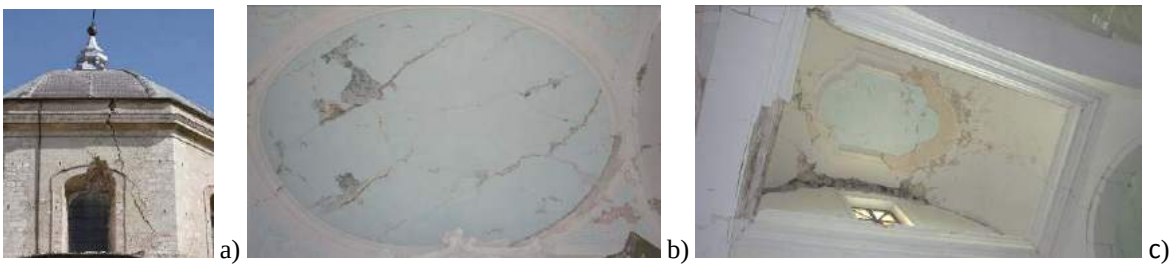

Fig. 5: Diagonal cracks on a) dome in San Bernardino in L'Aquila b) vaults in St. Maria Nova in Goriano Sicoli.

Fig. 6: a) Reinforced concrete roof in St. Gemma church, b) damage on the keystone of the arch in St. Martino and c) Punching phenomenon at the tie anchor-plate.

thrust force on the vertical supporting walls of the heavy roofs. The presence of iron ties certainly limited this effect; nevertheless, in some cases, punching phenomena of the ties-key have been noticed (Fig.6c).

3.2 Damage evaluation

The observed damage has been classified for macro-elements, according to the Italian Guidelines for Cultural Heritage (G.U. no. 47, 2011) [3]. Then, the damage level has been determined and the corresponding frequency of occurrence has been evaluated. Consistently with the Italian Code, the classification of the observed damage has been carried out accounting for twenty-eight mechanisms referred to the main macro-elements (i.e. the façade, the colonnade, the vaults, the apse, the transept, the dome and the bell tower). For each mechanism, six levels of damage dk (d0-d5) have been defined according to the observational criteria introduced by EMS-1998 scale (Grunthal, 1998), which have been revised in order to account for the fact that they were originally referred to the entire building.

Each level of damage d_k has been associated to a damage score k ranging from 0 to 5. Moreover, for each mechanism an importance factor score (ρ_k), ranging from 0 to 1, has been assigned, according to [4] and [5] in order to account for the influence of that mechanism on the global stability of the whole structure.

Therefore, a global damage index (i_d) has been calculated according to equation (1), which is proposed in the Italian Guidelines.

$$i_d = \frac{1}{5} \cdot \frac{\sum_{k=1}^{28} \rho_{k,i} \cdot d_{k,i}}{\sum_{k=1}^{28} \rho_{k,i}} \qquad (1)$$

Being the obtained values defined in the real number field, a transformation of the indices into natural numbers, so to get countable level of damages for statistically managing purposes, has been carried out by correlating each damage index id to a damage score D_k (ranging from 0 to 5), which is defined in Figure 7 similarly to the damage levels defined by Grunthal for the EMS98 scale. The correlation between the analyzed data has been performed according to Lagomarsino and Podestà (2004a, 2004b). The obtained results are shown in Figure 7.

It can be observed that the majority of the churches presents a global damage level D_k equal to 0, 1 or 2, whereas only fourteen churches (22 of the whole stock) suffered a damage level equal to or higher than 3. It has to be pointed out also that the damage score D_k equal to 5 has been obtained only for the two churches of St. Nicandro e Marciano (SNM) and St. Gregorio Magno (SGO), both located in the outskirts of L'Aquila. Moreover, some churches presented damage scores equal to 4. This was mainly due to the activated collapses of several parts of their central body. In particular, in the cases of St. Maria di Collemaggio church (CLM) and St. Massimo e Giorgio cathedral (SMG), the transept, the dome and the triumphal arches fell down, because of an increased structural demand, likely due to restorations carried out in the past that changed the original structural layout.

3.3 Damage Probability Matrices

In order to evaluate the damage scenarios observed after the 2009 seismic event from the quantitative point of view, the obtained frequencies of the damage scores D_k have been elaborated in order to obtain the related Damage Probability Matrix, which is shown in Figure 8a. It is interesting to note that

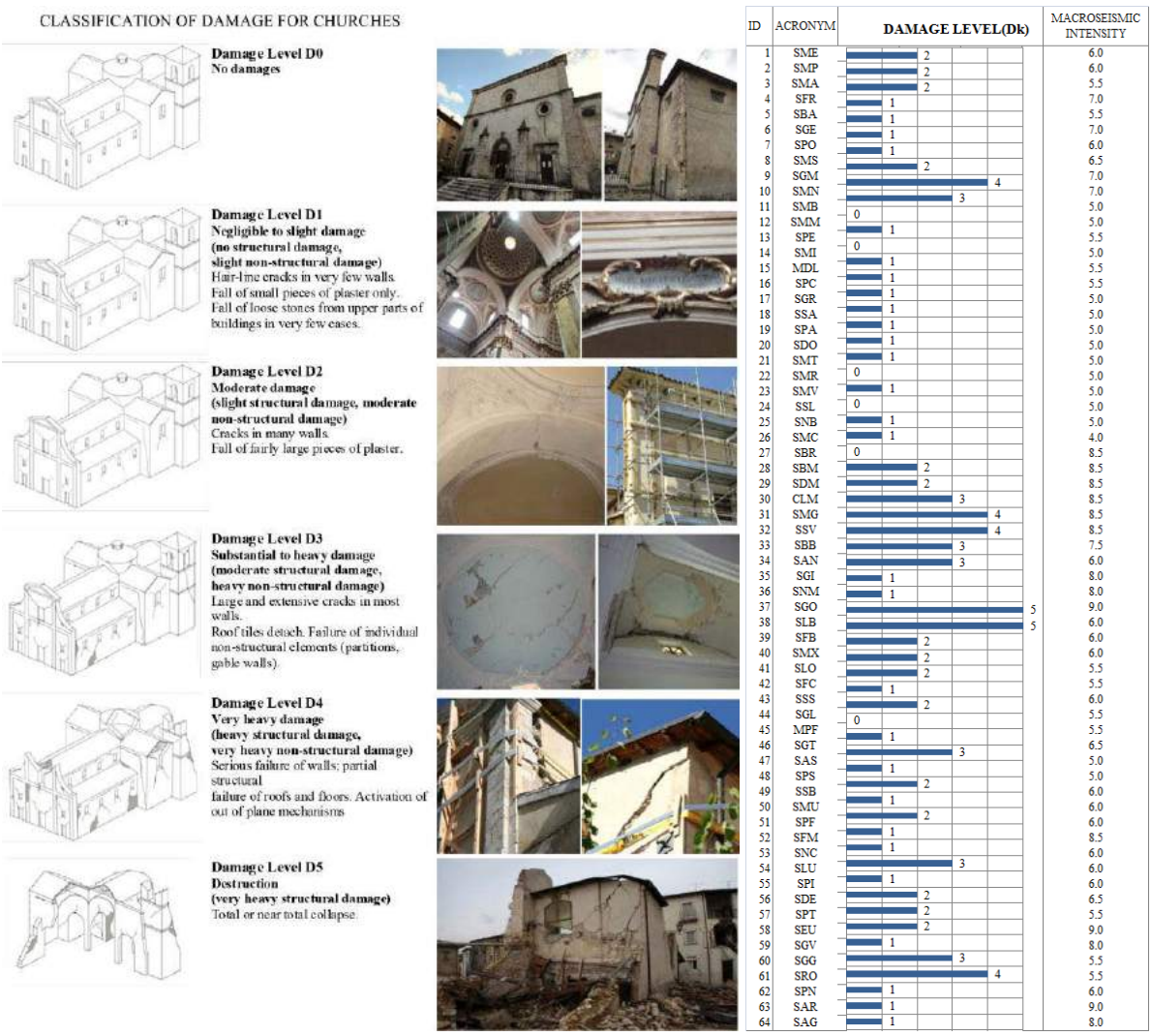

Fig. 7: Damage classification for masonry churches according to Grunthal and Damage levels (D_k) for churches under investigation.

the results described above are very similar to the findings of da Porto et al. [6] who carried out an analysis on a stock of 241 churches located in the area hit by the 2009 earthquake, including several typologies different from the ones analyzed in this paper.

Also, it should be pointed out that the Medieval type churches experienced a mean damage index equal to 0.95, the Post medieval type churches equal to 1.1 and the Hybrid type churches equal to 1.6. This confirms that the correlation between the homogeneous classes (referred to the historical classification) introduced in Section 1.2 is realistic.

Then, it has to be highlighted that the obtained frequencies refer to a very large territory that experienced a macro-seismic intensity going from the fifth to the ninth grade of the MCS scale. In order to provide results that could be useful also for smaller territories, Damage Probability Matrices for churches that experienced a macro-seismic intensities of grades IV-VI (named as □Group 1□) and VII-IX (□Group 2□) according to the MCS scale, are proposed separately in Figure 8b.

The interpretation of the obtained matrices led to achieve an important conclusion. In fact, it can be observed that such results are well fitted by the Binomial Probability Density Function (BPDF in Fig. 8), given in eq. (2), that provides the probability p_k (k□0,1,2,...5) of experiencing a damage score D_k as a function of the mean damage μ_D (shown in Fig. 8 for both the whole population of churches and the two groups) given in eq. (3), where n is the number of analyzed churches.

$$p_k = \frac{5!}{k!(5-k)!}\left(\frac{\mu_D}{5}\right)^k\left(1-\frac{\mu_D}{5}\right)^{5-k} \qquad (2)$$

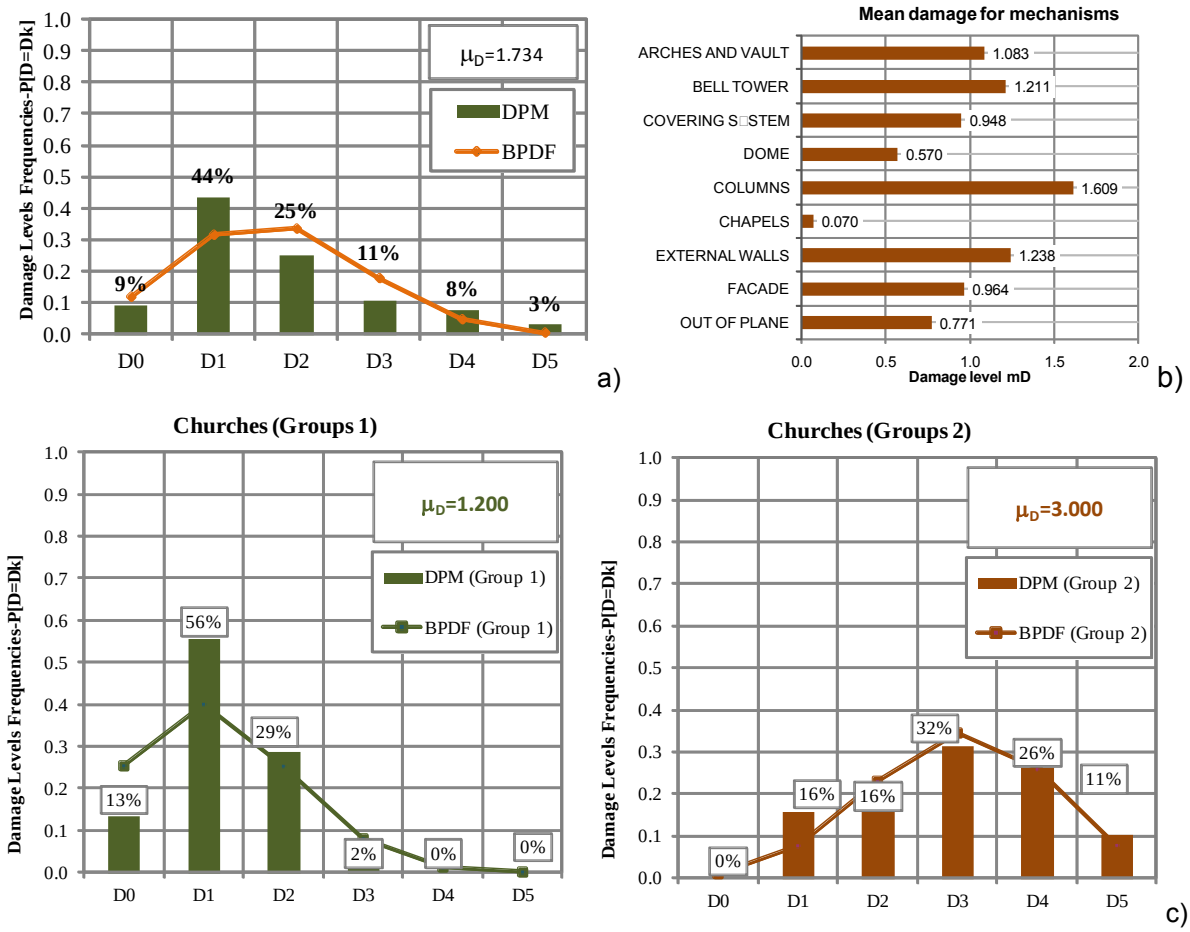

Fig. 8: (a) Damage Probability Matrices for the whole analyzed population of churches, (b) Obtained mean damage values for single macro-elements and (c) Damage Probability Matrices for churches subjected to different seismic intensities (Group 1 from IV to VI MCS and Group 2 from VII to IX MCS).

$$\mu_D = \frac{\sum_{i=1}^{n} D_{k,i}}{n} \tag{3}$$

4. DEFINITION OF THE DAMAGE PREDICTIVE MODEL

With the same approach used for the damage evaluation based on the application of observational method, the vulnerability assessment of the churches has been based on the partition of the buildings into macroelements, accounting for 28 possible collapse mechanisms. For each mechanism, fragility indicators and possible protection devices have been detected, as for example longitudinal and transversal ties, contrast elements, corner connections, pilasters and buttresses. In the same way the vulnerability elements for churches have been selected, as for example thrusting elements, presence of openings at the corner, decorations at the top of the façade and presence of vaults and arches.
Then, a vulnerability index has been therefore calculated according to equation (4), calibrated in order to retrieve back a vulnerability index ranging from 0 to 1.

$$i_v = \frac{1}{6} \cdot \frac{\sum_{k=1}^{28} \rho_k (v_{ki} - v_{kp})}{\sum_{k=1}^{28} \rho_k} + \frac{1}{2} \tag{4}$$

In the above equation ρ_k is the importance factor, ranging from 0 to 1, based on the influence that the mechanism itself has on the global structure stability. The vulnerability parameters, v_{ki} and v_{kp}, are scores that can be ascribed to the fragility indicators and to the anti-seismic devices, respectively, according to their absence/presence, uneffectiveness/effectiveness.

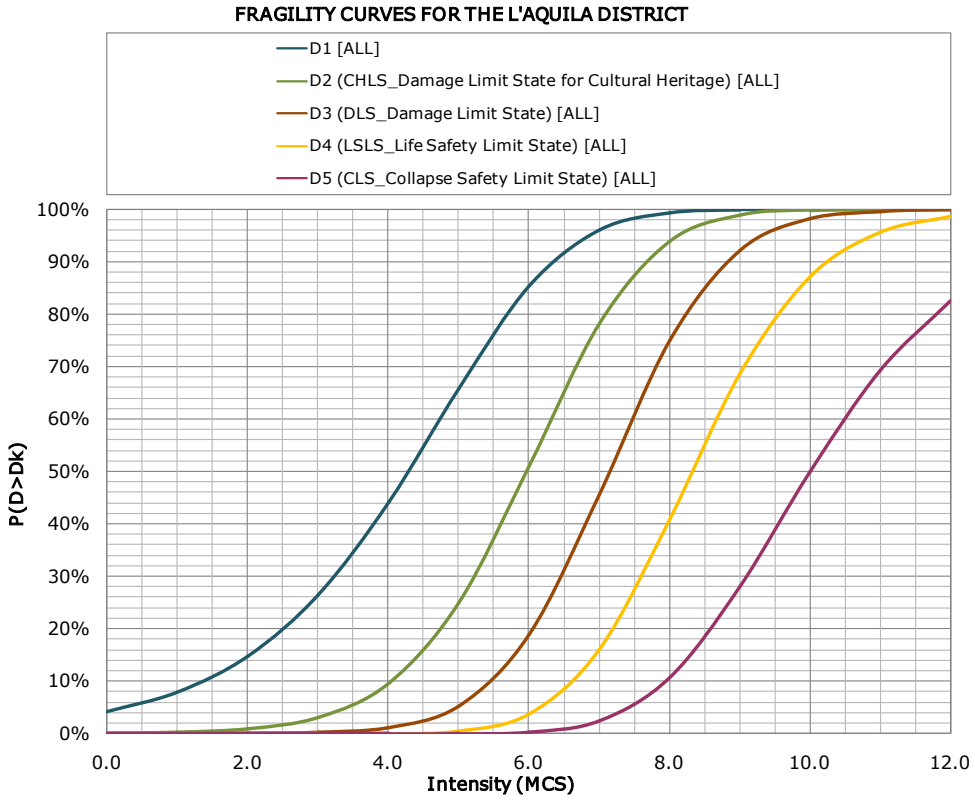

Fig. 9: Fragility curves for three nave churches in the L'Aquila and Sulmona-Valva dioceses.

The correlation of the above vulnerability index with the observed damage ($\mu_{D,o}$) and the occurred seismic input (I) is defined according to eq. (5); then, a procedure for determining fragility curves (Fig.9) is obtained according to eq. (6).

$$\mu_{D,o} = \mu_{D,p} = 2.5\left[1+\tanh\left(\frac{I+3.4375\cdot i_v - 8.9125}{3}\right)\right] \tag{5}$$

$$P(D \geq D_k) = \sum_{j=1}^{5} p_j \tag{6}$$

The obtained curves, which represent the possible damage scenario in a given area, have been calibrated on the basis of real a post seismic damage analysis, related to the intrinsic vulnerability of each of the 64 analyzed churches. In order to interpret the above graph as a capacity of the buildings to comply certain performance levels, the Damage Limit State (D3) can be considered as the admissible standard of failure for monumental buildings of architectural significance. Even in case of moderate earthquakes, as for example 8 MCS, the damage exceeding probability is about 75%.

5. EXTENTION TO CAMPANIA REGION: PERSPECTIVES AND CONLUSIONS

Once the model for the prediction of potential damage occurring on churches due to earthquake has been calibrated and also proved for a large group of buildings in Abruzzi, as further step to validate the proposed procedure, it is interesting to investigate different church typologies belonging to a different geographical context. The Campania region seems to be a good scenario to be investigated for planning such an activity. Indeed, as a perspective for the mitigation of seismic risk, the South of Italy, and in particular the Neapolitan territory, is characterized by very high seismic hazard and, above all, a considerable exposition factor. In fact, the territory structure and the cultural evolution of the region, the population density is about four times larger than in Abruzzi. Moreover both the high presence and

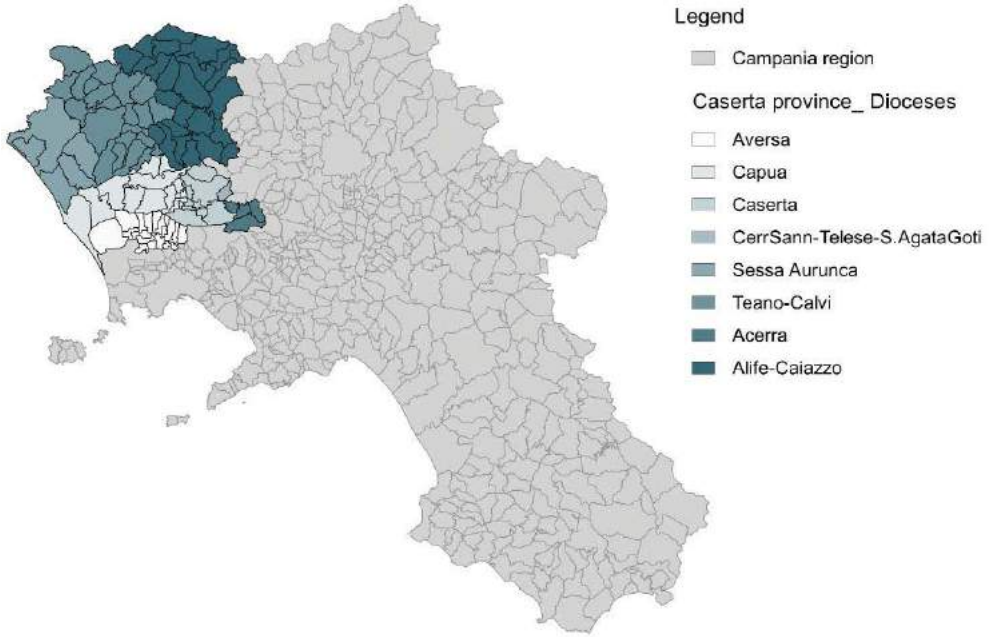

Fig. 10: Map of the Campania region and localization of the 24 dioceses (to the north the Caserta political district is evidenced).

the different concentration of churches (as it can be seen comparing Figure 1a and Figure 11), due to the ancient history of the Campania region, reveals a potential very high seismic fragility of such area. In the whole, the Campania region (Fig.10) is formed by 550 municipalities, 5 political districts (Napoli, Caserta, Benevento, Avellino and Salerno) and 24 ecclesiastical administrative boundaries, (i.e. the dioceses). In the Caserta district there are seven 7 dioceses and about 300 parish churches have been identified. Among them, interesting samples are certainly localized in the Caserta, Aversa and Capua dioceses, as these cities are the main cultural, politic and commercial centers of the province. These places are furthermore characterized by a very high population density, as it can be seen in Figure 11a, where it is evident that there is a considerable number of churches belonging to these dioceses. In Figure 11b the relation between the location of such buildings and the seismic hazard is also shown. It should be underlined that this stock of churches is represented by different structural typologies, as one nave, three naves and central churches. In addition, some of these churches are represented by small chapels that are close to other churches or connected to the main building. Therefore a suitable selection to identify a stock of representative but also homogeneous churches should be made to get coherent results in terms of damage susceptibility evaluation. In fact, a very large number of about 280 churches belonging to the political district of Caserta (including all the

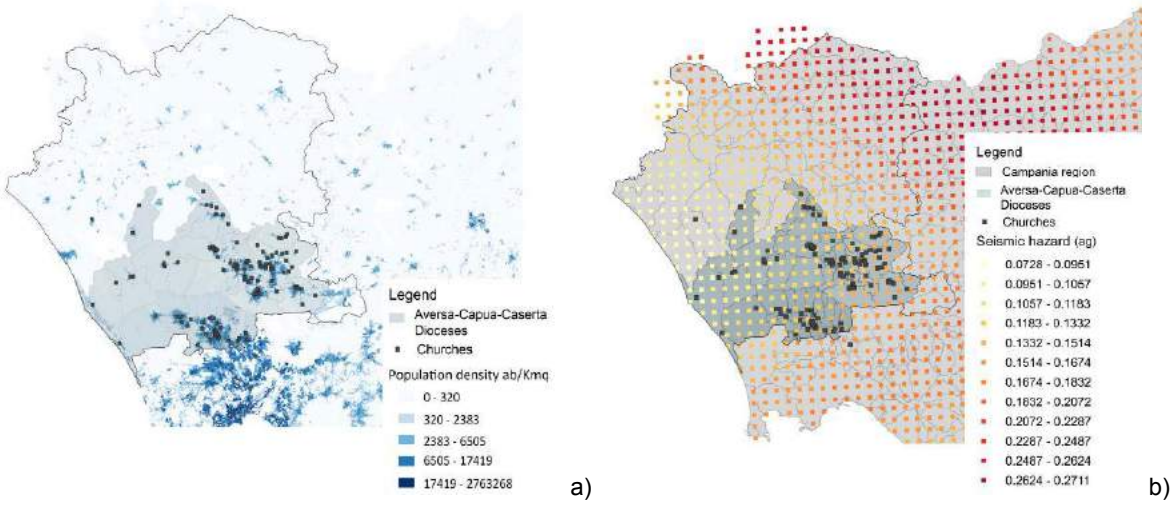

Fig. 11: Map of the Caserta, Aversa and Capua dioceses with a) correlation between detected churches and population density and b) correlation between detected churches and seismic hazard.

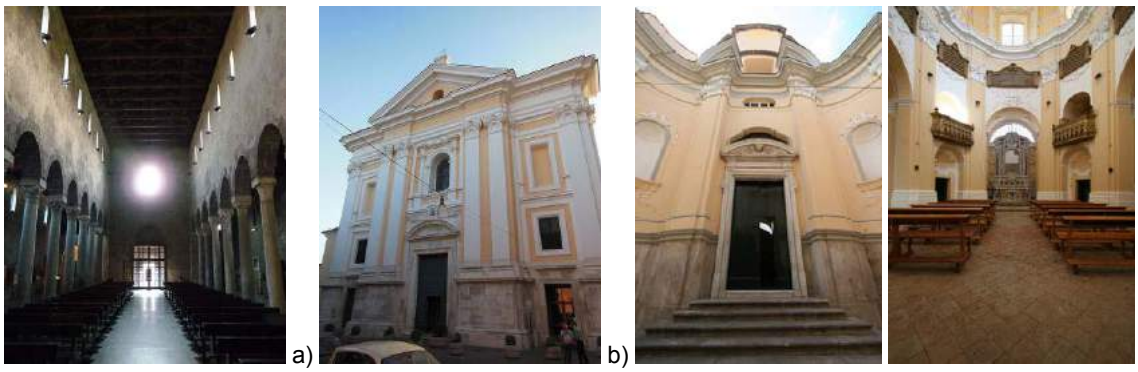

Fig. 12: a) Casertavecchia Duomo in Caserta, b) St. Paolo Cathedral in Aversa and c) Charity church in Capua.

churches and not only the catholic ones) has been detected, in addition to other about 50 churches belonging to the Aversa diocese but which are in municipality of the Naples district.
These 280 churches are not homogeneously distributed in the three dioceses, as about 20□ remains in the Aversa diocese, while 55□ and 25□ belong to the Capua and Caserta dioceses, respectively. In such areas the identified churches are characterized by heterogeneous features in terms of geometric proportions and architectonic style. This is due to the fact that many stratifications occurred in the whole territory, also because of the main earthquakes which took place in the past, for instance, the ones occurred in Campania on 989, 1456, 1694, 1732, 1910, 1930, and 1980.
Many churches were built in the first centuries of the 2nd millennium, thus defining the diffusion of the Romanic style, as for example the Casertavecchia Duomo in Caserta (Fig. 12a) (1113 a.C.-1153 a.C.). Several churches were built in the medieval period as in the case of the St. Paolo Cathedral in Aversa (Fig.12b), but some transformations were done during the XVIII century, in particular on the façade. On the other hand, in the Capua territory, the great part of churches have been built between IX and XV centuries, but most of them have been completely restored in the following centuries. However, some interesting samples are present, as in the case of the small Charity church in Capua (Fig. 12c), a very faithful opera of the typical Baroque of Capua.
A survey of all the churches belonging to this area is in progress, with the aim to (1) evaluate the main representative typologies in terms of architectural style, constitutive materials, geometry, vulnerability elements etc., (2) recognize possible failure mechanisms and (3) apply the proposed methodology as a predictive tool to evaluate possible earthquake damage scenarios. The final objective is to stimulate the adoption of useful strategies for seismic risk mitigation at regional scale.

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Campania, Unesco Sites and illegal building. The assessment of the sanction.

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Abstract
There are 5 Unesco Sites in the Campania area, unfortunately troubled by the illegal building. Unfortunately, especially in Campania, the authority delegated to the supervision of such assets are not able or do not have sufficient resources to hinder, deter, suppress the speculative development that transgressors still led unperturbedly. The Italian Code of the Cultural and Landscape Heritage (art.167, Legislative Decree n. 42/2004) ascertains that, in case of violation of the obligations and orders, the transgressor shall be obliged to restore the cultural property to its original state at his own expense or "pay a sum equivalent to the greater amount between the damage caused or the profit derived through the transgression". This eventuality is provided only in cases of landscape proven compatibility with the infringement. The sum is determined by the Municipality on the basis of an official assessment and shall be utilised for safeguarding purposes, works for reclamation of landscape values and the upgrading of deteriorated areas.
Several are the procedures used by municipalities in order to determine the value of illegal works, some of which will be analyzed in the article.

Keywords: cultural heritage, illegal buildings, sanctions, assessment

1.Introduction:
It can venture to the birth of the unauthorized building in Italy during the period immediately following the war, years in which the country came out destroyed by the World War II, there is an urgent need for a quick reconstruction, since the legislator chooses to postpone approval of 1 town planning law n. 1150 1942 in order to invest time and resources in the financing of reconstruction plans. Italy has not only lost the opportunity to revise the system of management of the territory on new bases, but has also obtained an uncontrolled urbanization, disordered that to the oil stain has invaded the peripheries. If the end justifies the means, the abuses committed building in the years 50' of 20 century, are not attributable as true and own transgressions, as performed by necessity, the end of all different from those practiced in the second half of the 900', for speculation. It is true that in the south, the consistency and the number of registered abuse is markedly higher than those operated in the north; to the north Italy triumph of illicit processing committed in partial or total differences from the titles of authorizations, while to the south it is implementing total abuse. The cause is probably to be attributed in addition to the administrative incompetence devoted to supervision and urban management, even organized crime which in the building industry has rediscovered a good ally for the illegal on investment. In Campania, the phenomenon referred to above, focuses primarily in the areas close to the five Unesco sites:

- The historic center of Naples,
- The archaeological areas of Pompei, Ercolano, Torre Annunziata;

- The Royal Palace of the XVIII sec. at Caserta with the park, the Aqueduct vanvitelliano and the complex of S. Leucio
- National Park of Cilento and Vallo di Diano with the archeological sites of Paestum and Velia, and the Certosa di Padula
- Amalfi Coast

Despite the legislator, made aware of the urgency of the matter, has attempted to reset the accounts with the unauthorizated building trying to heal with the 3 building amnesties, promulgated by the laws No. 47,724,269, respectively in the years 1985,1994,2003, the only result that has obtained, paradoxically ,in correspondence of the three dates ,is an increase in illegal construction.
ou must wait for the 2001 why Italy prepares the known "Consolidated Text of the laws and regulations governing the construction industry with the D.P.R n.380" and the "Code of Cultural Heritage and Landscape, D.lgs n.42/2004" in order to have a proper and correct, restrictive system of sanctions.
From the study of a small sampling of the municipal regulations, what emerged was the great difficulty is that local authorities in defining the methods and criteria for the correct calculation of the penalty provided for by Article 167 of the abovementioned code, mainly for the absence of a real market price, being the environmental assets Intangible. In the folders to follow will be analyzed and listed the estimating methods adopted by Italian municipalities, in particular from those of the South.

2. Code of Cultural Heritage and Landscape: Section "sanctions"

The art.167 of Legislative Decree n.42/2004 "Code of Cultural Heritage and Landscape", requires the offender in the event of a breach of the obligations and orders provided for in Title I of Part Three of the same, the demolition and remission pristino in the status quo ante, except as provided for in paragraph 4. So those who for malice or negligence commits the damage to the environment is obliged to restore the initial condition or the adoption of remedial measures complementary[1] and/or allowance [2] .
Only in the case in which:

a. proves impossible or excessively onerous remission pristino in total or partial to the status quo ante;
b. are likewise impossible remedial measures complement, the damaging is obliged to compensation for equivalent [3].

In the case of abuse in building construction, where the demolition is not economically feasible, due to the effect of the combined provisions of art. 31 of Law 380/2001 (consolidated text of the laws and regulations governing construction) and without prejudice to the criminal sanctions, The Institution/Common responsible for the protection of the bond is authorized by a side to the forced acquisition and free of works to the heritage of the public administration, and on the other to collect the compensation per equivalent of environmental damage. As mentioned above, for only a few informal interventions(subparagraph 4 of Article 167 of Legislative Decree n.42),the transgressor, can in place of recovery, petition of amnesty:

a. for jobs, undertaken in the absence or divergence from'permission landscape, which do not have determined the creation of useful surfaces or volumes or increase in those legitimately made;
b. for'use of materials dissimilar from'permission landscape;
c. for jobs configurable anyway such as routine or special maintenance within the meaning of' Article 3 of the decree of the President of the Republic 6 June 2001, n. 380;

Only in these cases the Ente-Comune, which is delegated competence in this matter, will verify compatibility landscape of transgression, will dispense a pecuniary administrative sanction of equal to the "greatest amount between the damage caused and the profit achieved as a result of the infringement" to evaluate with an expert report of estimation [2].

1.Repair "complementary": any remedial measure taken in relation to natural resources and/or services to compensate for the failure to complete restoration of natural resources and/or services damaged" (Dlgs 152/2006, Annex 3 point 1.(b). "The purpose of complementary remediation is to obtain, if appropriate even at an alternative site, a level of natural resources and/or services similar to that which would be obtained if the damaged site had been returned to its original condition. Where possible and appropriate, the alternative site should be geographically linked to the damaged site, taking account of the interests of the affected population" (Dlgs 152/2006, Annex 3, point 1.1.2.).
2."Repair "allowance": any action taken to compensate for the temporary loss of natural resources and/or services from the date of the occurrence of damage to when the primary repair has not produced a full effect" (Dlgs 152/2006, Annex 3 point 1.(c).

The administrative penalties laid down by the legislation in question in order to avoid the demolition of the article are substantially of three species: the first two refer to the expertise of esteem, which constitutes the measure "base", while the third, varies between a minimum of €3000 and a maximum of € 50,000 ,a choice at the discretion of the Administration. In summary, you have three cases:

a. the penalty referred to in art. 167 of the d.lgs. n. 42/2004 in its measurement "base" due in relation to the investigation of landscape compatibility referred to in paragraph 36 (amnesty "steady state") of art. 1 of the law 308/2004;
b. the penalty referred to in art. 167 of the d.lgs. n. 42/2004 "plus a third to half" for the investigations of landscape compatibility pursuant to paragraph 37 (amnesty "extraordinary") of art.
c. the 'financial penalty additional", determined by common between a minimum of € 3.000,00 to a maximum of € 50.000,00, always with the investigations of landscape compatibility referred to in paragraph 37 (amnesty "extraordinary") of Law 308/2004, which goes to be combined with the one just above indicated.

From a technical point of view the estimate wants to identify criteria and methods for determining the measure "base" of the pecuniary sanction (as for the other two types will not need to apply the increases provided by the law and that can be determined exclusively by the administration) which "higher amount between the damage caused and the profit achieved".
For this purpose we need developing techniques and tools for evaluating characterized by an integrated approach, which overcomes the approach exclusively financial and which instead takes account of a multidimensional vision and of the interaction between the material goods, economic activity and the landscape [1].

3. Environmental damage and profit achieved. Assessment criteria

As said before, in order to determine the financial penalty to be paid and heal the building illicit judged by local government compatible with the landscape, you must estimate the environmental damage caused from these; In most cases, being the environmental assets intangible, it does not have a market price and therefore we must have recourse to one of the two methods of monetary evaluation, indirect or direct, to identify the value. While the first assesses the good object of estimation starting from behaviors and from real choices made by individuals (preferences revealed) with regard to other goods valued by the market, the consumption of which presents a report ("of weak complementarity') with the consumption of the good landscape; they include the Edonimetrico Method (hedonic price) and the method of travel cost (Travel cost); those direct, instead, are based on potential behaviors and hypothetical, never verifiable in market situations, available through interviews; between various the method most widely used is the guest quota (contingent valuation).
In summary the environmental damage is estimated through three approaches:

- Aesthetic perceptual-based on the judgment of the population, i.e. referring to "visual preferences" (possibly associated to the analysis of the opportunity cost of other configurations of the territory): may refer to such a methodology also assessments based on interviews users, which however provide for the more qualitative indications and non-quantitative [1];
- Type "quota",which refers to the "willingness to pay" consumer, acquired by means of interviews to a limited number of users; the evaluation of willingness to pay is based on the sum that a person is prepared to pay in order to continue to enjoy that good price (compensation) compared with the sum that would be willing to accept to abandon them (equivalent price) [1];
- Type "edonico", “stimating the value of environmental goods by observing the market prices of real estate sites nearby; can be used as individuals express their appreciation of the quality of the landscape paying different prices for buildings depending on the position of the visuals[1].

We consider however that the municipalities, which are responsible for the evaluation and the imposition of sanctions, rarely possess specific skills for the unwinding of the valuations of the estimate with which to determine the "higher amount between the damage caused and the profit achieved as a result of the infringement".
Very few are then the municipalities that have opted to perform evaluations of estimate ad hoc as required the norm, while for the more you are equipped with special regulations for the evaluation of the damage landscape, which make reference to criteria extremely simplified with the use of parametric tables, or other criteria (e.g., those already in use for the pardon building) that very often well have little to do with the requirement of the norm.

3.The criteria currently in force for the quantification of damages to the environment are those prescribed by art. 5 bis of Law n. 166 of 20 November 2009 (Law of conversion of Dlgs 135/2009).

It was thus found that very few municipal regulations have made use of the methods for the evaluation of environmental goods. One hundred regulations consulted, less than ten per cent has made reference to considerations of aesthetic type perceptual for the assessment of the penalty, performing interviews with a sample (reduced) of users and meetings with stakeholders and citizens, while almost all other municipalities have preferred to make reference to techniques and established rules for the assessment of penalties for abuses of buildings, or indications of the value of the buildings listed by the observatory of the real estate market of the agency of the territory [1] . The municipalities that have carried out interviews and meetings, have then translated the results of investigations in the tables of the coefficients to be applied to sanction base (commensurate or to the manufacturing cost of the abuse or the cost of "remittance in pristino") as a function of location, constructional criteria, visual impact, morphological alterations and naturalistic. ou can still say that the minimum limit for the evaluation of the "damage" is determined by calculating the sum that would be required for the setting of the pristino state before the execution of the works.
Regarding the evaluation of "profit achieved", to compare for the purposes of the imposition of the sanction with the evaluation of the "landscape damage caused", many municipalities still proceed by calculating the difference between the "market value" of opera abusively made and the cost of realization, reducing the matter to locating the only "real estate profit"; Others use instead the criteria reported in the law n. 47/1985 (the first building remission) in which the penalty was commensurate with the "value" determined, pursuant to art. 28, from the tax office; still others take inspiration from the criteria indicated in the single text of the construction, according to which the penalty for building abuse is equal to the double of the increase in the market value resulting from the abusive work, equating so abuse landscape to abuse the buildings. But the "profit" could not be understood as a simple increase in the value of the property obtained through abuse as instead provides for the remission construction, but it must be understood as greater economic efficiency, that, since the amendments made to the landscape, also includes the variations of individual wellbeing and complementary benefits.
Various municipal regulations have mobilised in this direction,in fact for the assessment of profit provide multiplication coefficients of value in relation to various destinations of use (normally is used the coefficient equal to 1 for the destinations of use residential "normal" in condominium, and for other destinations different coefficients, both greater than and less than 1, in relation to the achievable profit with the different destination).In this circumstance it is necessary to consider also the "relationship of complementarity between the work abusive and buildings to whose service is performed, which involve the fact that profit is equal at least to the cost of manufacture. In order to better understand the concept of complementary relationship and its interaction with the profit achieved, for example we can think of an owner of a property in a hilly area bound , who chooses to provide a way to facilitate the achievement of its property; Even though it is the road has no market value, he surely this operation will gain a greater economic profit ,at least equal to the cost incurred for the construction of the road itself, as if the "profit" was lower, there would not have been a convenience to finish it.

4. Methods used.
From a sitological on municipal research, regulations in the area of sanctions for damage landscape revealed ,on a hundred of municipalities, interpretations that are very different in some cases completely absent (refer to compliance with the standards established by the laws in force concerning construction and urban planning and in particular by Law n 1150/1942 (text in force), from LURC, by Legislative Decree No. 42/04, by the TU D.P.R Building No.380/2001). To follow are reported with maximum conciseness possible, the main methods used by the various municipalities taken into consideration.

Methods Found	
1	Application of an increase in the percentage of profit achieved by the abuse
2	Average damage calculated in €/m2 or in €/m3 of abuse, with the tables of maggiorativi coefficients as a function of location, constructional criteria, visual impact, morphological alterations naturalistic.
3	Reference to the cost for the restoration of the state of the places or for the mitigation of the impact of the work (criterion more adherent to the spirit of the rule).

Tab. 1. Methods for calculating the environmental damage caused.

While for the profit achieved, many municipalities determine it by calculating the value d'Estimo, understood as the real estate value for purposes ICI; then reach the identification of profit achieved by multiplying the difference between the d'Estimo value before and after the abuse a percentage, most of the times equal to 3□. In the case in which that value is not predictable, proceed by subtracting the value of the abuse the cost pe make it happen; also the modes of estimate of these last two values vary from municipality to municipality:

1□	Through the expert (often oath) of professional who has the practice for the assessment of compatibility
2□	Search engine optimization to estimate to entrust each time to professionals of the administration's trust;
3□	Use the values indicated by the observatory of the real estate market of the Agency of the territory, as reported by the Agency, and remedial action
4□	Identification of average values of reference and of the coefficients for the location for the various types of works, for localization for the dimension for the ancientness
5□	Use of the criteria identified by the law n.47/1985 (1□building remission).

Tab 2. Methods used for the estimation of the value of the abuse.

Very few are then the municipalities that have opted to perform evaluations of estimate ad hoc as required the norm, while for the more you are equipped with special regulations for the evaluation of the damage landscape, which make reference to criteria extremely simplified with the use of parametric tables, or other criteria (e.g., those already in use for the pardon building) that very often well have little to do with the requirement of the norm.

5.Conclusion

Despite Italy has included in its constitution is the protection of the landscape, and both the country in which there are the best protection laws, it is clear from statistics the nation most affected by unauthorised building stimulated certainly from a system that despite legally authorizes the construction wild. Now reached alarming heights, it is now time to intervene concretely with mitigativepolicies beyond that countervailing measures that stop in the immediate future the advance of this "evil" which from the middle of the 20 century infects our country as well as our land bell. The weight of this phenomenon instead discourage should encourage the authorities for the protection of environmental goods and landscaped to invest in rehabilitation programs, protection and enhancement of the campanian heritage campano, land where to now weighs the greatest number of illegal buildings especially in proximity of the five Unesco sites:

- Historical center of Naples;
- Archaeological Areas of Pompei, Ercolano, Torre Annunziata;
- The Royal Palace of the XVIII sec. at Caserta with the park, the Aqueduct vanvitelliano and the complex of S. Leucio ;
- National Park of Cilento and Vallo di Diano with the archeological sites of Paestum and Velia, and the Certosa di Padula;
- Amalfi Coast.

Substantially study on unauthorised building played Casertano and Neapolitan emerges that today in these areas there is no municipal rules that determine correctly an administrative penalty amnesty of building illicit foreseen in paragraph 4 of art.167 of the DLG.n.41/2004. Paradoxically it occurs to me that the brim of the quantity of natural beauties that we have at hand, we are distracted by value and by benefits from these goods could draw; the campanian people are not completely aware of their "luck", because they are not conscious that this is a great luck, indeed they tend to depreciate it.The other European countries, on the other hand though possessing a small slice of intangible assets, to the eyes of the world appear priceless, simply because they on culture and on environmental heritage-landscape-historical-archaeological invest everything, aware that keeping them adequately may they

take an economic profit infinity. If we invested in programs and policies to safeguard, recovery, restoration of only 10□ equity campano, the region could live only tourism. For that much, and not a little,that remains to us we must try to protect it and we must not keep destroying it. Let's say No to illegal building.

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The paradigm of eternal present

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Abstract
How many furnitures, or houses, or urban districts, that where designed and made in the 80s are still relevant today What clothes or shoes that period can be worn without appearing old or out of time Everibody can say almost all. In forty years the living spaces have not changed that much. Even less their projects have been modified. The way in which they are conceived and designed is almost the same. Fashion, architecture, and cities are the sensitive forms that better represent the people that generated them. They express lifestyle, a status and, in some way aspirations and expectations for the future. Is it possible that they remained so indifferent to the changes of the last decades
A few times the distance between gestalt and zeitgeist was so dramatic. The paradigm that binds the aesthetics to the projection of time blowed up. The overcoming of modernity lies especially in this. We live like an eternal present. Where the sensitive forms and their representations in solid space no longer carry an idea of the future. They always seem to be more or less the same, immutable and increasingly deprived of sense in the rush of the sharing information technologies revolution that is distorting the system of social relations and the way in which things and places are related each other. Even today everything changes and so much faster than before. Innovation is conducted in the intangible areas of the net rather than in the material spaces.
We live with our head in the Cloud. Objects are intended to produce informations that are monitored and transmitted in real time. Everything is accessible and traceable. The control is based on knowledge. In the era of the Internet of Everything, everything is destined to become another (as Marco Valsecchi wrote in February 2016 in the Sole24Ore Dossier on Technological Innovation).
How the forms of living are changing, or will change The architecture of the eternal present, paraphrasing Sigfried Giedion (The Eternal Present, the beginnings of architecture 1964), is still able to propose innovation trough projects
The simultaneous action of three key factors: the economic crisis, the environmental one and the sharing information technologies revolution is so deeply changing our lifestyles and the way we imagine and we want the solid forms of our future that all our design knowledge suddenly seems inadequate both as an interpretative tool of the current condition and as a device capable of generating new environmental, social, economic performances and new beauty.
Nothing surprising. In the history of architecture and the city the great technological changes have produced major changes in the lifestyles, in the forms of living and consequently in the way in wich we design them. If the major paradigm of modernity was about the best possible spatial synthesis between function and architecture. Today, with the information technologies revolution, we have the opposite problem. To give meaning, narrative and uses -even temporary uses- to spaces that have already given forms. And turn them into attractive and ecologically efficient places to live.

1. The paradigm of eternal present
In everyday language a paradigm is a reference model, a term for comparison. The word comes from the ancient greek paradeigma, which means pattern, example, sample. In philosophy of science, a paradigm is the framework of a scientific discipline. A comprehensive (and globally shared) vision of the world crystalizes around this framework. More specifically, it's the world in which the framework operates and the on which a specific scientific community concentrates. It constitutes and delimits the field, its logic and its research procedures, giving Leibnizian order to things. It is inside this paradigmatic logic that scientific research finds the object of study, the more cogent problems and the best techniques for dealing with them.

Thomas Kuhn (The Structure of Scientific Revolutions, University of Chigago Press, Chicago, 1962) used the following definition for the term paradigm: “The logical relationship between the main concepts that dominate all the theories and all the discussions that depend on them”. As a result of being the “first unmoved mover”, the paradigm must necessarily be shared by a community of scholars. Not by chance, only the more mature disciplines have a stable paradigm.
In that form, in normal science, a paradigm is the conjunction of experiments, based on models, that can be copied or emulated. The prevailing paradigm often represents a specific way of seeing reality or the limits on proposals for future investigation, which is something different from and beyond generic scientific method. Along those lines, a scientific revolution is characterized by a change in paradigm.
Not more to add to the comprehensive definition of paradigm in wikipedia.
What here is perhaps more interesting is to understand is when and why it make sense to refer to the concept of paradigm speaking about recycle for for the space design disciplines. In other words whether it makes sense to inscribe the discourse on recycling within a wider theoretical frame that relates either to the huge scientific technological revolution that is now taking place, either to the obsolescence of the old disciplinary paradigms that unfit to understand the changes.
In the world of urbanism, architecture and landscape, a new paradigm is a new way of doing things that has a huge effect on the living spaces. New paradigm draws its roots from the idea of a paradigm shift in science, in which technology or new findings completely change the way people think about or interact with something. In the design disciplines the idea is the same; a whole new way of looking at lifestyles, living spaces and their changings. However they happen.
How many furnitures, or houses, or urban districts, that where designed and made in the 80s are still relevant today What clothes or shoes that period can be worn without appearing old or out of time Everibody can say almost all. In forty years the living spaces have not changed that much. Even less their projects have been modified. The way in which they are conceived and designed is almost the same. Fashion, architecture, and cities are the sensitive forms that better represent the people that generated them. They express lifestyle, a status and, in some way aspirations and expectations for the future. Is it possible that they remained so indifferent to the changes of the last decades
These have been the years of the most profound technological revolution in history. More pervasive and effective than the one of the internal combustion engine at the end of the XIX Century that upsets not only the modes of production and the social hierarchies, but also the aesthetics and the solid shapes of living. When, with the second industrial revolution, all the material world changes very quickly. They invent urbanism. The architecture of iron and concrete generates new larger and larger cities. The art goes futuristic and abstract. Lifestyles change and clothes too. The modern world projects humanity in the future with its forms. The ideas of speed and of future express the zeitgeist in the design culture. As Zygmunt Bauman writes in Liquid Modernity "modernity is time in the era in which time has a story" In modernity genius loci coincide with genius saeculi, the forms of the city, of architecture, of fashion fulfill the epoch. To dress or to design furnitures, houses or cities as they did in the previous century it is unthinkable in the modern age.
Today it is no longer the case. A few times the distance between gestalt and zeitgeist was so dramatic. The paradigm that binds the aesthetics to the projection of time blowed up. The overcoming of modernity lies especially in this. We live like an eternal present. Where the sensitive forms and their representations in solid space no longer carry an idea of the future. They always seem to be more or less the same, immutable and increasingly deprived of sense in the rush of the sharing information technologies revolution that is distorting the system of social relations and the way in which things and places are related each other. Even today everything changes and so much faster than before. Innovation is conducted in the intangible areas of the net rather than in the material spaces. The way to experiment and disseminate informations and knowledge are especially mutating in a vortex of accelerated change where the tools and virtual synapses materials involve the activities and lifestyles linked to them while the more traditional and unconnected spaces tend to remain inert, equal to themselves. Or they change slowly.
Douglas Rushkoff, professor of media theory at the City University of New ork, describes the impact of the information technologies revolution on society as the present shock. A crushing of the time in a myriad of parallel peripheries where everyone feels the need to live the instant in which everything happens. A disorientation that blurs past and future in a continue hyper-connection and creates an infinite present. He wrote: "The future that we have pursued for much of the twentieth century has finally arrived. Today the technology that we can dispose allows us to stay connected with anyone and to have at hand all sorts of information, at any time. But what will be the effect on our lives of this amazing compression of space and time The era of the total access has a downside that we had underestimated. Social networks fuel the anxiety of a constant "here and now" without direction and priorities, fragmented and distracted. E-mail and instant messaging are now an assault; and we are overwhelmed by an illusory continuous present that always gets out of hand. "

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How the forms of living are changing, or will change The architecture of the eternal present, paraphrasing Sigfried Giedion (The Eternal Present, the beginnings of architecture 1964), is still able to propose innovation trough projects Is it still suitable, in other words, to express visions of the future for solid material spaces And how those visions can and will make sense in the era of 4.0 technology
To answer these questions it is best to go step by step.
The digital progress we have seen in recent years is certainly impressive, but it is only a clue of what will come. It is the dawn of the second age of the machines. To understand why this is happening now, we must understand the nature of technological progress in the era of hardware, software and digital networks. The rapid and always faster digitization will probably lead to more economic and environmental devastation due to the fact that becoming the computers most powerful companies will have less need for certain types of employees. In his race progress he will leave someone unemployed, perhaps many people. Erik Brynjolfsson and Andrew McAfee, two economists at MIT, developed those concepts in the book: The new machine revolution. Jobs and growth in the era of triumphant technology -translated in Italy by Feltrinelli in 2015- wich tells us with great effectiveness the impacts of the sharing information technologies revolution for lifestyles and work processes.
The economic crisis is the first tangible result of the digital revolution that gradually reduces the job opportunities and empties the built spaces of the western city featuring new metropolitan figures. The technologies for sharing informations tend to transfer in the immaterial space of the Net functions and places that needed physical spaces to be realized until now. It is an obvious phenomenon at all. Just think about how are changing the behaviors of consumers that more and more now are buying on the net and there is less need for retail spaces in the city. ou can meet, establish a relationship, give a talk via Skype or other social media without physically being there where it takes place. Now everything happens in the video, but soon our presence will be virtually expressed by holograms that can also simulate physical, emotion and meaning. Anyone can become a part time taxi driver and sell his travels on Uber or share the car with Car to Go or even the political choices at the click of Avaaz. In a few years with a 3D printer we can produce construction components and whole buildings. ou can make at home spare parts of any object in common use and in a basically equipped laboratory also blenders and other machines. While the new figures of the digital artisans are emerging the appliances factories in Friuli and Veneto have already closed. All the computers become more powerful and smaller and smaller. New technologies have less need for physical space.
The ASCI Red, the first product of the Accelerated Strategic Computing Initiative of the US government, was the fastest supercomputer when it was introduced in 1996. To develop it had cost 55 million and its 100 cabinets occupied nearly 200 square meters (80 of a tennis court) at Sandia National Laboratories in New Mexico. Designed for tasks where needed so much computing capacity, such as to simulate a nuclear test, ASCI Red was the first computer to exceed the teraflops, a thousand billion floating point operations per second, in the classic test parameter for the speed of the computer. To get to this speed consumed 800 kilowat per hour, about as much as eight hundred houses. In 1997 he touched 1.8 teraflops. Nine years later another computer touched 1.8 teraflops. But instead of merely simulating nuclear explosions was able to draw those and other graphics in all their magnificence realistic, three-dimensional, real-time. He does not do it for the physics community but for a video game. This computer was the PlayStation 3 of Sony, Red all'ASCI equal in performance, however, cost about 500, employing less than a tenth of a square meter, and consumed about 200 watts per hour. In less than ten years, the exponential digital progress has transferred the computing capacity at the level teraflops by a single state laboratory to the living rooms and the halls of the whole world. The PlayStation 3 has sold approximately 64 million units. The ASCI Red was withdrawn from service in 2006 (Brynjolfsson McAfee 2015).
In just 10 years from a 200 square meters apartment to a mobile device that takes up less than a tenth of a square meter. This story is emblematic. Just to make it clear that not only the shared information revolution incredibly reduces the need for occupation of physical space, but also cancels the necessity of specialization of physical forms -removing the rationalist principle of Louis Sullivan Form Follows Function- simply because by using small digital devices we can do almost everything almost everywhere. Anyone can find thousands of similar examples that show how you always need less functional space to live and work because many of the uses that occupied real volumes in the city have been transferred or will transfer in the virtual spaces of the Net. If all of this is about to happen or already it happens it is clear that many essential paradigms of modern, not only that of the close relationship between function and form of architecture or town, emptied of meaning. Ultimately the sharing information technologies revolution displaces the certainties of the modern project and it makes suddenly seem out of time all the theories and practices that relate to it. The zoning, the

functional organization of urban or those architectural spaces, the models theories, the best practices ... seem to manifestations of a logic that belongs to another era. They were designed to handle the expansions of inhabiting solid spaces that probably are no longer expected to grow up nowaday. For sure elarging footprint is no more the only possible project for the development of built spaces.
This is the point. The simultaneous action of three key factors: the economic crisis, the environmental one and the sharing information technologies revolution is so deeply changing our lifestyles and the way we imagine and we want the solid forms of our future that all our design knowledge suddenly seems inadequate both as an interpretative tool of the current condition and as a device capable of generating new environmental, social, economic performances and new beauty.
If we look to the future it could be said that one crucial effect of sharing informations technologies revolution on the most advanced societies is the possibility of being able to live in much more physical space than in the past. A kind of space that it is not necessary to conform on the basis of pre-established specific fates. Simply, we dispose of a huge amount of built volumes that is no longer needed or do not yet know how to use. The same happens for infrastructure and open spaces.
What is the destiny of the design disciplines in an age that seems to consider only -or at least- with absolute priority the development of not material spaces and the interconnection devices If today -and in the future more and more- the theme of the development of the city is no longer about the growth but about the resilience and environmental quality When not constructing new architectures, but retrofitting and re-signifiying the existing ones becomes the central issue of the building production
Returning to the initial question precisely, while everything is whirling changing … clothes, houses and cities are apparently always the same. Is it possible to start reasoning about a new statute for the architecture of the eternal present
Nothing surprising. In the history of architecture and the city the great technological changes have produced major changes in the lifestyles, in the forms of living and consequently in the way in wich we design them. If the major paradigm of modernity was about the best possible spatial synthesis between function and architecture. Today, with the information technologies revolution, we have the opposite problem. To give meaning, narrative and uses -even temporary uses- to spaces that have already given forms. And turn them into attractive and ecologically efficient places to live.
Thomas Kuhn (1962, cit.) Explains how in the early stages of scientific revolutions when major disciplinary paradigms are in crisis and are about to change, it is possible that two extreme theoretical positions cotrast each other. One wants to substantially confirm the priciples of the discipline. It tends to claim the specificity and uniqueness of the discipline in its traditional and absolute essence. The other uses curiosity as new knowledge device. He wants to challenge the established principles, pursue the paths of change, exploring other cultures and other worlds, acquire new disciplinary contributions, have different points of view on the future. It is a major challenge for the architectural culture. A challenge that gives value to the existing with conceptual devices that work on the slip way and new life cycles of living spaces. A challenge that sees the environment as a project, the landscape as an infrastructure that produces ecological performances and the future of the city as a collective and not authorial vision.
Detroit is the manifesto of the urban condition that identifies the new paradigm of recycling. Perhaps it is the most important in this phase of history. 15 years after the height of the disaster that has hit Detroit is being revived. New materials and impalpable devices are replacing traditional urban figures. They are icons of change that reduce, reuse and recycle what is left of the city in a new landscape. The satellite views; the maps, the diagrams and the projects through which Stoss Landscape Urbanism suggests establishing recycling processes at the urban scale; the reuse experiments houses burned (Fire Break) and disused spaces (TAP) Dan Pitera, the reduction of the Michigan Theatre in a parking lot, "visions" focused on the practice of recovery told by Arens; build the epic of a city that experiences the possibility of another future after the metropolis. No one today in Detroit wants to return to the metropolitan glories of the past. This is not a traditional process of urban redevelopment. It is not appreciable any attempt of regeneration of the city of Detroit of the last century. There is no idea of the restoration of a lost urbanity. What is happening in Detroit is the creation of new value through the reduction of traditional metropolitan functions, the re-use of derelict spaces and recycling of surviving urban materials. They are all obvious symptoms of a city that begins to live differently and to convey the innovation. Ultimately it is just this. A recycling process of urban figure that generates new value by assigning new meanings to what already exists.
Recycling means putting back into circulation, re-using waste materials, which have lost value and / or meaning. Recycling protects the environment and it is economically convenient. It is a practice that allows you to to limit the presence of waste, to reduce disposal costs and to contain those of the new production. Recycle means creating new value, new way. To begin a new cycle, in another life. In this lies the propulsion of recycling content. The very idea of recycling provides a vision. As detective of space the architects are interested in the possibility to revitalize the existing, to find new meanings for it, to create new conveniences and new beauty by the recycling built spaces that so rapidly are

abandoning their characteristics of use. Recycle is an ecological action that operates pushing the existing into the future by transforming waste into prominent figures. In other words, as scholars of forms of physical space it is not interesting to adopt recycling paradigm because it is an ethical action - good and right-, but because in architecture today to recycle is to design.
The new paradigm of recycle projects into the future the reassuring image of the eternal present and twists it in a vision of beauty.

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Crossing □ sustainability. Innovation in urban mobility to increase the quality of life

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Abstract
Urban mobility needs to be organized according to the criteria of sustainability and, therefore, conceived as a system that "meets the needs of society to move freely, gain access, communicate, trade and establish relationships without sacrificing other essential human or ecological requirements today or in the future" (World Business Council for Sustainable Development). Urban mobility is, in fact, one of the main elements upon which the quality of life of the city is usually measured. The authors, based on a didactic experiment, propose a series of considerations on the relationship between urban mobility and the quality of life. Road systems, which constitute 80□ of the public spaces, are often not able to provide residents either a space to move safely or a place to meet and socialize. Precisely for these reasons, it is necessary to work on urban mobility through an approach that aims to redevelop the existing road patrimony taking into account the social, technological and environmental components. In particular, with respect to the ecological-environmental dimension, redevelopment strategies aimed at improving the overall quality of life (urban comfort, safety and environmental protection) through natural systems with low environmental impact were examined.

Keywords: environmental redevelopment, urban mobility, natural systems, ecological network.

1. Streets as public spaces (Caterina Frettoloso)
The key points that underlie the "Guidelines for the sustainable development of green spaces. Planning, design, construction and maintenance" issued by the UNI in 2014 fall into three areas: protect and increase biodiversity and resilience aimed at the implementation of the ecological and social networking on a local scale; good practices for the design, maintenance and management of green spaces; the application of a low energy management method, physical and economic.
The application contexts are not just parks and gardens, but also, pedestrian and cycle paths as well as roads where *"the quality of green spaces is related to the action of protecting areas capable of maintaining functional goods and services for the welfare of the environment and man, and which represent the value of the territory itself. The design of a green space, and the impact of human actions on it must ensure that the ecological dynamics continue to evolve"* [1].
The considerations that follow come from the idea to technologically-environmentally redevelop roads strategically positioned with respect to the urban context but not properly designed to meet the needs of environmental well-being and protection. The identified application is of particular interest since it interfaces with the theme of urban mobility that in recent years has become the focus of the national and international debate concerning the reduction of environmental impact, given the close relationship between the transport system and air pollution. *"The improvement in environmental terms in the demand for mobility, particularly in urban areas, is a priority to promote a better quality of life for citizens in terms of social and cultural relations, as well as to create new economic opportunities and development"* [2].
Urban mobility is one of the main elements upon which the quality of life of the city is usually measured but road systems, which constitute 80□ of all the public spaces, are often not able to provide residents either a space to move safely or a place to meet and socialize.

Mobility needs to be organized according to the criteria of sustainability and, therefore, conceived as a system that "*meets the needs of society to move freely, gain access, communicate, trade and establish relationships without sacrificing other essential human or ecological requirements today or in the future*" [3]. In fact, *"sustainable mobility means to choose transport modes that spare energy, matter and space, that do not deteriorate the environment, in which people live and move, by atmospheric, acoustic, visual and olfactory pollution and that are economically endurable for the community (…) it means also to consider the consequences that transport choices have on people's quality of life, both from the physical point of view and from the social and psychological one, that is to take into account how such options meet users' needs and expectations"* [4].
According to these considerations, the new organization-functional space planned for the project area is inspired and reflects the concept of so-called linear parks intended as "*a publicly accessible natural or landscaped space in an urban or suburban setting that is much longer than it is wide and that often follows the route of an abandoned railroad right-of way, a cut-and-cover tunnel, and urban river or creek, or is located under elevated transit tracks*" [5].
Among the many features of linear open spaces, the one that most attracted our interest is in the mode of use. In fact, unlike traditional urban open spaces designed for recreation, that could be called "passive", linear parks constitute connection systems. They are not places where to go and stop but rather lead somewhere, combining recreation with those aspects related to mobility. Public spaces open to a prevailing linear development are configured not only as a new system of sustainable mobility but also as a system connecting different cultural and economic resources of the city, helping to trigger urban regeneration mechanisms.
The adopted approach shares the guidelines that characterize the most important action programs on active urban mobility, and, in particular the idea that *"pedestrian mobility and cycling is a specific segment, and not ancillary, of the urban mobility system, that public space of the street is a place of encounter and not only transit and improving the active mobility has positive effects on the overall environmental quality and urban landscape"* [6].
In fact, the idea, also applied during the didactic experiment, promotes slow mobility through a dual strategy that, on the one hand, relates to the physical component and infrastructure of the road system, while on the other, the socio-cultural dimension. In the first case, the project addresses the issues related to the differentiation of the users/means flows, the use of natural systems for the protection of the environment and the rational management of resources (for example the inclusion of shaded paths to reduce the island heat effect, contributing to water management and making any form of movement as comfortable as possible). In the second case, it is based on the motivation, in an effort to raise awareness and educate users about adopting responsible behaviour and, therefore, changing their travel behaviour.
Policies oriented to *green* roads set up in Toronto and Chicago highlight not only the need to consider streets as public spaces but also the strategic role they can play in building a resilient city. "*Today, people are reclaiming their streets as public spaces. The desire to have livable or complete streets is present in many corners of the world. However, for streets to be livable or complete they must first be recognized as public spaces. (..) Once streets are recognized as public spaces, they can be planned and designed to serve communities and continue to ease mobility to enhance economic productivity as well as social engagement. (..) Various notions of streets have been proposed, such as "livable" streets, "complete" streets, "streets for all", "quality" streets; "friendly" streets, and "healthy" streets. In terms of variables, these notions embrace more or less similar concepts that touch on people's wellbeing and that make cities more prosperous*" [7].

2. The road system and environmental redevelopment: a didactic experimentation in the town of iugliano (NA) (Federica Damasco)

Crossing sustainability is a project for the environmental redevelopment of one of the roads of the town of Giugliano in Campania which connects the underground station to the city centre. Over the years, some form of maintenance has been carried out to fill some of the performance deficiencies that has made the site not always appropriate to the intended function.
The technological analysis carried out to identify the user needs highlighted how, on one hand, the pedestrian path is not very popular. In fact, most of those who could walk to the underground station prefer to go by car. While, on the other, a lot of children use the area as a meeting place, even if there are no appropriate structures.
The environmental analysis has highlighted the level of degradation in the intervention area: the green areas are "used" to store waste, with them not being properly maintained. Analysis of the site location highlighted a diversity of solar exposure and prevailing summer and winter winds. These considerations strongly influenced any subsequent design choices.
There were two main redevelopment activities proposed for the road: walking and meeting.

Fig. 1: Road connecting - first stretch (photo: Federica Damasco).

Fig. 2: Road connecting - second stretch (photo: Federica Damasco).

The activity of walking is defined according to two different modes. It is intended both as the possibility to quickly reach the underground station as well as a walk that can also including stopping and, therefore, take longer. In both cases, the primary requirement is to make the area comfortable and eliminate any disturbances.
Starting from the results of the different stages of the technological and environmental analysis, the first step involved the re-designing of the roadways. The paths (pedestrian, bicycle and vehicular) are differentiated so as to make the users feel safer. All the surfaces were treated with drainage and permeable materials. The project of the entire road network is designed along an articulation that involves three areas with specific strategies and intervention technologies.

Fig. 3: Masterplan (elaborated: Federica Damasco).

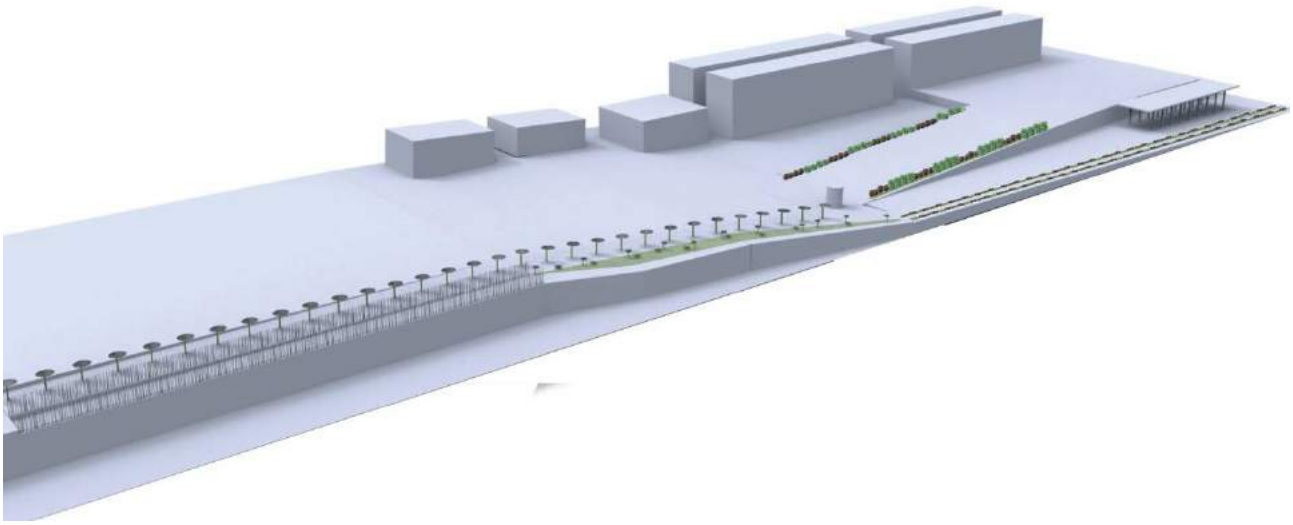

Fig. 4: Overall project view (elaborated: Federica Damasco).

Two technological systems were designed for the first stretch, with them articulating the space separating the different ways of use (vehicular/pedestrian/bicycle traffic): rainwater collectors and groups of piezoelectric poles. The rainwater collectors have a collection tank supported by a vertical hollow support element with a double soul: rainwater is channelled from the inner tube into an underground collection tank, with part of it being used to maintain the vertical plants. In fact, the hollow supporting element is covered with plants that grow on the surface through the various support layers. The first layer is formed by the outer surface of the support that, being micro-perforated, gradually releases the water that it filters.
The second layer is made of feltboard, a material with a high absorption capacity and upon which plants can grow. They are native species capable of live in both conditions with plenty of water as well as in drought situations. The rainwater collector is designed with a threefold function: to channel rainwater, improve the micro-climate and divide the road from the pedestrian path. The piezoelectric poles system takes advantage of the ventilation of the area and generates electricity.
The poles are made of piezoelectric ceramic cells can generate a potential difference when subjected to a mechanical stress. They are connected by electrodes and coated with a layer of carbon-fibre, that being elastic allows the pole to oscillate. Every element is connected to an underground storage system which supplies a series of LED lights that light up in the evening.
This structure is self-sufficient and also serves to mitigate the ventilation.
In the second section, seating systems with small herb gardens were designed for rest and relaxation activities. From a morphological point of view, the system follows the concept of the previously described collectors.
These systems help to mitigate the micro-climatic conditions as well as make the area pleasant due to both the smell as well as the visual aspect.
The last stretch is characterized by the presence of rain-gardens. These systems are already in use in many cities and are used both to reduce the surface soil erosion as well as avoid road flooding. They seem like land depressions, similar to flower beds, capable of collecting rainwater and releasing it into the sewerage system, thus avoiding overloading.

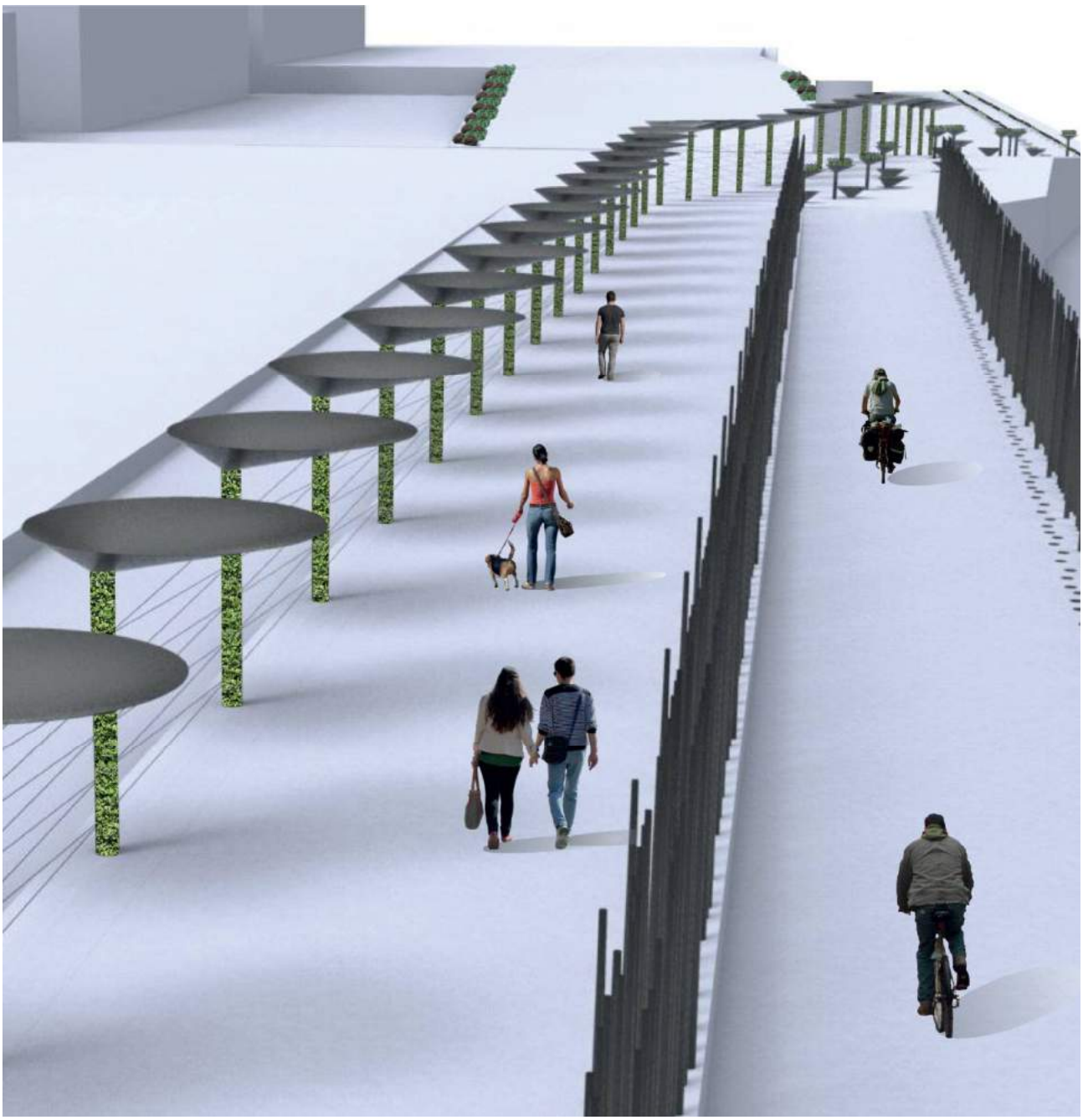

Fig. 5: Rainwater collectors and system of piezoelectric poles - first stretch of road (elaborated: Federica Damasco)

In addition to their environmental value, these systems also improve the aesthetic appearance of the area. In the project, rain-gardens were used either to divide roads or take advantage of their performance characteristics so as to improve the overall environmental quality of the site.
All the strategies used take into account the needs of the users and contribute to improving urban quality. The main idea of the project is that it is a first step of a larger intervention which involves a system of roads to improve mobility in the city and raise awareness of the environment and urban spaces.

Fig. 6: Rest and relax system - second stretch of road axis (elaborated: Federica Damasco).

3. Natural systems to improve the ecological urban quality (Raffaela De Martino)

Cities are the places where conflicts between artificiality and naturalness are at their most. Soil sealing, the continuous expansion of the built environment, the reduction of green spaces are causes of the loss of biodiversity, quality of ecosystem services and resilience. Green infrastructures represent an important tool that territorial development policies should adopt since they allow for the improvement of the environmental, economic and social structures of the city. They are considered by the European Environment Agency as *a network of natural and semi-natural areas planned at the strategic level with other environmental elements, designed and operated so as to provide a wide range of ecosystem services*.

According to this definition, the concept of green infrastructures is not only related to the themes of the environment and landscape with the sole aim of "environmental protection and conservation", but it is directed towards an integrated spatial planning system that aims to unite actions of nature conservation with the expansion and territorial growth management in urban and regional planning [8].

In the program for *Green Infrastructures* of the United States Environmental Protection Agency, green infrastructures is an approach that communities can choose to implement to keep waters healthy, providing multiple benefits for the environment and supporting local communities [9].

In particular, they are defined, at an urban level, as *"an array of products, technologies and practices that use natural systems - or engineered systems that mimic natural processes - to enhance overall environmental quality and provide utility services"* [10].
According to this vision and from a strictly environmental point of view, the adoption of strategies to promote the realization of green infrastructures and urban greening interventions is dictated by the need to restore natural hydrological and thermoregulatory processes so as to control the effects produced by urban heat islands and pluvial flooding, both caused mainly by the high impermeability of the surfaces [11].
In a scarcely anthropized environment, almost all the rainwater wets the land where it lands and infiltrates; only heavier rains exceed infiltration rates to produce surface runoff. Part of the infiltrated water, in a continuous and contained manner, provides the necessary nutrition to vegetative growth, maximizes the groundwater recharge and minimizes flooding and surface erosion.
In an urban context, however, the massive presence of impermeable surfaces completely distorts the phases of the hydrological cycle, causing a strong alteration of the amount of infiltrated rain. On the one hand, this causes an increase of the surface runoff, while on the other, it considerably reduces the groundwater recharge [12].
Green infrastructures can therefore be used as components of systems for the management of rainwater in highly anthropized contexts. These are processes through which rainwater is collected from a surface in order to be reused. There are two main rainwater collecting methods: passive and active. Active systems make use of containers, tanks or cisterns to capture and store rainwater, whereas passive systems make use of the soil and vegetation for the infiltration, evapotranspiration and/or recycling of rainwater. Once intercepted, the rainwater can be collected, slowed, maintained or directed using different techniques, including: micro-basins, swales, French drains, rain-gardens, permeable pavements, and curb and road grading design [12].
The are many advantages of passive systems. They allow to: reduce flooding and surface erosion phenomena, increase water availability in place to "feed" the vegetation, provide green areas with high quality water characterized by a low salt and high nitrogen content, have green areas in urban environments that in addition to the improvement of biodiversity allow to create core areas for the realization of an urban ecological network.
In recent years, the concept of ecological network, as a system of interconnected habitats which protect biodiversity, although usually applied to large geographical areas, has been proposed for the reorganization of the green spaces in urban areas. The construction of an urban ecological network and the subsequent connection of open spaces are a pre-requisite for the improvement of not only ecological functionality but also the physical and environmental aspects of a city.
From an ecological point of view, the importance of networks is an opportunity to create corridors and connections within the urban fragmented landscape, in order to avoid being confined in closed habitats, while allowing for the development and consequent spread of flora and fauna throughout the territory. The phenomenon of fragmentation, which is due to the uncontrolled growth of cities and related phenomena of settling, infrastructuring and manufacturing, has profoundly altered the urban ecological structure, transforming the semi-artificial and/or semi-natural spaces, present in the city, into isolated pieces, poorly connected and with their ecological functionality severely compromised.
Urban ecological networks are, therefore, able to establish both physical and visual ecological connections between the urban fabric, agro-ecosystems and natural ecosystems present in the peripheral areas.
The functional elements of an ecological network, with a present or potential urban environmental value, are nodes and connectors. The nodes (core areas) are areal elements and represent small basins of naturalness within the city, since they are large enough, not manufactured, while being more or less distributed evenly across the urban area. The connectors (ecological corridors) are linear elements that link the aforementioned nodes between them as well as the urban fabric with the ecological connective outside the city. The links can be constituted by continuous or discontinuous elements. The discontinuous ones consist of small units (stepping stones) which, although not physically connected to each other still allow movement along the line that ideally connects them.
The construction of an urban ecological network is based on two assumptions: the first is that the spaces are characterised by an adequate environmental quality, while the other is that they are connected to the network.
The knowledge of the "state of health" of the spaces and their connections is a fundamental condition to orientating the redevelopment. It is therefore possible to recover the compromised areas that may constitute natural elements diffused throughout the city to work alongside the main natural units (parks and reserves). To promote ecological territorial connectivity, there is also the recovery of the existing connecting elements as well as the construction of small new connection units (stepping stones) which, as previously mentioned, even if they do not give structural continuity to the network, guarantee, however, functional continuity [13].

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Diagnostic plan on the Monastery of St. Mary of the Virgins in Cosenza (Italy)

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Abstract
The process of restoration provides an important preliminary step, very complex and articulate, aimed, to collect all the information necessary to make design decisions more effective and relevant to the individual case. This preliminary step consists in the drafting of so-called diagnostic plan, which forms the basis of the restoration project. This paper deals the preparation of a diagnostic plan for the future restoration project, that should be addressed for the Monastery of St. Mary of the Virgins in Cosenza, one of the most important of Calabria region, thanks to the particular beauty of its cloister. Over time, the cloister has suffered various kinds of degradations, which are slowly causing the loss of its aesthetic features, as well as structural instability problems. The diagnostic plan performed has had the aim to contextualize first the architecture examined from a territorial and historical point of view, as well as perform accurate architectural analyzes based on the architectural survey.
Next, the state of conservation of the religious structure regarding the building materials it was investigated, highlighting potential forms of degradations, through specific microscopic analyzes SEM/EDX, and allowing to hypothesize related causes. Lastly have been put forward careful considerations about the static functionality of the cloister's columns.

Keywords: Diagnostic plan, valorization, SEM/EDS analysis.

1. Introduction
The study of an architectural complex, which belongs to the cultural heritage, is aimed at profiling an advanced methodological process, to collect detailed information about the architecture object of study [1]. This path is best described as a diagnostic plan, finding investigation of the state of conservation of the artifacts having historical and artistic value, preceding conservation work or restoration. In particular, the diagnostic path analyzes the modifications of the structure and constituent material object, produced by degradation, identify its causes and the best solutions to stop or contain the effects of the deterioration processes. Analyzing the degradation of artifacts, the diagnostic plan can also provide information on the composition of the materials used, the technique of execution of previous restorations and possible changes in the intended use [2].
The diagnostic procedure developed has three fundamental points. The pre-diagnosis comprising the analysis of the territorial and urban context, in order to identify any aspects of the physical environment that can contribute to the degradation processes of the article, which follows the true diagnosis phase itself, which provides for: the 'anamnesis' aspect highlighting historical reconstructions and any restoration work, the sampling and consequently their laboratory results.
The third and last phase of the post-diagnosis, on the basis of analytical results, is it destined to the identification of the most appropriate types of intervention to the preservation and possibly to the artefact restoration, highlighting, also, connections and criticality present so favoring interdisciplinary exchange between of varying competence experts [3.4].

2. Historical and geographical context

The Monastery of Saint Mary the Virgin is located in the heart of the historical center of Cosenza, the capital of the northern most province of Calabria situated on seven hills in the Crati river valley, at the confluence of the latter with Busento. This confluence is used to distinguish the origin of the settlement area, placed high up the hill Pancrazio, and the modern city developed along the left bank of the Crati.

Fig. 1 Territorial context.

Fig. 2 Urban context.

The historic core, better known as Old Cosenza, reflects the common facies of the ancient hilltop settlements, dominated by narrow, winding streets along which stands un'edificazione made by smaller buildings and palaces, perched on the hills Pancrazio, Guarassano and Torrevetere, to the left of the river Crati and rarely found homes on the remaining parcels Gramazio, Triglio, Mussano and Venuses.

The entire settlement area is protected to the west from the southern coastal range that separates the city from the Tyrrhenian Sea, and to the east by Sila [5]. The monastery, annexed homonymous church is located near the present off the Virgin (Fig 3), space that was obtained from the demolition work carried out between 1835 and 1842 of a building in those years now dilapidated. It was founded between 1512 and 1520 from the merger of two female Cistercian monasteries, the one of Santa Maria della Motta and Santa Maria De Medio Domains Aegidi, with the annexation, later, the Benedictine of Mendicino, to the time when he was archbishop of the city Giovanni Ruffo Teodoli (1511-1527). Unified structure, assuming the name of St. Mary the Virgin, established his cloistered in a building where the houses were founded by Francesco Favaro and grandchildren, close to the Jewish synagogue. Originally the new institution was home to aristocratic women and the civil class and only in a second time only noble women. Between the seventeenth and eighteenth centuries the monastery

Fig. 3 Statement of the monastery of Virgins

was incorporated into the adjacent Palazzo Sersale built in 1493 by Gaspare Sersale, as remembered by the inscription on the arch next to the coat of arms of the family. In 1809, these same premises, was housed the girls' orphanage where they welcomed the orphans of St. Teresa of the Discalced Carmelites and the Trinity Monastery [6]. From 1887 to the "Virgin" seat of the first house cosentina of Sant'Anna daughters, while in the cloister adjacent spaces was allotted the middle school flag Brothers.

3. Architectural description

The monastery is accessed by a local stone portal particularly elaborate: from the crankcase develop three decorative bands, one characterized by small eggs, one with ashlar diamond point and a third carved with acanthus leaves, which accompanies the entire perimeter of portal and arc to all sixth. The quadrangular courtyard is dominated by a wooden door framed by a wealthy white stone portal. The wooden double doors (see Figure 4), built between the end of the sixteenth century and the beginning of the next century, it is the work of local carvers probably roglianesi or the Savuto valley. The refined decoration develops within twelve panels adorned with reliefs of female figures, vases, phytomorphic images, faces of satyrs, busts of saints of the Benedictine and Cistercian. The stone portal, however, made by stonemasons roglianesi between the XVII and XVIII century has a lowered arch and molded and a decoration typically Baroque, with pendulous branches and flowers juxtaposed with scrolls of the capitals. The style and composition reminiscent of the artifacts produced as part of Nicholas and Nicholas Ricciulli Altomare. The broken pediment encloses the fresco of a Cistercian Santo, probably St. Bernard of Chiaravalle.

Fig. 4 The stone and wooden portal

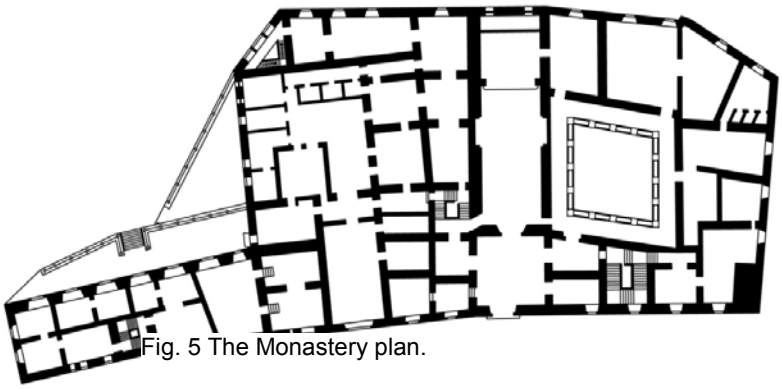


Fig. 5 The Monastery plan.

On the right and left of the quadrangle are of walled arches that originally allowed the communication with the interior. They are dated to the period of transition between the seventeenth and eighteenth centuries, a time when Palazzo Sersale could be, totally or partially, already annexed to the Monastery. The adjacent church was built 1515-20 to the design of Domenico La Cava, foreman of the Valley of the crater. A nave with presbytery surmounted by a dome and area of access defined by a time in the sixth plate richly decorated with white stucco and gold.

Fig. 6 View of the Cloister

By the right wing of the court or directly by the Church, by an access placed under the front once, it leads to the beautiful cloister (Figure 6), considered among the most beautiful in the city. It was a place where closed from upstairs nuns could attend religious services. Its construction dates back to 1537 and it openly takes

the adherence to schedules and Renaissance matrix models. It is spread over a quadrangular plan, almost rhomboid, not perfectly axis with the entire structure of the architectural complex, developing on two rows with five columns on each side. The columns at the bottom showed stem tuff tapered at the ends, while the capitals alternate the Ionic order to the Tuscan, the number of columns create a system with round arches, supporting the floor above. The entire north wing was rebuilt, only in the first order, in the restoration of the '70s. That intervention restoration and other post have noted the existence of many alterations, especially in the distribution of access among which the large arch that was the old entrance to the cloister. At the center of the cloister, as usual, it was once a well at which today there remains no trace [7].

4. The structural improvement work carried out in the past inside the cloister

In the past, in order to run the structural improvement of the architectural elements of the cloister, the vaults of the storage conditions were analyzed characterizing the spans of the porch on the ground floor. The crack patterns appeared on the intrados surfaces of the time, resting one hand on the perimeter walls of the cloister area and the other on the arcade piers have shown a principle of the opening mechanism of the same [1]. Such kinematic mechanisms have suggested, therefore, to realize an intervention capable of canceling the horizontal thrusts sometimes induced by the pillars of the round arches. Therefore, they were applied metal tie rods in the direction perpendicular to the sides of the cloister. You may notice, however, the lack of intervention for improvement of the seismic response of the arches in their plan, usually performed by inserting horizontal metal chains at the height of the kidneys of the arches. Further structural problems were found in the columns of the cloister. In fact, who suggested a confinement action of the columns, made in 2004 has been detected an overload problem [2].

The adopted confinement technique, at the time of the intervention, was extremely innovative and new concept. It focused on the application, on the masonry of overloaded columns, composite materials, fiber-reinforced FRP. In the present case, composite materials have been used in the form of fabrics in CFRP carbon fibers, applied to the masonry by means of the manual layup technique, resorting to the epoxy resin (Fig. 7). After having cleaned and suitably prepared for the application of the substrate, the CFRP fabrics were wrapped around the shafts of the columns and impregnated with the epoxy resin; the same has allowed the reinforcing elements to become integral with the masonry.

Such hoop technique allows to oppose the transverse expansions of the brickwork of the columns, induced by excessive axial compression actions, taking advantage of the great resistance of the carbon fibers traction. A similar confinement action translates, from a tensional point of view, in the transfer on the masonry of a beneficial state of triaxial restraining compression, then an increase of the compressive strength capacity achievable without introducing new seismic masses inside of the bearing elements [3].

Fig. 7 Operation of hoops

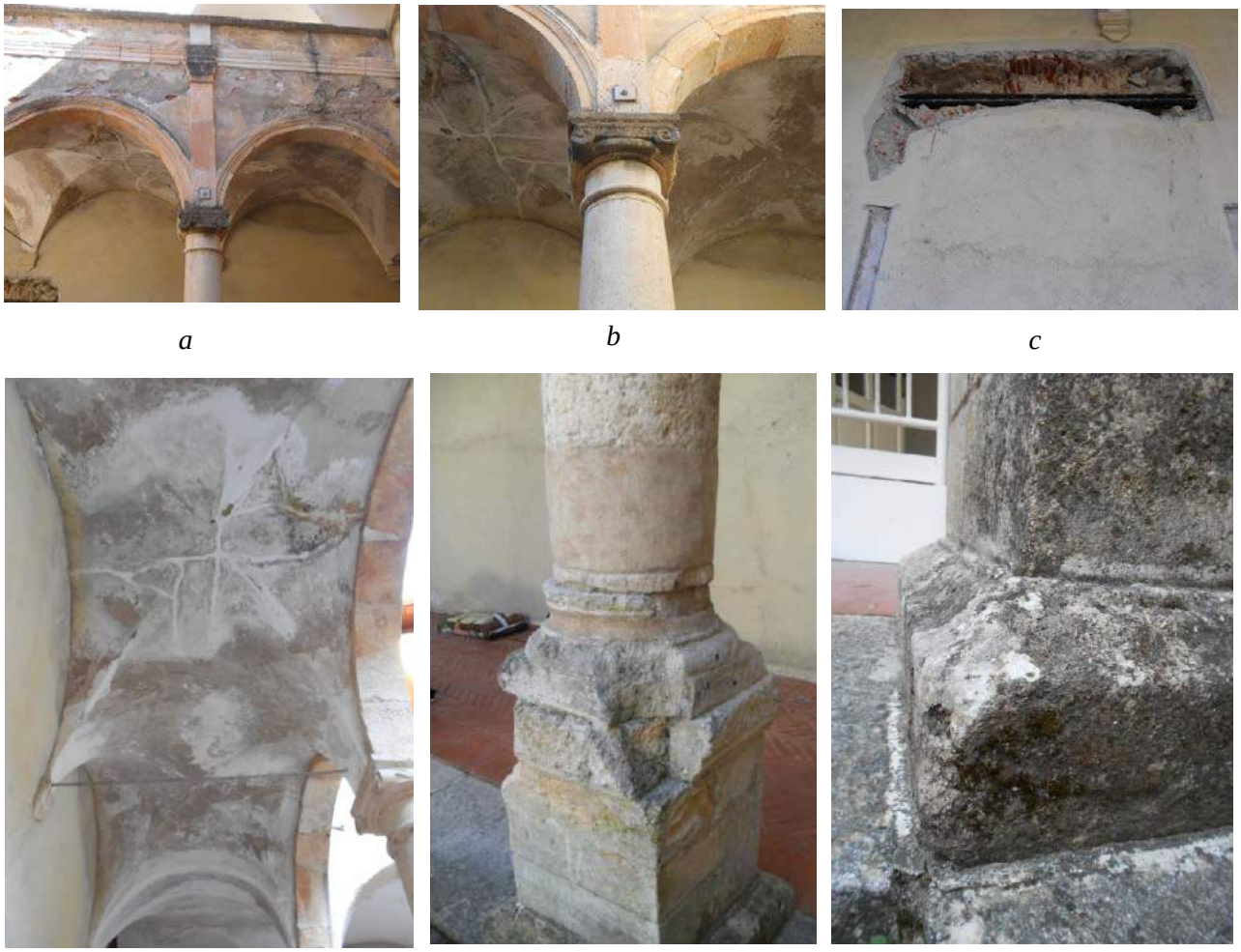
Fig. 8 The columns on the west side after surgery

5. The state of preservation

Essential in order to identify a suitable preservation process or restoration, it is to define the conservation status prevailing in the structure, thus identifying all those who are the visible manifestations of deterioration, such as gaps, gaps, cracks, lack of cohesion, which could then be documented on scale plants, indicating the nature and location of damage highlighted (mappings). [8-11]

The cloister appears subject to various types of degradation, particularly on the west front, despite having already undergone previous restorations as mainly aimed at static reorganization of the colonnade. Are present degradations (Fig.9) of type anthropogenic resulting in lack of material at the walls (c) and the pedestals of the columns (e), whose constituent stone material is easy disintegration. Exfoliation, which

occur with the detachment of the surface layers of plaster often followed by their final fall at the structures above the arches (a) and black crusts mainly concentrated on the capitals, distinguishable from the characteristic color and hard and brittle texture (b). Also you notice, biological patinas at the bases of the columns, green and consist mainly of microorganisms that can join dust and dirt (f) and efflorescence, whitish compounds due to the crystallization of the salt compounds present in aqueous solutions within the walls, spread along the corridor colonnade coverage where you also notice the presence of previous fractures (d) [12,13].



a *b* *c*

d *e* *f*

Fig. 9 Details

6. Sampling plan

During the sampling (shown in Fig.10), were collected fragments for physical-chemical analysis in relation to the research objectives. The general requirement is to minimize the number and size of samples, selecting the most significant of sampling zones for the aspects of the problems that are to be investigated, in accordance with the principle of least action, that regulates the action of restore.

To draw digital medical records and better understand the characteristics of the materials and the degradation of the cloister, the removal of some micro-samples of material to subjected to specific laboratory analysis, has been planned and executed.

The dimensions of the samples were chosen not only according to the material and the state of preservation, but also the type and number of investigations to be carried out [15]. The sampling (sample 1 and 2) was carried out through non-invasive intervention, taking snippets of already removed material due to environmental factors and biological patina formed on the surfaces of the stands. All samples taken were numbered and documented by photographic dossier [16,17].

Fig. 11 Digital microscopic observations of sample 1 (left) and 2 (right).

Fig. 10 The sampling

7. Microscopic analyisis

7.1 Dino Lite observations

Both samples appear whitish in colour, the second more porous on the surface than the first and covered both by biological surface, as it can be seen from digital microscopic observations (Dino Lite Pro series) (Fig.11).

7.2 Scanning electron microscope observations.

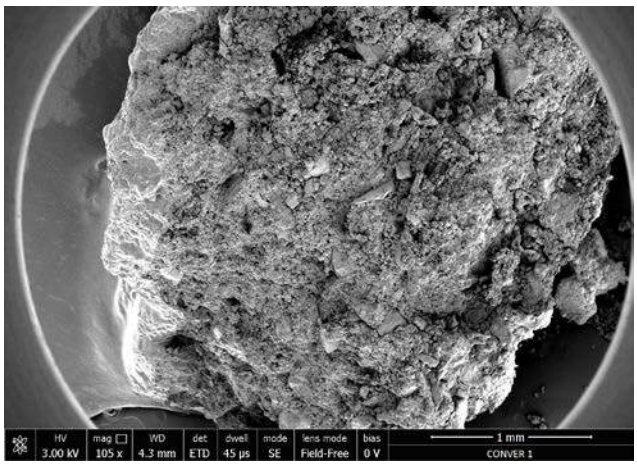
After these observations a specific analysis SEM/EDS (Scanning Electron Microscope/ Energy Dispersive Spectroscopy) was conducted. The samples was named as follows: sample 1 “CONVER1” and sample 2 “CONVER2”. This advanced thecnique, based on the interaction of a beam of electrons with the material, allows to obtain both morphological information (about the surface and some biological alteration present), both on the elemental chemical analysis, also at micrometric scale, of the constituent materials. The samples

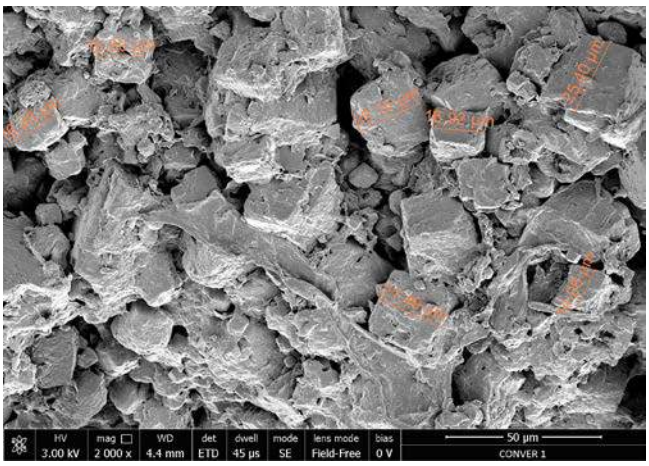
are placed on an aluminum stub with graphite adhesive disk and metallized with Au and Pd for these observations.

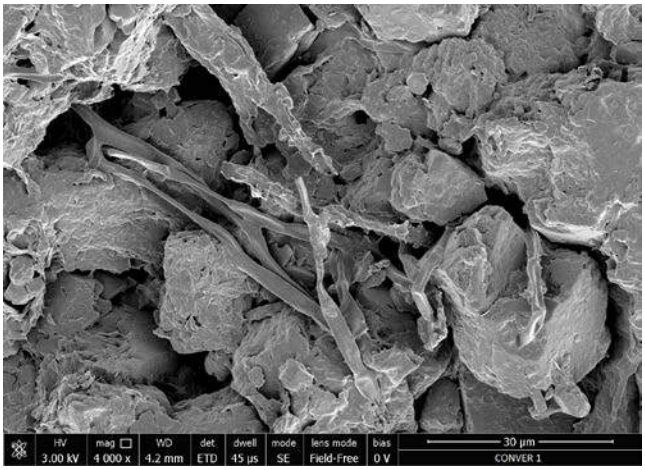
7.2.1. Morphological and chemical analysis CONVER1

The apparent little porous texture is belied by SEM pictures (Fig. 12) : by the overview stands out not only the roughness of the surface but also the porosity of the matrix. It consists to higher magnifications (2000 x) in cubic crystals of variable size between and (14,06-25,40)m.

In the complex, the fragment is like a conglomerate, with biological ramifications (moss protonema at 4000x) which tend to disrupt the texture and making fragile the material from which comes the sample. The matrix rich in crystals has carbonatic composition (Ca and Mg carbonate) with aluminium silicates, as seen from EDS spectrum.







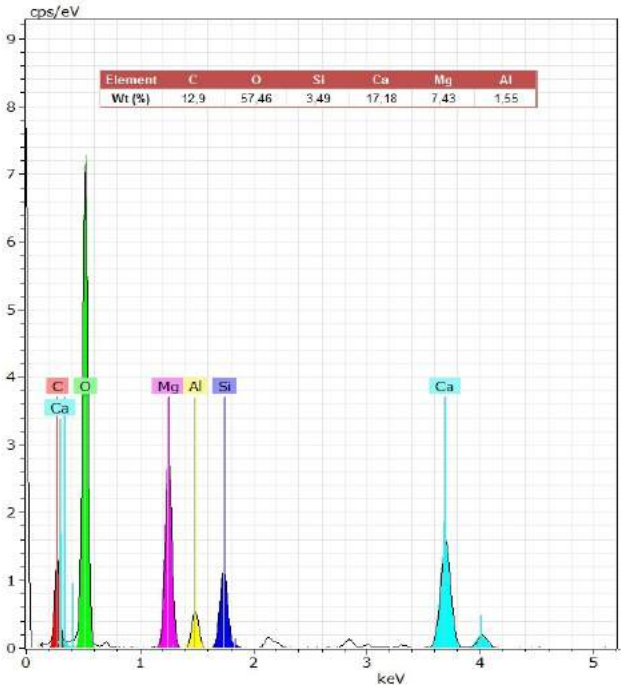


Fig. 12 Overview CONVER1 (105x) and details of the matrix and biological alteration present (2000x, 4000x); EDS spectrum of the matrix.

7.2.2. Morphological and chemical analysis CONVER2

The porosity most evident from digital photos is confirmed by the SEM observations (Fig.13): here the matrix appears collapsed with muschive ramifications widely spread on the surface and between the pores. Were also seen other kind of organisms (indicated by orange crosses) and rare groups of diatoms, mainly pinnate, (indicated by light blue crosses), aquatic organisms typical of fresh waters, having a shell (frustule) partly intact and partially crumbled (light blue circled) and mixed with the matrix. This observations, in relation to the sampling point leaves to think about their origin, probably different from the current one.

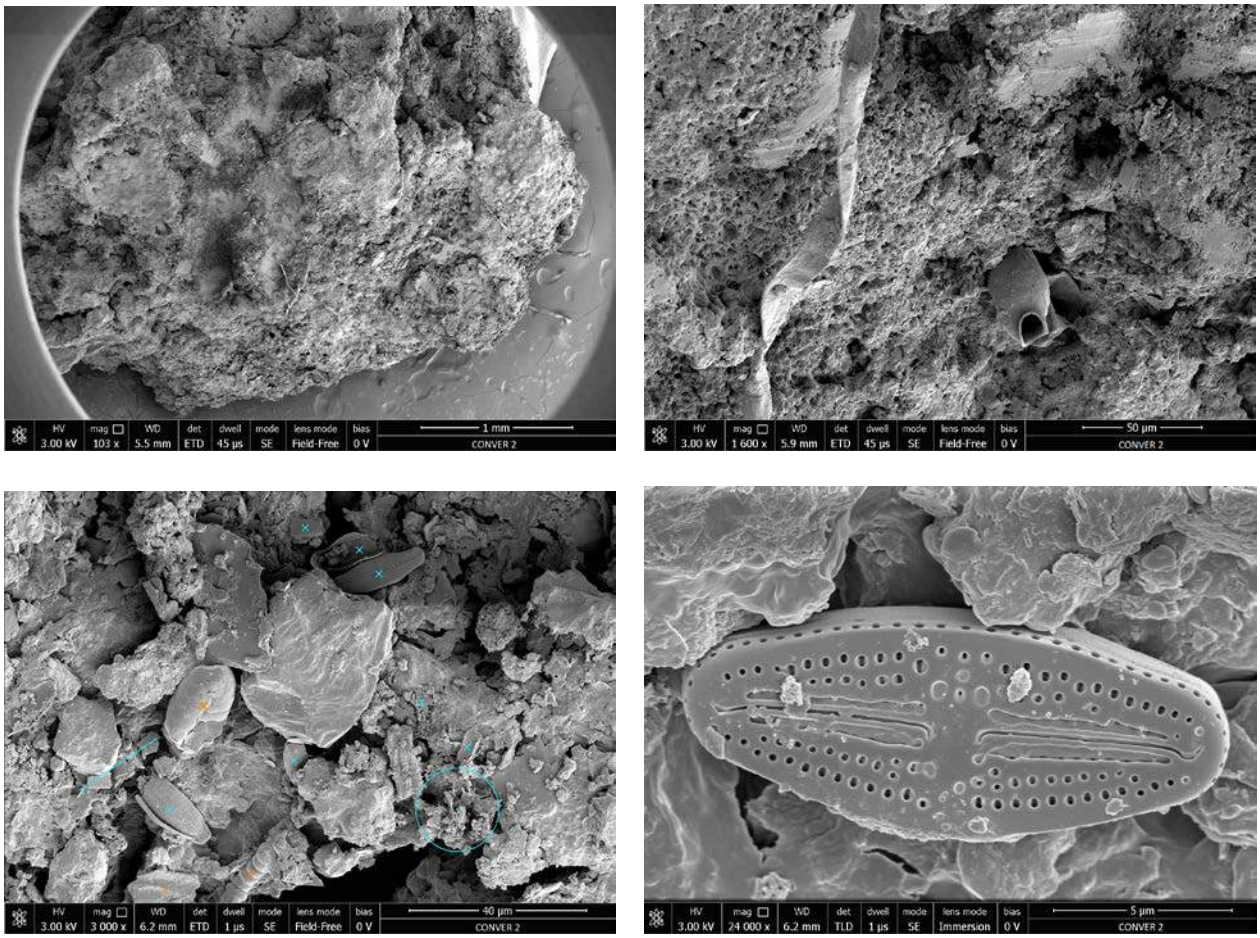


Fig.13 Overview CONVER1 (103x) and details of the matrix with muschive ramifications (1600x) and groups of diatoms and other organisms present (3000x), close-up of a diatom (24000x).

The EDS spectrum run on the matrix reflects the siliceous composition of diatoms and view the unfailing presence of carbonate (of Ca, Mg and K), also observed for sample CONVER1; traces of Fe are also detected. Multi-element map summarizes when told by the different colours, more or less intense depending on the greater or lesser abundance (Fig.14).

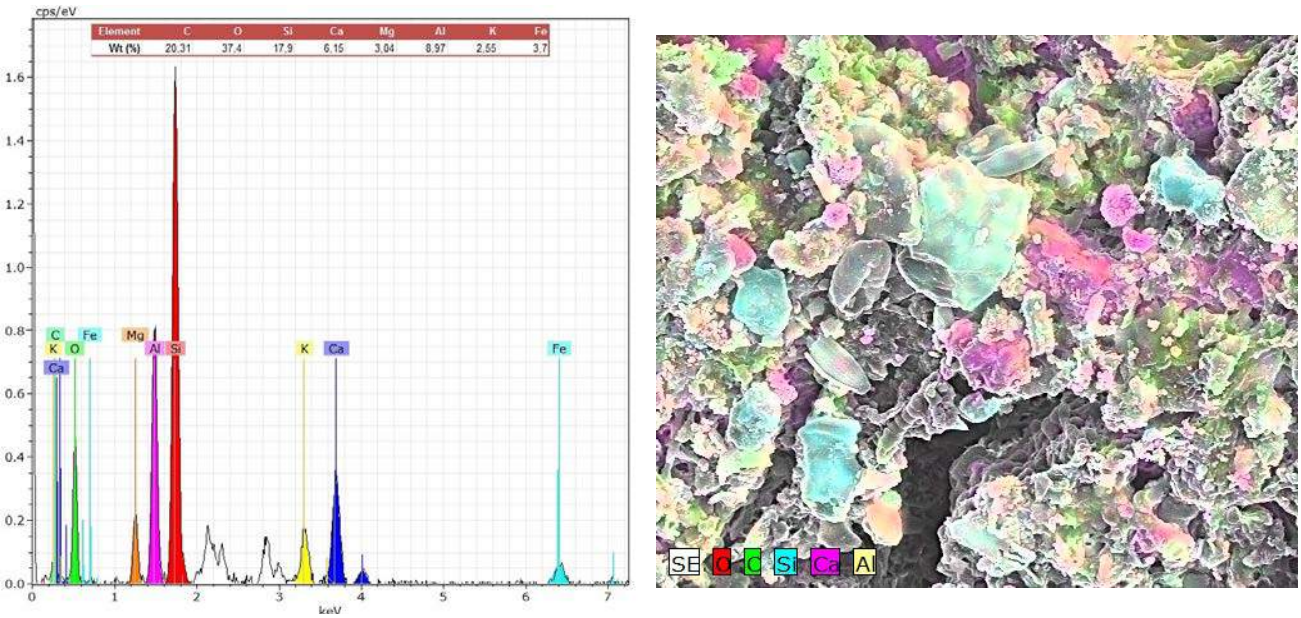


Fig. 14 EDS spectrum and multi-element map of the matrix.

8. Conclusions

The cloister of the Monastery of St. Mary the Virgin, located in Cosenza, although it is considered one of the most beautiful of the place and despite having been subjected, over time, to more conservative and restoration is affected by degradation widespread and diversified.

The aim of this study was to offer a contribution of research to counter the continuous process of degradation, providing a cognitive framework of the work examined through the preparation of a diagnostic plan. The plan provides for, first, a systematic collection of existing information, supplemented later, with new data obtained from scientific analysis carried out on samples taken, aimed at the characterization of the constituent materials and biological degradation present.

In details, the materials examined by microscopic techniques showed both carbonate and organic cover composition that makes them more vulnerable at erosion from atmospheric factors (acid rain) and from biological organisms like the mosses, that can easily colonise them, invading the surfaces and the internal structures, resulting in aesthetic alterations and especially causing lack of cohesion and stability with consequent disintegration. These results collected are essential for planning future conservation work and / or restoration.

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Creative Education: the case of an experimental project in the schools of Salerno

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Creative education: the case of an experimental project in the schools of Salerno
The research is focused on the sociological analysis of the Project [Diaeta Mediterranea: LANDesign -ali -ment-azione]^{R} Viavaio Salerno for Expo 2015 in the Department of Architecture and Industrial Design S.U.N, on the analysis of multidisciplinary achievements i.e. social, economic, environmental, educational, employment-wise and pedagogical-behavioural repercussions, and evaluation of the degree of innovation of the process experimented.
In particular, the Applied Research Project [Diaeta Mediterranea: LANDesign -ali -ment-azione]^{R} Vivaio Salerno for Expo 2015 in cooperation with the Department of Education and the Public Green of the City of Salerno has involved 22 schools from Salerno, that have joined the Project, documenting the construction of a garden - orchard and/or recycling an unused internal space and participating in cross-cutting activities, aimed at upgrading the spaces.
The objectives were understanding the ways of promotion/acceptance of the Project, the concrete actions of the Project, the student population of reference, the impact of the Project on environmental, social, alimentary education of the pupils, the strengths and weaknesses.
The qualitative analysis used documents, participant observation, semi-structured interviews, photos and videos as research tools.
The data were analysed using Grounded theory, i.e. content analysis that includes theory "rooted" in the data.

Keywords: reconversion, creativity, training, smart growth, education.

1. Creative education: the case of an experimental project in the schools of Salerno

The XIV Forum "Le Vie dei Mercanti" aims at investigating the complex relationship that develops between world heritage and degradation by promoting intelligent design, planning and technology. The Project [Diaeta Mediterranea: LANDesign-ali-ment-azione]^{R} Viavaio Salerno for Expo 2015 in the Department of Architecture and Industrial Design S.U.N, under consideration combines the goal of conservation and enhancement of the world heritage with an intelligent regeneration of degradation. The work is a sociological analysis of the Project and an evaluation of multidisciplinary achievements or social, economic, environmental, educational, employment-wise, pedagogical-behavioural and emotional repercussions, and the evaluation of the degree of innovation of the process experimented.
The Applied Research Project [Diaeta Mediterranea: LANDesign-ali-ment-azione]^{R}, Scientific Responsible Prof. Sabina Martusciello and Prof.Mariadolores Morelli of the Department of Architecture and Industrial Design of the Second University of Naples, established the virtuous chain university school organisations enterprises families for the recovery of abandoned spaces in school buildings for new productive uses (gardens, greenhouses and laboratories). School principals, teachers of educational institutions, students, families and companies have participated to the Project.
The Applied Research Project [Diaeta Mediterranea: LANDesign-ali-ment-azione], paradigm of the "School Project EXPO 2015" and "The University for EXPO", of high cultural, scientific and humanitarian profile, adhering to the founding values of the BIE (peace, tolerance, dialogue, etc.) matches the themes and goals of EXPO 2015: sustainability in the production chain of food on the planet; best practices and innovation in the field of nutrition, health, wellness, sustainability and

technology; implementation of sustainable and innovative solutions, enhancement of lifestyles with respect to education and food, environmental heritage of the Mediterranean area and its variations; territorial enhancement and urban aspect of the city with attention to the elderly, the disabled, minors, the sick; promotion of sport values in correlation with the theme “Feeding the Planet. Energy for Life”.
From January 2011 to February 2015, the Project achieved the following results: 350 schools of Campania of all levels were involved in the Project; 1280 university students tutoring the Project in schools; 45,000 students from participating schools; 251 allotments made in schools; 200,000 square meters of green areas retrieved in schools; 500 design products on LANDesign ali-ment-azione co-projected by design students and schoolchildren.
In particular, the Applied Research Project [Diaeta Mediterranea: LANDesign-ali-ment-azione]^{R} Vivaio Salerno for Expo 2015 in cooperation with the local Department of Education and Environment of the City of Salerno involved 22 schools from Salerno, (primary and secondary and high schools) which joined the Project, documenting the construction of a garden-orchard and/or recycling an unused internal space and participating with cross-cutting activities, aimed at upgrading the exterior spaces, building a virtuous chain, a branched-out system of cultural transmission, identified in the logo Vivaio Salerno. The survey carried out in the municipality of Salerno in 2015 started from the analysis of the Memorandum of Understanding signed by the Regional Education Office with the Department of Architecture of the University of Naples SUN. It also began from the documentation of the Project with direct knowledge of the recipients of the Project, who were school managers, teachers, kids, college students, using the participant observation and qualitative in-depth interviews given to the teachers responsible of the schools in which the Project was carried out as an evaluation tool. The ethnographic methodology allowed me to investigate all the relational dynamics generated in the schools in which the students have realised the Project and assess what has stimulated the process of learning and teaching in schools for the construction of a shared social environment and educating in the care and regeneration of environmental heritage surrounding us. As observed by the famous anthropologist Bronislaw Malinowski (who first used this methodology in the early twentieth century to study some ceremonial practices of the indigenous culture of Melanesia) it is essential to “grasp the views of the observed subjects, the entirety of their daily relationships, to understand their view of the world”.
The question that guided the stages of research involved, in particular, measuring the impact of the Project on the environmental, social and nutritional education of the pupils. The data were coded with Grounded Theory (Glaser and Strauss, 1967), which is a content analysis of the data that includes the theory “rooted” in the data, which is divided into three phases: open, focused and theoretical.
The Project [Diaeta Mediterranea: LANDesign-ali-ment-azione]^{R} is an Applied Research Project of the Department of Architecture and Industrial Design of the University of Naples SUN with the Direzione Generale-MIUR Campania, in response to the MIUR note “Guidelines for nutrition education in Italian schools” [No. 7853del 14/10/2011] and topics of EXPO 2015 “Feeding the Planet. Energy for Life”.

1.1. The focused and coding theory search:

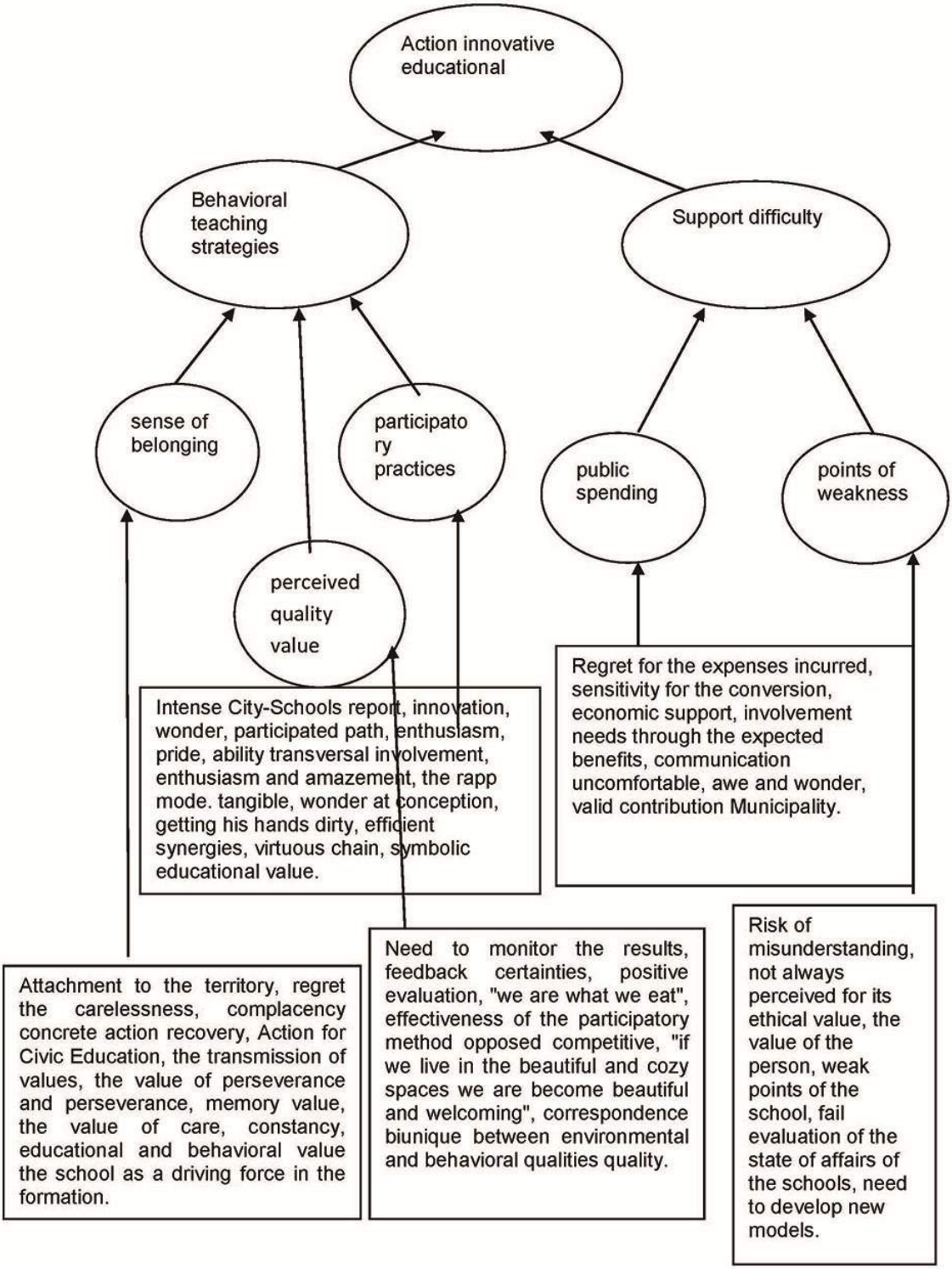

Fig. 1: Interview n 1

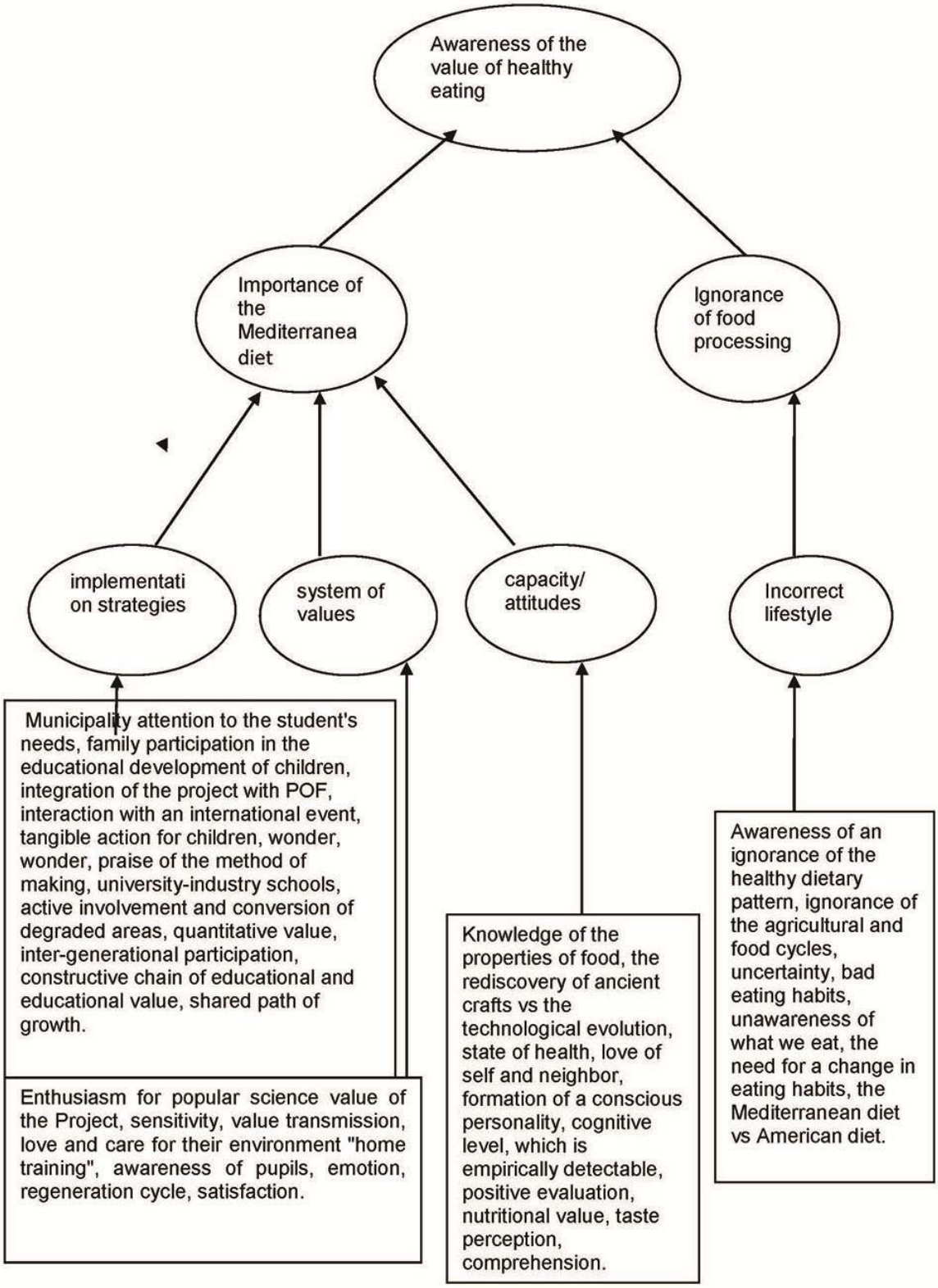

Fig. 2: Interview n 2

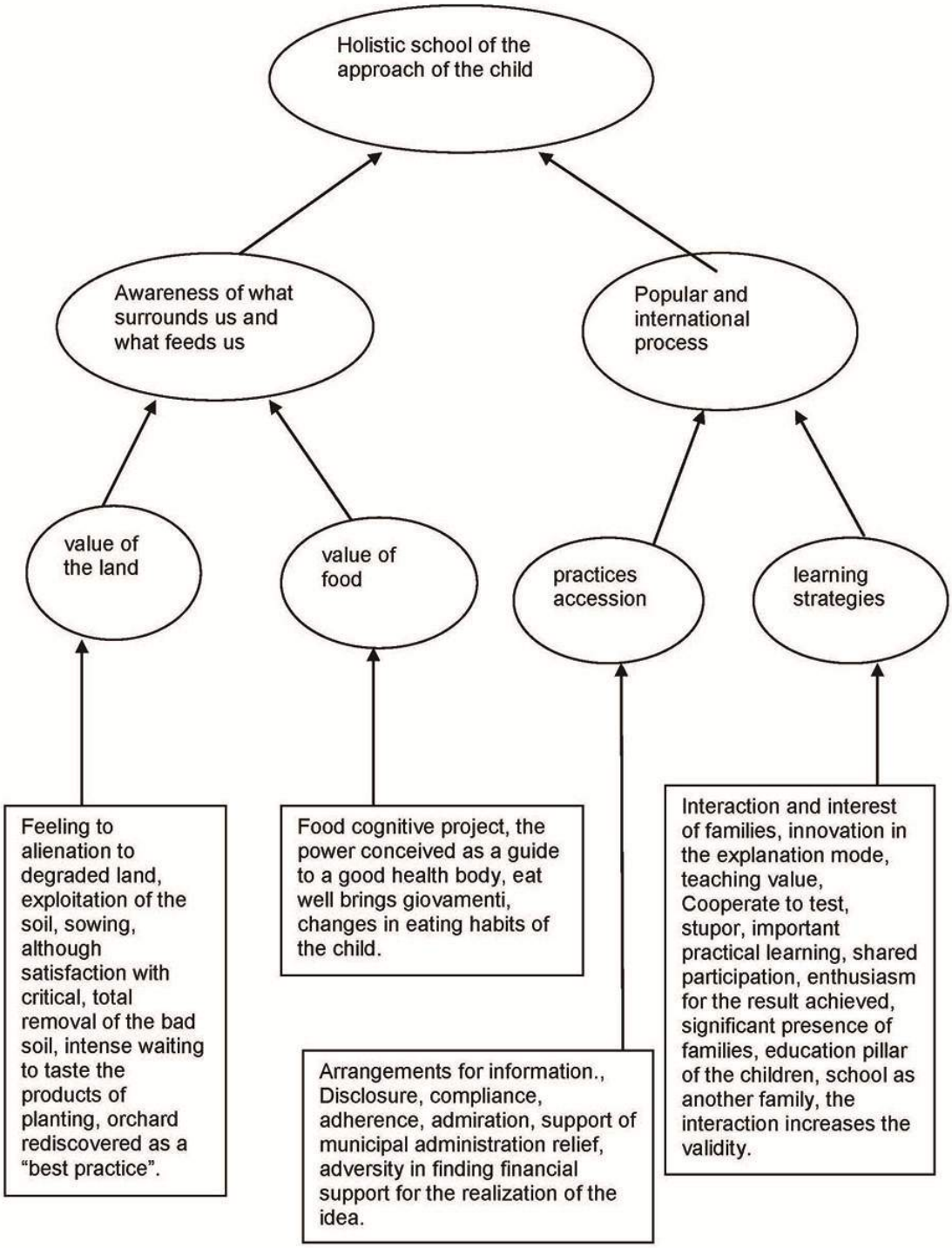

Fig. 3: Interview n 3

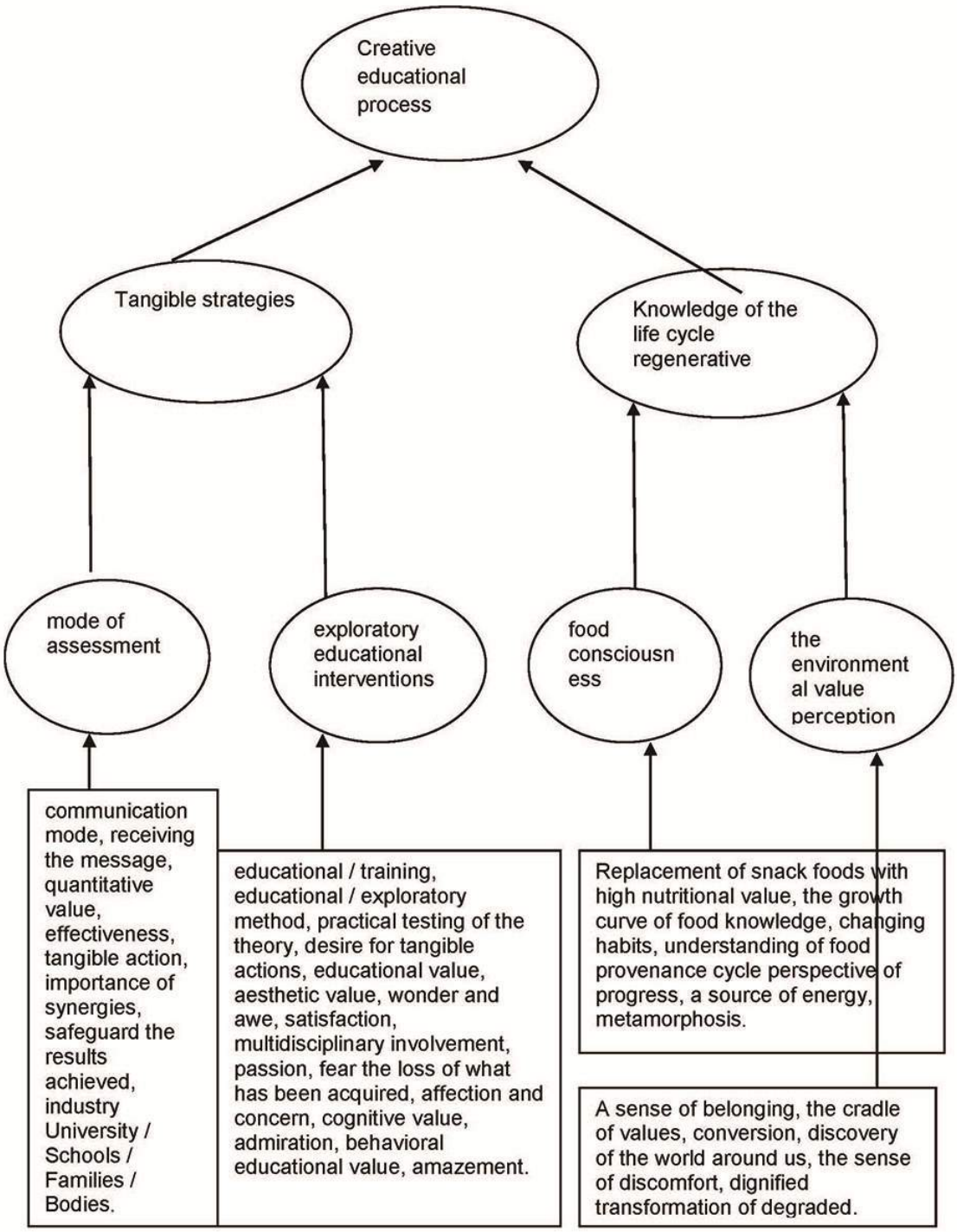

Fig. 4: Interview n 4

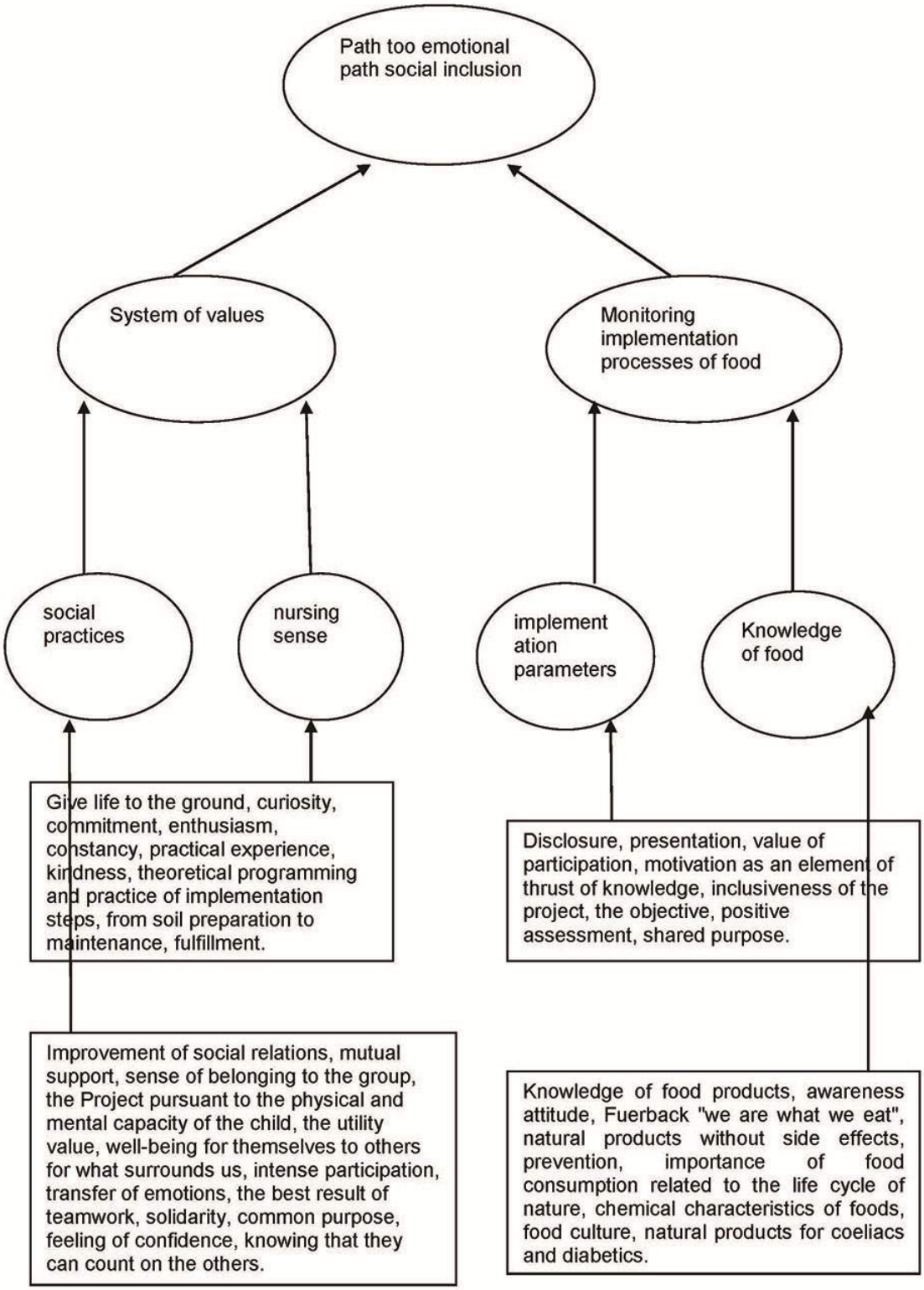

Fig. 5: Interview n 5

1.2 The interpretation

It emerges from the analysis how the Project starts off the earth as a resource not only be protected, but as a creative and innovative source capable of becoming a project thanks to the convergence of the ideas and actions of all those involved. The works aims at the recovery of forgotten and abandoned spaces in the schools involved and their revisiting in the name of nutrition: nutrition thus becomes art - thanks to the convergent work of all students - and art becomes design, giving the same spaces a new meaning. If the school-space improves we will be even better, happier and citizens aware of the richness of their land. Nutrition is a holistic issue that involves the participation of all of the most different points of view. A theme is an activity that, being unavoidable, must stimulate our minds to change.

By processing the data, it emerged from the interviews administered how the Project would affect the environmental, social and nutritional education of the child and how school represents an important educating family. Besides teaching how to learn, schools should teach how to be, and to be able to promote a sharing of values, turning the members of a society into an inclusive community, as a cultural and relational place in which ties are generated. A great qualitative value It was also noticed, as perceived in the need to monitor results, feedback certainty and correspondence between environmental quality and behavioural qualities as envisaged in the Project aims Expo 2015 - which the Project embodies. The Project has developed a sense of belonging to their territory, a cradle of values and a regret for negligence; it has supported concrete recovery actions, of total removal of the ill ground and the rediscovery of orchards as “best practices” with the value of perseverance and tenacity. Documentary analysis showed that 1,362 square meters have been recovered from the abandoned areas of the schools out of a total of 27,740 square meters of the available areas (Fig. 6) and 940 students of the Schools of all levels of the city of Salerno have been involved in the Project out of a total of 4,818 students (Fig. 7), generating a great contribution in urban regeneration, these quantitative data also prove the significant achievement of the Project.

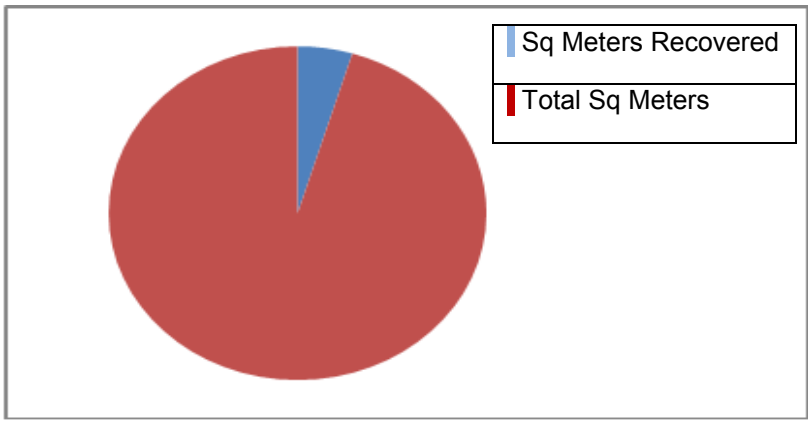

Fig. 6: 1.362/27.740 square meters

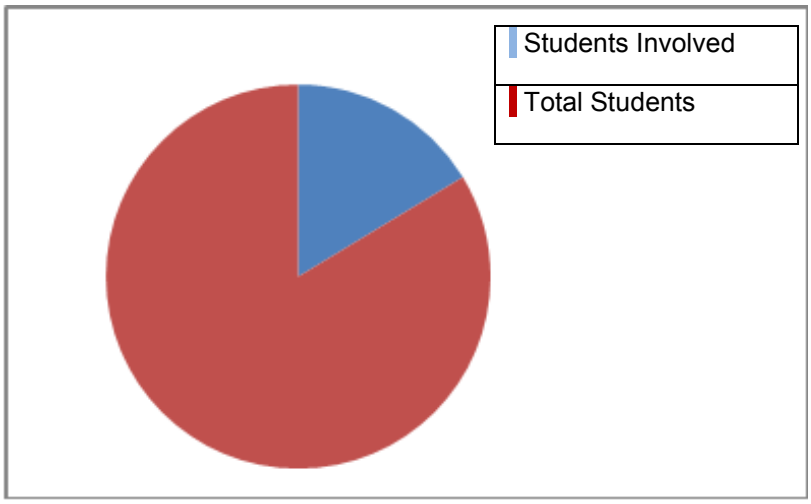

Fig. 7: 940/4.817 students

The research work includes the “reflection, both glorious and dramatic” by the Holy Father Francis, “Laudato Sì”, the Encyclical on the care of the common house. “Since everything is intimately related” says the Holy Father, “and that the current problems require a look that takes into account all aspects of the global crisis, I propose to stop now and reflect on the different elements of an integral ecology, including of course the human and social dimensions” [8]. This Encyclical, as highlighted, is primarily a tough but objective awareness about the reality of our common house, the earth with its creation. It is a careful analysis of how much our development patterns have affected and damaged things and people causing a deterioration of our common house. In the absence of rules, individuals pursue their own benefits, while ignoring the goal of replicability and sustainability of the economic, environmental, social and human capital. With this encyclical, “Laudato Sì”, Pope Francis urges the call to “cultivate and care for” (Genesis 2:15) calling for a radical change that will have to renew both man and the things done by man. “Speaking about an ecology that begins within us and reverberates in all its power outside with concrete actions that lead to peace and to a full wellbeing shared by everyone and everything, makes us look unfiltered to the depletion we have caused to natural resources, to the future possibilities that we deny ourselves, to the devaluation of our existence”. The encyclical asks us to start from the resources from the earth, water, agriculture, and food, so from an ecological inspiration but immediately also includes humans and can no longer tolerate the injustice that we perpetrate, as much to the nature as to our brothers and sisters (Carlo Petrini, prefais Laudato Sì 2015). The sustainability of wellbeing requires a healthy economy that is attentive to the satisfaction of people's needs and not only to the benefit of economic activity, without taking into account environmental and social costs. Educating to sustainable development means sensitising the civil society around the world, promoting a sustainable development perspective that will benefit the people and the future of the planet.
The Project [Diaeta Mediterranea: LANDesign-ali-ment-azione]^{R} welcomes this “integral ecology”: an environmental, economic, social and cultural, daily ecology, that generates social inclusion mechanisms, sustaining the formative growth of pupils cooperatively, allowing for a participatory and equitable path.
The sociological analysis showed the transfer of skills in collaboration with peers and the sharing of responsibilities and commitments, and thus represents a context of organisational innovation based on the succession on the following grades: e-ducating (in the etymological sense ex-ducere, to pull out) to know, e-ducating to do , e-ducating to do together, e-ducating to be, thus reflects the quality/value of the Project.

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Community and public cultural heritage: a chance to satisfy needs of protection, development and social cohesion

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Abstract
Italian laws concerning cultural assets allow the State to entrust its cultural heritage properties to private citizens or organizations, in order to reduce the management costs. In the last ten years, many heritage public buildings have been granted to private use in return for payment or for free. This trend is fostering autonomous action of citizens and non-profit organisations. In accordance to the principle of subsidiarity enshrined in the Italian Constitution (Article 118), people care for and manage abandoned public assets, considered as common goods. This trend is consistent with the aims of European Policy Area "Cultures and Citizens", that sees culture to the heart of European integration. Some municipalities have signed cooperation agreements with citizens in order to support and promote recovery and management of public real estate, through bottom-up processes able to increase inclusion and social cohesion. In order to build partnership able to accomplish goals of effective safeguard and enhancement, with positive effects in terms of welfare and local development, the research defines a new management model, based on stakeholders' consultation and cooperation.

Keywords: subsidiarity, cultural heritage, preservation, enhancement, management

1. Background
Over the centuries, the culture of conservation has become part of the Italian civil consciousness, so much that it is included in the fundamental principles of the Constitution; «starting from the most ancient edicts and decrees of the pre-unification states until the 1939 law, until today, there is a continuous leading thread: the compliance with certain principles, which does not have lost their newness. Two principles emerge among those: first, the public artistic heritage belongs to the citizens, as holders of popular sovereignty inherited from the ancient dynasties and republics. Second, the State has the duty to protect the (public and private) cultural heritage as a whole, promoting its knowledge through research. These are the main coordinates of a culture of conservation which has been deeply adsorbed by the social conscience before than by legislation and by administrative and politic practice» [19]. On these principles the Italian system of cultural heritage management is founded.
The connection between the two paragraphs of Article 9 of the Constitution shows that development, research, culture and heritage are parts of an indivisible system, which requires an active approach to the protection, consistent with the culture of citizens and able to guarantee usability of assets for the whole community. Indeed, the cultural heritage - as defined by the Code of Cultural Heritage - is part of our collective memory and helps to outline the identity of our country. It includes many types of assets, of a very different nature, which are subject to a continuous process of transformation. The control of transformations requires strategies able to ensure the compatibility of intervention with protection goals of identity and values rooted in the civil community.
Yet there are many deeply degraded or abandoned buildings with cultural value, even in the central areas of large cities, in urban and extra-urban areas with high level of tourism and recognized landscape quality. The

spread of this phenomenon shows that the abandonment is the result of several reasons, which, however, have a common effect: a loss of quality of the urban environment and, consequently, its less capacity of attraction [13]. This process, fostered by the abandonment of buildings, is a circular process, with widespread effects of quality decrease extended to the context. In fact, a study by Xavier Greffe highlights as the value recognised to cultural heritage is a function of its maintenance status [5, 9]. Research shows that there is a minimum threshold of buildings' quality, below which the disinterest of the local population to accomplish goals of protection and enhancement grows.

In management and administration strategies implemented by the State and the local communities, cultural heritage - both public and private - should play a central role. Public authorities, just like the private owners, are obliged to comply with the protection restrictions imposed by law. In addition, the ways of action and the decisions made for public cultural heritage should provide a model for the private, given that the very institutions that have issued national and regional laws are required to implement them.

The lively debate that, for several years, involves institutions, politicians, associations, scientific community, businesses and citizens, highlights the complexity and the relevance of this topic [1, 2, 3]. Also the national legislation concerning cultural heritage has taken behaviours that range from the need to promote public enjoyment - founded on the recognition of heritage's essential role in promoting the development of culture - and to encourage privatization, highlighting its role as a financial resource. Indeed, since the 80s of last century, the high management cost of the Italian public property and the stated objective of restoring heavy deficit for the tax authorities have led governments to try to profit from public property, by sale or grant to private management, and to identify measures to reduce the management costs covered by the public administration. With this goal, notwithstanding the regulation of the Civil Code, provisions were enacted to allow the sale and to extend the duration of the concession licenses for buildings with cultural value: this could cause significant transformations and limitations of public enjoyment of public heritage buildings, which are one of the main national wealth, element of identity and competitive advantage of our country in the tourist industry.

The privatization of public buildings, nevertheless, faced many problems, significantly reducing the expected revenue [6]. In just a few cases the characteristics of the goods on sale (size, condition, problems in adapting to user needs, etc.) have met the market demands. In addition, the increase in the building's market values, the planning restrictions buildings' use and the length of time for the authorizations issued by the Department of National Heritage are deterrents for private investors [7].

As for the preservation of buildings, the lack of appropriate suitable assessment tools prevented to verify the compatibility of new uses [16]. This led to an incorrect implementation of the privatization procedures, exposing the assets to the risk of uncontrolled transformations [17]. The observed failure has forced finding new procedures and more effective management models.

Within the Europe 2020 strategy, developed in response to the economic and financial crisis, the European Commission aims to promote the European public and cultural space. The specific challenge concerning "Participatory approaches and social innovation in culture" (CULT-COOP-06-2017) recognises cultural heritage as a «resource for a sustainable Europe» and highlights that «participatory governance of cultural heritage offers opportunities to foster democratic participation, sustainability and social cohesion and to face the social, political and demographic challenges» in Europe (Council of the EU (2014): Conclusions on cultural heritage as a strategic resource for a sustainable Europe and on participatory governance of cultural heritage. May and November 2014). The European Commission considers cultural heritage as a shared resource for people and set the objective of continuing to develop more participative interpretation and governance models, through greater involvement of the private sector and civil society.

For implementing strategies drawn up in the European context, the effectiveness of the cultural heritage process requires finding new synergies, in order to identify sustainable scenarios for safeguarding, use and promotion of assets. These scenarios should protect the architectural quality of buildings, their historical significance, the benefits of their location in central urban areas or in tourist areas. Sustainable protection and public enjoyment are therefore economic goals, which should be pursued through new management models, able to optimize the use of public financial resources and to consolidate the existing bonds between citizens and historical heritage.

2. Italian experience in the public cultural heritage management

In 2012 the WWF made a census of Italian abandoned real estate assets, with a survey entitled “Reuse Italy”, involving many citizens and private associations. According to data from the WWF census, cultural heritage is more than 10 of the amount of the abandoned buildings. The degradation of most of such buildings and the need to meet new security, welfare and usability requirements, needed by a different function require high intervention costs, dramatically reducing profit margins and, consequently, minimising the ability to attract private capitals.

The different paths chosen in Italy in the last fifteen years for the enhancement and management of public real estate with cultural value have rarely achieved the desired results. The experiences show that the objectives of protecting and improving public enjoyment, the goal of reducing operating costs and the aim to make the assets income were disregarded.

The first problem for public cultural assets is the prospect to attract private funding. This issue affects both the sale and the concession. In the first case, the bad maintenance status and the high market value of buildings deter potential investors, because of high costs for buying and re-use. In the second case, the cost for reuse intervention is added to concession fees; this reduces revenues. Furthermore, in both cases, the constraints issued by the Department of National Heritage for the choice of new uses and for allowed transformations are deterrents for private investors.

Despite laws enacted to overcome these obstacles, much of the public real estate with cultural value remains unused. For this reason, recently new paths, to reverse the trend of top-down decision-making and try to encourage involvement of private investors, individual citizens and the third sector both in decision-making phases, and in asset management have been undertaken [10].

These trends are witnessed by recent tax breaks, public pool and regulations for active citizen participation. For instance, Franceschini Decree (Legislative Decree 83/2014) introduced the Art Bonus system; backers of enhancement initiatives will enjoy substantial tax benefits as tax credit. In Lighthouse project of the State Property Agency, citizens and entrepreneurs have expressed interest and suggested potential uses for the enhancement of 11 lighthouses abandoned through a public poll. To enhance, regulate and promote collaboration of citizens, non-profit organizations and public administrations in care and management of public goods, Regulations for active citizen participation have been subscribed.

A real opportunity for innovation in the public cultural heritage management is the implementation of the “principle of subsidiarity”. Almost ten years after the introduction of this principle in the European Treaties (1992), the reform of Title V of the Italian Constitution has allowed the autonomous initiatives of citizens in carrying out activities of general interest (Italian Constitution, Art. 118, paragraph 4, introduced by art. 4 of the Constitutional Law. n. 3, 2001: "The State, regions, metropolitan cities, provinces and municipalities shall promote the autonomous initiatives of citizens, individually and in combination, to carry out activities of general interest, on the basis of the principle of subsidiarity"). The action of social groups or individuals, conducted independently and with a spirit of solidarity for the common good, is aimed to encourage the growth of an active, responsible and supportive citizenship in the participatory management of common assets, building bottom-up processes. The Constitutional Law assumes that private citizens - organized in associations - may be willing to use their skills to solve problems that affect society. The law recognizes that citizens are able to take action independently in the public interest and provides that the institutions must sustain this commitment.

In recent years some experiences of shared management of public goods have been launched, thanks to the promotion conducted by the cultural association Labsus - Laboratory of subsidiarity, founded in 2005 by Gregorio Arena, former professor of administrative law at the University of Trento. Jurists, sociologists, economists and political scientists take part in the association, in order to develop ideas, to gain experience, standards and documents on the topic of shared management of common assets. The Regulations released by Labsus is a basic tool for defining the rules of collaboration between active citizens and public administrations for the care and regeneration of urban common assets. Endorsed on February 22, 2014 by the City of Bologna, it has been signed to date by 83 Italian municipalities. In other 80 municipalities the text is currently being approved.

Action taken in Bologna following the adoption of the Regulation, with the assistance of Labsus and Centro Antartide and with the financial support of the Foundation of Monte di Bologna e Ravenna, bear witness of

feasibility of the regeneration and management activated from the bottom with the guidance of the Public Administration [23]. The project, called "The civilized city", involves citizens, associations and schools, and allowed to activate three experimental laboratories:
1) District Navile - Park of Zucca, to protect and care the green area.
2) District Santo Stefano - Historical Center, to care of arcades and green areas and to increase awareness of the inhabitants.
3) District San Donato - Garden Bentivogli, to experience the civic management of a municipal building (former registry office) and its surroundings.
The project involves action on two main areas: the city administration action to make organizational charts, procedures and regulations directed to the ability of citizens to take action for the care of common assets; the operational testing of forms of civic management of public spaces through the full involvement of the neighbourhoods.
The start of the process required the mapping of stakeholders and the implementation of activities aimed at the involvement of citizens which have developed project ideas for managing assets, the awareness of the inhabitants and the education of students, with internal and external systems of communication and with work in progress monitoring.
The Bologna experience is a good practice for the implementation of conservation and maintenance measures for the urban common assets, aimed at ensuring and improving their usability and quality. The tested approach fuels social inclusion and cooperation between citizens; it extends the benefits deriving from interventions by the assets' safeguard to the increase of social welfare conditions due to the strengthening of relations within the local community.

3. The Neapolitan convent of “San Francesco delle Cappuccinelle”

In many Italian cities, alongside these best practices, we are seeing more and more frequently to the occupation of buildings by organized groups of citizens, a view to using abandoned properties that local governments linger to reuse. This phenomenon rarely produces the results hoped for, because due to actions without the support of public institutions and private lenders and not supported by adequate financial planning. This underlines the inability to obtain the substantial financial resources to subsidize the regeneration and adaptation to new activities.
An example of this trend is the complex of “San Francesco delle Cappuccinelle”, monumental abbey erected on the late sixteenth century, located along the Pontecorvo ascent in the Avvocata district of Naples (Fig. 1). The origins of the complex are related to the expansion of the city of Naples to house religious building, in an area described by Roberto Pane as a path «that takes place between an almost uninterrupted succession of piperno stone portals and bare cloistered walls» [15].
Built as a votive offering by the widow of the Duke Scarpato, the complex was originally intended to house single mothers and administered by the Sisters of the Franciscan order. In the eighteenth century the building was subject to significant transformations by Giovan Battista Nauclerio (1712) and, later, by architect Nicola Tagliacozzi Canale (between 1756 and 1760), with the reconstruction of the baroque facade of the church, of the entrance to the convent and many rooms, decorated with stucco and marble. The church has a Latin cross, T-shaped with the shape of the gallows at the upper end of the vertical strip. After World War II the dome was demolished because it was unsafe. However arches that crown the south-western arm of the cloister still characterize the complex and the image of the district.
In 1621 the institute was recognized by Pope Gregorio XV and subject to the Capuchin rule. In 1809, Gioacchino Murat ordered the suppression of the monastery and its conversion into juvenile reformatory, entitled to Neapolitan expert in labour law Gaetano Filangieri. During the Fascist period, the building was renamed “Institute of Child observation”.
Again used as “re-education Institute” since the war until the late 70s, the building underwent renovations in 1985, due to the request of the Neapolitan artist and life senator Eduardo De Filippo. Further work was carried out in 1999, for the creation of a "Day multipurpose centre".
In 2000, with the mediation of the City of Naples, the Filangieri institute was purchased by the Naval University of Naples for academic use, but the reuse works never started.

On 29 September 2015, the building was re-opened by the action of Scacco Matto, network of students and temporary workers, and renamed “Scugnizzo Liberato”, with the aim of returning the space to the inhabitants with free activities for citizenship, workshops, film clubs and after-school activities [24].

Fig. 1: The Convent of “San Francesco delle Cappuccinelle”. View from the roof terrace, courtyard and open gallery.

The main problem encountered in the experience of the Institute Filangieri is due to the absence of planning and cooperation between citizens and institutions: the failure to share objectives and the absence of agreements between the involved parties prevented to establish a profitable public-private cooperation, essential to ensure the feasibility of the reuse intervention. This problem is demonstrated by the poor state of maintenance of the building, due to the non-implementation of intervention required to ensure a satisfactory quality of use.
The autonomous action of the local community, in the case of Naples, is a real obstacle to the building recovery, endangering the users for poor safety, welfare and usability conditions. Moreover, the absence of recovery and maintenance jeopardizes the preservation goals, causing a damage to the community [20].

4. New shared management scenarios

The failure of top-down and bottom-up actions in the management of cultural heritage requires a reflection on the organization of decision-making processes, in order to identify new paths able to give satisfactory results both in terms of heritage protection, and in terms of welfare of the local community. The choice of cross-cutting decision-making processes, fostered by the reform of Title V of the Constitution and

experienced in the interventions realized in Bologna, today appears the way to go in order to improve the effectiveness of enhancement actions of public heritage. This hypothesis requires the active participation of all stakeholders (public administration, citizens and private backers), in all stages of the process.

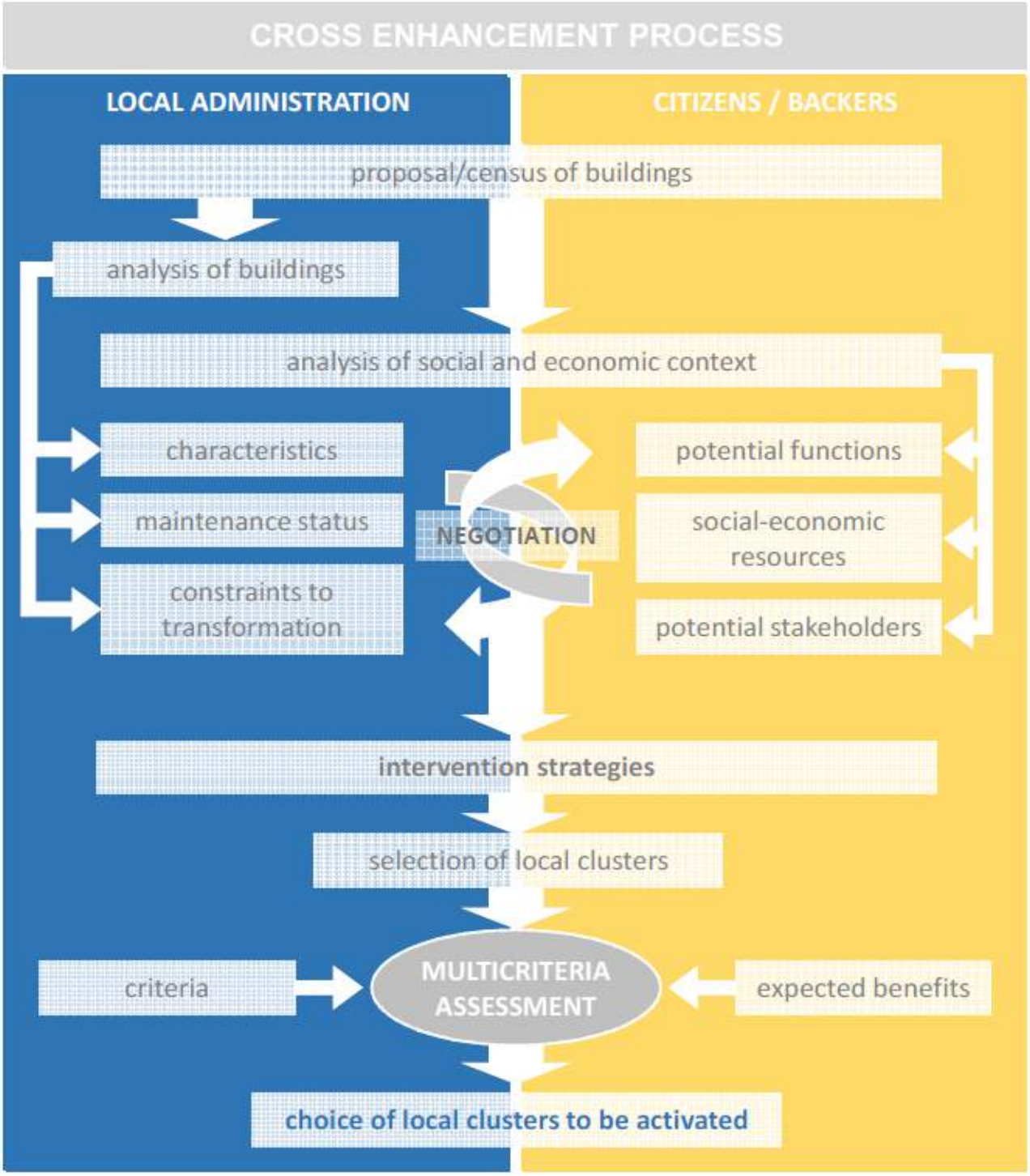

Fig. 2: Shared enhancement process for abandoned heritage buildings.

In this scenario, government should coordinate and monitoring activities at each stage, allowing to local communities, private businesses and lenders to share to choices (Fig. 2) and assuming the responsibility for final decisions.
Participation is indispensable from the start of the analyses aimed at selecting a new use for abandoned buildings: building's knowledge and socio-economic characteristics of the territory should be assessed to verify reuse compatibility, transformation dynamics of local context and targets of stakeholders [18, 22]. Therefore, the step of knowledge should be directed at outlining the potential of use of available funds by its state of maintenance and the constraints to its transformation, to compare with the needs of the local community, the social and economic resources in the territory and the potential offered by the direct and active involvement of citizens and business sector.
A dialogue among stakeholders enables to define intervention strategies to be implemented. These strategies are the result of concerted activity aimed at identifying shared goals, according to which the government may formulate cluster hypothesis including resources, subjects and activities at a local level. Based on the recognition of cultural and socio-economic chains, the clusters are local development engines; they amplify the positive impact of recovery of cultural heritage on the territory.
These assumptions should be evaluated according to criteria defined by the government and based on the benefits expected by citizens, lenders and private companies. The use of multi-criteria evaluation methods leads public administration at the choice of the preferable regional cluster between those assumed, on the basis of shared goals [8, 11, 14, 21].
The direct involvement of stakeholders in the enhancement should continue also during intervention implementation and building management. This requires constant communication of progress of the process and of results achieved in terms of conservation of cultural heritage and socio-economic development.

5. Conclusion

It is not yet possible to verify the real effectiveness of the bottom-up management processes recently activated. However, it should be emphasized that without coherent strategies at a local level the new measures risk to turn into mere media operations, limiting their effects to the recovery of single buildings, with poor results in terms of widespread territorial enhancement.
The intention to act according to a logic of system, despite being an objective of public administration, is only limited to promote tourist activities and cultural fruition, leaving little room for the development of other productive sectors of the country.
The poor availability of public financial resources for enhancement of cultural heritage imposes the search for new synergies between public authorities, citizens and private lenders. The active participation of local communities, nevertheless, highlights problems in definition of roles and rules for the recovery and management of common assets.
In fact, to build partnerships able to effectively pursue preservation and enhancement targets, with real positive impact on the welfare and on local development, it is necessary to outline appropriate procedures to select the actors to be involved. In particular, for abandoned buildings we can consider consensual practices of administration, but we previously need to define guarantees on results in enhancement and management.
While are several ongoing experiences in recovery and private management of public assets through long-term granting agreements for profit-making business, with a prevailing use of heritage as tourist accommodation, free concession to citizens requires public or private financing (as in the case of Bologna) to allow the start up. The participation of the local communities may be feasible with concessions to private entrepreneurs, assigning citizens a cooperative role in achieving the goals of conservation and public enjoyment of heritage [12].
Another problem is due to the measures to be taken on buildings which, although not under public ownership, are common assets for their cultural value. In such cases, the interest in ensuring protection and enhancement should prevail over the ownership regime, allowing management to ensure public enjoyment [4].
The objectives of protection and promotion of cultural heritage, extensive widespread throughout the national territory, require methodologies and tools for activating and controlling the enhancement actions.

The commitment of research to achieve those targets, taking into account the European challenge that directs towards participatory approaches and social innovation in cultures, leads to face with new investigation areas in the field of the cultural heritage:

- strengthening sharing values and information systems to facilitate the development processes, with a wide-ranging. The quality of the process is due to the ability to expand sharing of choices, information and services;
- improving knowledge networks to enhance the enjoyment of quality of heritage;
- developing evaluation methods and tools for simulation and analysis of alternative scenarios of intervention, to facilitate the achievement of shared goals.

The double interpretation as proposed by legislation, which considers the cultural property as identity item and resource, requires to mediate conflicts between the different needs related to enhancement processes: protection of memory and collective identity and transformation of the heritage required by new uses.
The presence of built heritage, environmental economic and social capital, require the development of innovative and creative approaches, to address enhancement strategies based on new dynamic balance between protection and development. Rhythms and ways of living, level of education, production economies and consumption of the local population are the “human factor”, the intangible capital able to strengthening the enhancement of heritage and to ensure over time benefits able to fuel new economic and social processes.

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Istanbul World Heritage property: representing the complexity of its Management Plan

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Abstract

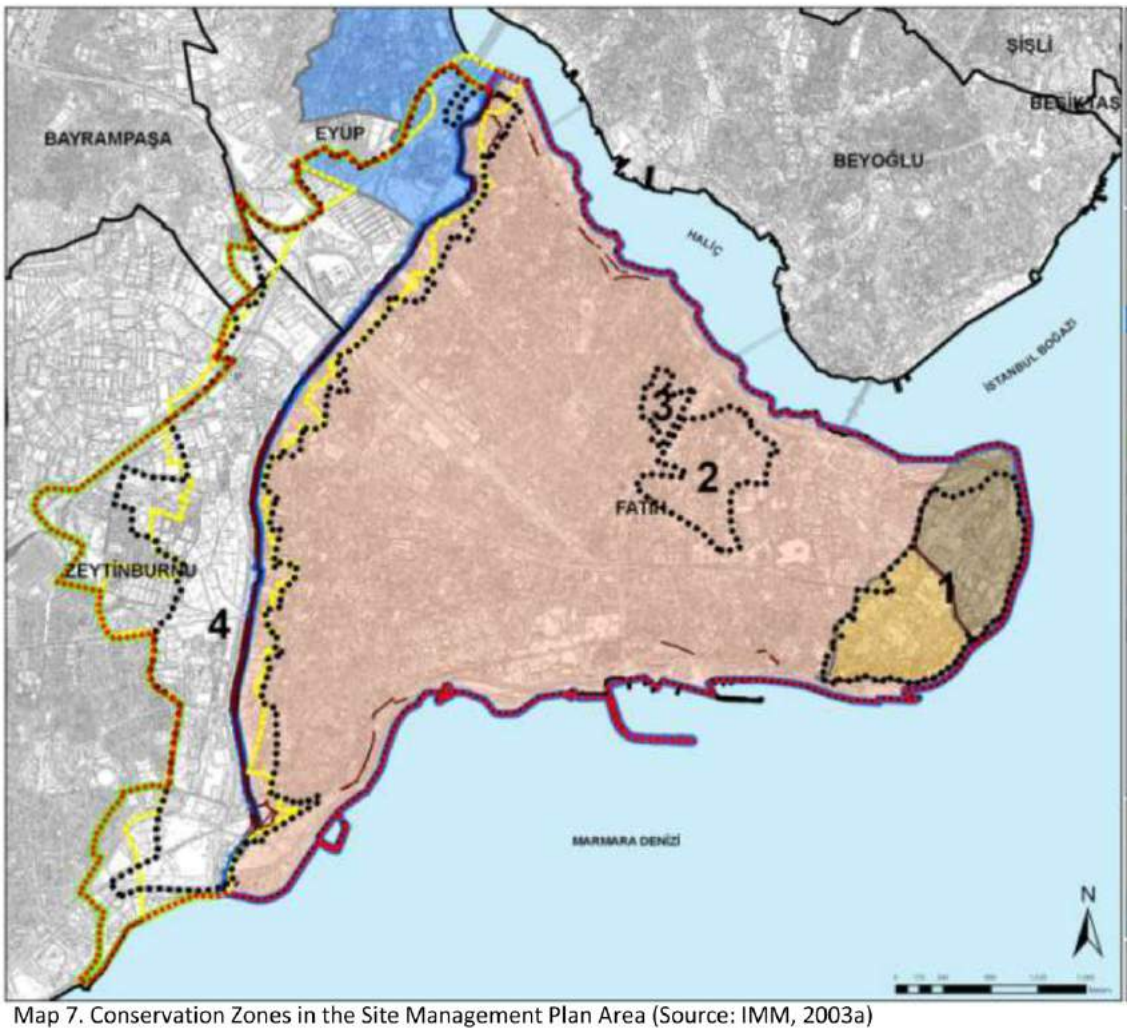
This paper focuses on the strategies proposed by the Istanbul Historic Peninsula Site Management Plan, which became operative in 2011, and its multi-disciplinary and multi-dimensional approach, considering main potentials and issues. The Outstanding Universal Value of the Areas included in the World Heritage List is considered through the criteria utilized by Unesco. Moreover, the author analyzed historical studies elaborated by colleagues of the Department of History (Faculty of Architecture, Istanbul Technical University) and of the Unesco Chair (Faculty of Art and Design, Kadir Has University), which both signed a Memorandum of Understanding (MoU) with the Department of Architecture and Industrial Design at the Second University of Naples, and with the Research Centre of the Campania Region on Cultural Heritage, Ecology and Economy (Benecon), institutional partner of the Forum Unesco. The aim of these MoUs is developing joint researches on World Heritage properties in Italy and Turkey, focusing on the Campania Region and the Istanbul metropolitan area. In this framework, the author, from November 2014 to April 2016, met in Istanbul three times experts of the two Turkish Universities and effectuated site visits in the metropolitan area. Particular attention is given to the process of public participation in the actions of preservation and enhancement of the Unesco site as well as to the issues related to the new contemporary projects transforming the city and its skyline.

Keywords: Representation, integrated management, design, public participation, urban landscape, cultural heritage

The Management Plan: issues and potentials

Ertuğrul Günay, former Turkish Minister of Culture and Tourism in the 2011, states in the preface at the Istanbul Historic Peninsula Site Management Plan '*Conservation, maintenance and transference to the next generations of cultural properties, which are invaluable and irreplaceable values of nations, are social responsibilities and the condition of keeping the national consciousness alive. Conservation of cultural and natural properties will only be possible if public awareness is created in which everybody, every institution, organization and occupational group takes part*'.
The concept of public participation is foreseen in additional Article 2 added to the Law 2863, namely the "Law on the Conservation of Cultural and Natural Properties" and the Law 5226 in order to provide the efficient conservation of the natural and cultural values of both Turkish properties on the World Heritage List and the properties in the Tentative List with a participatory strategy in the framework of a vision [1].
Public participation reveals the cultural identity and vision for a plan. The methodological approach of the Management Plan is multi-disciplinary including many sectors and aspects of knowledge. According to Gambardella '*The governance of the production cycle, understood in its regenerative action and in its role of modifying infrastructure, landscape products, it will be realized only if the complexity of local identity values are measured by knowledge, in their dual multi-dimensional*

understanding of the physical activity produced and to be produced, and returned as a heritage to citizens and stakeholders of the territory to take up economic activities at different scales of sustainable investment. The result will be that the products will have the more valuable the higher the degree of knowledge that we will be able to transfer in any part of the production cycle' [2] [3].
Importance in public participation also is relevant for the social processes of identity that leads the community to recognize the stratification reflected in the shape of the territory on which it is established, and the witnesses values. These encourage people to recognize in the territory an archive of evocative signs of past events [4].
In this framework, Istanbul can be considered one of the greatest city in the history [5].
Founded on the peninsula surrounded by the Golden Horn, Sea of Marmara and Bosphorus, being the capital of the Ottoman Empire, East-Roman Empire and inhabited since B.C. 6500, Istanbul has four areas which were registered on the UNESCO World Heritage List in 1985 due to their Outstanding Universal Value:
Sultanahmet Archaeological Park (Hagia Sophia, Hippodrome, Topkapı Palace, Sultanahmet Mosque); Suleymaniye Conservation Area; Zeyrek Conservation Area; City Walls Conservation Area.
These four areas of World Heritage reveal the urban history of Istanbul, differing in terms of the nature and qualities of cultural properties [6].
The Historic Peninsula Site Management Plan, which was prepared by Istanbul Metropolitan Municipality for the efficient conservation, maintenance and utilization of the Historic Peninsula in its natural integrity. In this context, the aim of the İstanbul Site Management Directorate is to provide a sustainable management plan for the archaeological sites, conservation areas and buffer zones by coordinating non-governmental and governmental organizations.



Map 7. Conservation Zones in the Site Management Plan Area (Source: IMM, 2003a)

Figure 1. Istanbul, Areas inscribed in the World Heritage List. 1. Cultural Properties in Sultanahmet Archeological Park World Heritage Site; 2. Cultural Properties in Suleymaniye Mosque and its associated Area World Heritage Site; 3. Cultural Properties in Zeyrek Mosque (Pantocrator Church) and its associated Area World Heritage Site; 4. Cultural Properties in land Wall of Istanbul World Heritage Site (source: Istanbul Historic Peninsula Site Management Plan, 2011).

The Management Plan is a road map to protect the World Heritage Assets and Candidates in the Tentative List with the stakeholders in a reasonable, sustainable and integrated way. In addition to the Outstanding Universal Value of the assets, it also aims to preserve their vividness and development, and transmit them to the future generations by creating a balance between them.
Throughout the country many historical buildings/monuments such as mosques, tombs, bridges, bazaars, public baths, fountains, Khans, caravanserai, churches, monasteries are under the management of İstanbul Site Management Directorate, which is authorized for the maintenance, repair, restoration and reconstruction of these buildings.
The Outstanding Universal Value of Istanbul passes through its rich history. According to the ancient writers, Byzantium was founded by the Megara and Argos (Greece) colonists in 660 B.C., a few years after they founded Chalcedon on the Asian side at the Marmara Sea coast.
In 512 B.C. Byzantium was captured by Dareios and ruled under the Persian Satrapy. In 478 B.C. it was captured by the Spartans and became a member of the Attic-Delos Sea Union. Up to the siege of the Macedonians in 339 B.C. the city was taken over by the Spartans or the Athenians as it was on an important trade route and military location [7].
After the march of Alexander the Great's army the Black Sea trade route lost its importance. Thus, Byzantium gradually lost its status in the region.
Byzantium was taken over by the Romans during the reign of Vespasian (69-79 A.D.). It had a Roman governor, subjected to taxation and soon became again economically rich.
The water conduit of the city and a bath near Strategion were most probably constructed during the reign of Hadrian (117-138).
Severus (197-211) carried out vast construction activities and the city enlarged in the south. The construction of the Zeuxippos Bath and Hippodrome started in this period [8].
Due to the political and economic importance of the city, Constantine declared Byzantium as the second capital of the Roman Empire. In 325, the construction of the new capital started. Thus, Constantinople became a major architectural center in the Roman world.
The Hippodrome is one of the most important buildings of this period. Its construction begun by Severus; it was remodeled by Constantine and reached its final state in the reign of Theodosius (379-395). The Hippodrome was the center of civil activities where chariot races and theatrical shows were performed and political discussions were made.
The emperors of Constantinople lived here until the capture of the city by the Latins in 1204. After the restoration of the Byzantine Empire in 1261 the Great Palace was found in a state of advanced decay and was never restored.

Figure 2. Istanbul, Sultanahmet district, Hagia Sophia (on the left), Blue Mosque (on the right), photo by the author, site visit: April 2016.

The water supply system and the cisterns of the period still exist. The first water supply line to the city was built during the reign of Hadrian (117-138). Later, during the reign of Valens (364-378) the water supply system of the city was once more constructed and conveyed water over the Valens Aqueduct.
The city walls were extended, rebuilt and repaired during the reign of Theodosius II (first half of the 5th century), and they are the ones which exist today.
The land walls extended from the Sea of Marmara to the Golden Horn. They were constructed as double walls-an outer and an inner wall-and a moat in front and were six and a half kilometers long. Both the inner and the outer walls were studded by defense towers at regular intervals. There were ten gates on the land walls [9].
The time of Justinian marks a turning point in architectural history. The foremost task that Justinian commissioned was the building of the Hagia Sophia. The first basilica, completed in 360 and remodeled from 404 to 415 had burnt to the ground in 532 in the course of a revolt, the Nike Riot. Justinian decided to build a new church with an outstanding plan and size.
The rule of the Macedonian Emperors, from 867 to 1204 marks a high point in learning, arts, religion and politics. As a political entity, the Byzantine Empire in the Late Byzantine Period showed a slow decline after the Latin invasion.
Constantinople was captured by the Ottoman Turks in 1453 and declared as the capital of the Ottoman Empire. Immediately after the Ottomans took over the city, its restoration started as repairing the existing buildings and constructing new ones.
The Topkapı Palace, was built on the ancient acropolis of the city. The constructions started in 1459 on the orders of Mehmed the Conqueror and continued with his successors till the middle of the 19th century at the site.
The Topkapı Palace was the private residence of the Ottoman Sultan as well as the seat of the supreme executive and judicial council of the Empire and housed the Palace School where the selected students trained for the imperial civil service.
The Ottoman building tasks reached its peak in the flourishing period of the Süleyman the Magnificent in the 16th century.
The Süleymaniye Complex commissioned by Sultan Süleyman, consisting of a mosque, two tombs, five medreses, a Quran school, a primary school, a soup kitchen, a hospice, a caravanserai, a hospital, a bath and shops, was designed by architect Sinan and constructed in 1550-1557 [10].

Figure 3. Istanbul, Süleymaniye Mosque, photo by the author, site visit: April 2016.

Considering the aspects of urban management, of particular interest for the author is the paper of Yonca Kosebay Erkan (Kadir Has University, Faculty of Art and Design, Istanbul, Turkey) by the title 'Monitoring Historic Areas of Istanbul: Potentials for Historic Urban Landscape Approach' [11] in which she suggests to analyze the Istanbul World Heritage property through an Historic Urban Landscape (HUL) integrated approach [12][13].
This can suggest solutions for many of the problems identified by the World Heritage Committee after the evaluation of the Management Plan and its effects, as well as the Commission's site visits to estimate the actual and real conditions of the Areas included in the World Heritage List.
The Management Plan is developed through a multi-disciplinary / multidimensional approach. This analysis allows to investigate from the landscape - territorial scale, to the architectural work and to the minute objects - regardless of the date of the object of study - the human and natural phenomena understood as complex and continue realities through a careful process of discretization and measurement able to research, in the essence, each of their single connotative aspect.
The monuments, landscapes, architectural structures, in the multidimensional analysis, are analyzed and interpreted through an integral of knowledge - the different disciplines of study – which does not only measure the formal and geometric shape, but it extends to intangible components, able to give signs about the history as well as the environmental, sociological and cultural context in which that monument, landscape or architectural work was born and has configured.
The evolution of science now provides advanced tools for the highly technological surveys, supported by sophisticated software. These are able to provide future scenarios, from the actions aimed at the protection of monuments to those oriented to the territorial governance, although often, however, it has not yet acquired the ability to use in a syncretic way the many opportunities offered by the technological innovation. This kind of methodological approach is particularly indicated for Istanbul, considering its past, its evolution and the role it has had in the history.
Istanbul is one of the continuously inhabited historic cities in the world demonstrating a rich heritage starting from the Neolithic period. As the capital of three empires, the city inherited architectural monuments from Roman, Byzantine and Ottoman periods [14].
The Outstanding Universal Value of Istanbul is considered unquestionable due to its place in history. Urban conservation was relatively a new layer added to the conservation framework, while today the world heritage community is discussing historic urban landscape approach that respects all historic levels, all natural and physical components along with intangible human values.
The comments of the advisory body on the nomination file of Istanbul for inscription to the WHL is illuminating on that matter.

Figure 4. Istanbul, location Eminönü, photo by the author, site visit: April 2016.

The official records as of 2014 give the current population of Istanbul as 14 million 160 thousand 467. This figure is nearly 6 times more than what it used to be in 1985. In those years the city was identified as a 'large metropolis', today it is a mega-polis. The threats facing the historic city have changed form, mega transportation projects being placed at the top.
On the other hand, the dilapidation of the traditional housing stock, problems facing management and conservation of historic areas are still challenges.
Even today, Istanbul needs to tackle the problems identified at its inscription, yet it has to deal with bunch of others that have arisen through increasing population and changing concepts of conservation and urban economy.
It is observed that the conservation status of Istanbul is worrisome with an accelerating trend. Istanbul is under close monitoring process especially since 2003. In 2008, 2009 and 2012 reactive missions were sent to Istanbul to make on site observations of the state of conservation of the property with a risk to be placed on the World Heritage in Danger List.
In the 1950s, the city lost large areas for urban infrastructure such as opening of large boulevards, and creation of public squares. However it was the 1980s when the historic quarters of the city degenerated most with the uncontrolled migration to the city [15].
At the time of inscription to the World Heritage List, timber Ottoman houses were already in a sensitive state which got worse with the immerse migration the city received after 1970s.
Reorganization of the plan typology, introduction of modern sanitary facilities that lacked in the original design and lack of maintenance resulted in significance loss of authenticity of the houses.
As very well known, since 2000s management plans have become a requirement for newly inscribed sites as well as for sites that are already on the list. In 2004 the Ministry of Culture and Tourism appointed a management team.
In 2011, the management plan of Istanbul has been finalized only eight years after an office was established to coordinate the project and to monitor it. However completion of the management plan is not considered fully adequate for the World Heritage Committee and over the years it was asked to implement the annual review of the plan.
Concerning the concept of Historic Urban Landscape there have been large-scale development projects such as the Golden Horn Metro Bridge, Eurasia Tunnel, Yenikapı Landfill, 9/16 Residence that have engaged the world heritage authorities with concern, leading to possible inscription of Historic Areas of Istanbul on the World Heritage in Danger List [16].

Figure 5. Istanbul, Galata Tower from Haliç, photo by the author, site visit: April 2016.

According with Architect Halil ONUR, Site Manager, tacking in consideration the importance of public participation in the planning process ‘The management plan was prepared by both central and local governments, universities, nongovernmental organizations and local inhabitants coming together and constituting a vision, mission and main objectives and particularly within the frame of UNESCO Operational Guidelines for the Implementation of the World Heritage Convention and international agreements, regulations and principles of UNESCO and ICOMOS and its subsidiary organization for the cultural heritage issues.
The plan consists of general strategies which were determined by considering the contribution of the stakeholders as a consequence of a meticulous study under the headings of Management, Conservation, Planning, Quality of Life, Perception, Training, Awareness Raising, Risk Management and a range of action plans prepared in accordance with these strategies.
Therefore, the implementation and realization of these action plans are the responsibility of the related/authorized stakeholders. From this time forward, a new period begins where we all work together to manage the site in the best possible way, generate decisions and implement these decisions in unison’.

Best practices and brief considerations

Innovative management practices and strategies were applied in the Istanbul Historic Peninsula Site Management Plan through operative projects, for example, in the Neslişah and Hatice Sultan Districts in order to ensure the conservation of the Outstanding Universal Value (OUV) of the property [17].
Neslişah and Hatice Sultan Districts Renewal Project shall set "an example and a model” in the building of the “renovation” concept in the country as per the methodologies and standards set as the first and most important project under Law No. 5366 on ‘Preservation by Renovation and Utilization by Revitalizing of Deteriorated Immovable Historical and Cultural Properties’.
Since Istanbul land walls are inscribed as world heritage, the ramparts and its environs are considered under the UNESCO decisions. Land walls and annexes including historical and cultural monuments were wholly preserved and removed of any illegal occupations in the surrounding.
An Infrastructure and the social and cultural texture areas were created to assist in the conservation of living culture. The current composition of ownership in the region is comprised of 620 residences and 44 business places. The project is based on this number of households and their actual state.
The aim of the project is to ensure that all of the families residing in the region continue to be residents.
Special measures were taken to ensure that the legal framework for the World Heritage site is effective in maintaining the OUV of the property.
To sustain the "Outstanding Universal Value" of Istanbul Land Walls as a World Heritage Site, Neslişah and Hatice Sultan Districts including many other adjacent areas were declared Renewal Areas according to the Law No. 5366.
This law stipulates that housing, commercial, cultural, tourism and social sites should be allocated, any precautions against natural disasters should be taken, historical and cultural properties should be conserved by renovation in the regions that comprise timeworn and impaired cultural and natural assets registered and declared by conservation boards as conservation sites, and the conservation sites within the borders of these regions by means of re-building and restoring in line with the development of the region.
Innovative ways of dealing with the boundaries of the property, including for management of the buffer zone, were put in place, to effectively to manage the site and protect its OUV.
The aim of the project is to allow all families who inhabit the region to reside in this place. However, it is legally impossible for the tenants to acquire houses from the region since they do not hold ownership rights. Nevertheless, the practice became a first in Turkey, and tenants within the project scope are assigned rights to acquire houses under the same conditions. The number of tenant households is 346, and they will be able to continue to reside in the region if and should they will be able to agree with their former landlords. The project includes development of housing and business places the same number as the number of current households.
Effective strategies were developed and implemented to assure adequate and sustainable financial resources for implementing the management measures required to maintain the site's OUV.
Neslişah and Hatice Sultan Districts are positioned between two main arteries called Vatan Main Street and Fevzipaşa Main Street, just near the Istanbul Land Walls, and form a significant urban focus point that causes the town to open up (to other town focuses). For this occasion, it is considered the center of settlement, tourism, history, culture, trade and economic life.
The project was prepared with utmost care in consideration of all data; an attraction center drawing on contemporary building techniques, where modern living levels up to humanistic living standards are achieved while historical and cultural heritage is conserved and renovated. The project was designed

in 2, 3 and 4 storey buildings with an inner court system, starting right after the walls. Vehicle traffic is eliminated except for emergency and all the grounds are allocated for pedestrians.
The grounds are reserved completely for social facilities, green areas, leisure, pedestrian paths, children's play area, promenade, etc. Other than the houses, an elementary education facility, accommodation unit, and an area with commercial center at the basement floor and culture and education center at the second floor. The culture and education center is designed to preserve, improve and promote cultural values of the region, while earning its worthy place within national and international values. Measures thus taken will improve the welfare of region's population and provide that the growth becomes sustainable while observing the drafted management plan.
Approaches and strategies were developed and implemented to assure that the human resources are adequate to manage the World Heritage property. Preliminary Renewal Project has been drafted in line with the principles and considerations defined by the consultation and with the contribution of expert academicians from universities. The administration plan developed by experts from varying occupational groups to take roles in the regional administration system, will provide the continuity of the region's administration. The existing staff of restoration architects, architects, urban planners, archaeologists and art historians who were involved in the preparation of Renovation Preliminary Study gained expertize by participating in every phase of this "first" project planned within the scope of Law No. 5366. Moreover, the expert staff gained a growing awareness on the protection of world heritage sites by joining trainings and seminars organized by universities and non-governmental organizations. Effective mechanisms were put in place to ensure that resource use permitted in and around the World Heritage site is sustainable and does not impact negatively on OUV.
The key principle of the project has become the conservation of the Land Walls and the surrounding. In this context, sustaining the historical texture and preventing physical deterioration, encouraging economical development, safeguarding cultural dynamics and boosting urban integration and life quality, and promoting involvement will yield the sustainability of the project in line with the principles set forth in the scope of the project [18].
This brief analysis on the Istanbul's Management Plam can be interesting since the strategy of protection and enhancement of heritage, thus understood, faces the possibility of transferring management policies from one environment context to another. Contemporary research on local development in a global context show that examples of successful development in a region, city or industry, however, are hardly to re-propose, in the same way in different areas.

Figure 6. Istanbul, Galata Tower, Beyoğlu; **Figure 7.** Istanbul, Phanar Greek Orthodox College. Photos by the author. Site visit: April 2016.

The local development, in fact, depends on environmental conventions, models of reference, habits and social conventions that cannot be recreated but only built.
It is also true that best practices are all characterized by constant and key factors that can not take in consideration the condition of the territory.
In asset management, in a logic of sustainable tourism development, and Istanbul is a tourist destination, concepts such as cultural identity, integration of tourists with the local community, cultural tourism, economic development, tourism management, participatory processes in the appropriation and knowledge of the identity of the territory's values, are synonymous of successful policies , and therefore can become a stimulus for planning and management strategies to be adopted elsewhere.
The full participation of communities in heritage management for the definition of its local identity is, in fact, as much a duty as a responsibility for governments and citizens, in order for that development to be oriented to the real expectations and needs of the inhabitants of the territory. In a collective project in which tourism becomes a component of the broader process of regenerative preservation of heritage, the methodological approach, multidisciplinary and multi-dimensional, structures the knowledge of the area and directs its management as 'Knowledge Factory' [19].
'The governance of the production cycle, understood in its regenerative action and in its role of modifying infrastructure, landscape products, it will be realized only if the complexity of local identity values are measured by knowledge, in their dual multi-dimensional understanding of the physical activity produced and to be produced, and returned as a heritage to citizens and stakeholders of the territory to take up economic activities at different scales of sustainable investment. The result will be that the products will have the more valuable the higher the degree of knowledge that we will be able to transfer in any part of the production cycle' [20].
In this sense, the depth of realities that are considered management model for the real involvement of local people, it becomes spin off for reflection on strategies, which could be adopted, as advocated by the World Heritage Convention (1972) and the Budapest Declaration on World Heritage (2002).
Particular attention, for the international importance which they invest and for the specific legislature related to them, should be reserved for those sites that for their typological characteristics, historical, or natural assets are considered emblematic and of excellence for a Country or for the world community. This is the case of properties included in the World Heritage list, which, for their Outstanding Universal Value, become an attraction for cultural tourism on a global scale.

Figure 8. Istanbul, Ragıp Paşa Kiosk, Caddebostan; **Figure 9.** Istanbul, Zincirlikuyu.Phothos by the author. Site visit: April 2016.

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Representing cultural heritage: a communication plan for the World Heritage properties of Tunis, Carthage and Sidi Bou Said

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Abstract

This paper presents the author's idea to establish a 'cultural district' which connects the Medina of Tunis, the archeological area of Carthage (both World Heritage properties) and the village of Sidi Bou Said. The project is included in the researches carried out in the last decade by the Research Centre of the Campania Region on Cultural Heritage, Ecology and Economy (Benecon) – institutional partner of Forum Unesco University and heritage – the Department of Architecture and Industrial Design at the Second University of Naples, the Unesco Centre of Caserta, in cooperation with the Unesco Club of Tunis.
In particular the proposal is developed through a deep research carried out in Tunis with the Manager of the World Heritage property, though, among other, site visits in July-August 2015 and April 2016. The author analyzed the documentation available on-line on the World Heritage Centre's website related to the nomination files and the state of conservation as well as literature of reference.
The idea to establish a network and a cultural route among the sites come from the lack of tourism caused by the actual world geopolitical situation as well as by the loss of identities that this places had in the last decades since their inscription in the World Heritage List.
The proposal, through a plan of communication, suggest a network able to involve local communities in the process to preserve and enhance their heritage. From a physical point of view this project is feasible because the properties are located in a close area and are connected among them by public transportation.

Keywords: Representation, Cultural Heritage, Communication Plan, Landscape, Design

The multidisciplinary approach as the knowledge base for the Plan

The paper analyzes the proposal to create a cultural and tourism promotion plan for the Medina of Tunis, the archaeological site of Carthage and Sidi Bou Said, considered as a network able to offer significant routes for residents and visitors.
The communication plan must be based on a thorough multidisciplinary and multidimensional analysis of the cultural heritage, both material and intangible, which is the premise of all project activities [1] [2].
In this framework the author agrees with the idea that 'the historical centers, monuments, even the degraded landscapes, form the raw material of our investigation, the hardware on which the thought and integration of skills act as a software to define a repertoire of appropriate solutions to return to those environments to the local community through an action of regenerative protection.
In this sense, it is vital the international confrontation in order to share best practices of preservation and management of monuments, sites and historic environment, in which conservation and development coexist in positive models that can be exported to other territorial contexts [3].
The author tries to understand if positive results in the promotion of heritage in Tunis and its metropolitan area can be supported by the main stakeholders of the territory.

The importance of the concept of 'site' is of crucial importance in the fields of design, architecture, planning and management, and the way in which planners and designers have addressed these issues has radically changed over the years. Little has been written on this subject, as well as much less has been said about the characterization, the wealth and the typological variety of the World Heritage of Tunis, Carthage and Sidi Bou Said.

Although the historical, artistic, architectural, landscape and immaterial heritage in this region is subject of an extensive scientific literature, on the other hand, researches and projects only rarely translated into integrated and sustainable management actions. From the critical analysis of the Medina of Tunis, the archeological area of Carthage and Sidi Bou Said, the author reinforced the idea that the multidimensional and multidisciplinary approach, linked to the analysis of international best practices, constitutes a new analytical method on the issues related to the promotion of cultural heritage, landscape and intangible assets, which historically were addressed from a local point of view and in a non-integrated perspective. Finally, in the context of the strategies related to cultural promotion, the author supports the idea that links survey, analysis and representation with the proposals for the enhancement of heritage connected to the needs and wishes of local communities:

'it is in the representation that the project comes out from the great sea of possibilities in order to get a concreated shape, it becomes communication, which is premise of each project' [4].

The author begins the study observing the state of conservation of the Medina, which was included in the World Heritage List according to the following criteria (ii), (iii), (v), defined by the Operational Guidelines, as well as for its Outstanding Universal Value, in consideration of the property's integrity and authenticity.

With its souqs, its urban fabric, its residential quarters, monuments and gates, this ensemble constitutes a prototype among the best conserved in the Islamic world.

Criterion (ii): The relay role played by the Medina of Tunis between the Maghreb, Southern Europe and the East encouraged exchanges of influences in the field of the arts and architecture over many centuries.

Criterion (iii): As an important city and the capital of different dynasties (from the Banu Khurassan, to the Husseinits), the Medina of Tunis bears outstanding witness to the civilizations of Ifriqiya (essentially from the 10th century).

Criterion (v): The Medina of Tunis is an example of a human settlement that has conserved the integrity of its urban fabric with all its typo-morphological components. The impact of socio-economic change has rendered this traditional settlement vulnerable and it should be fully protected.

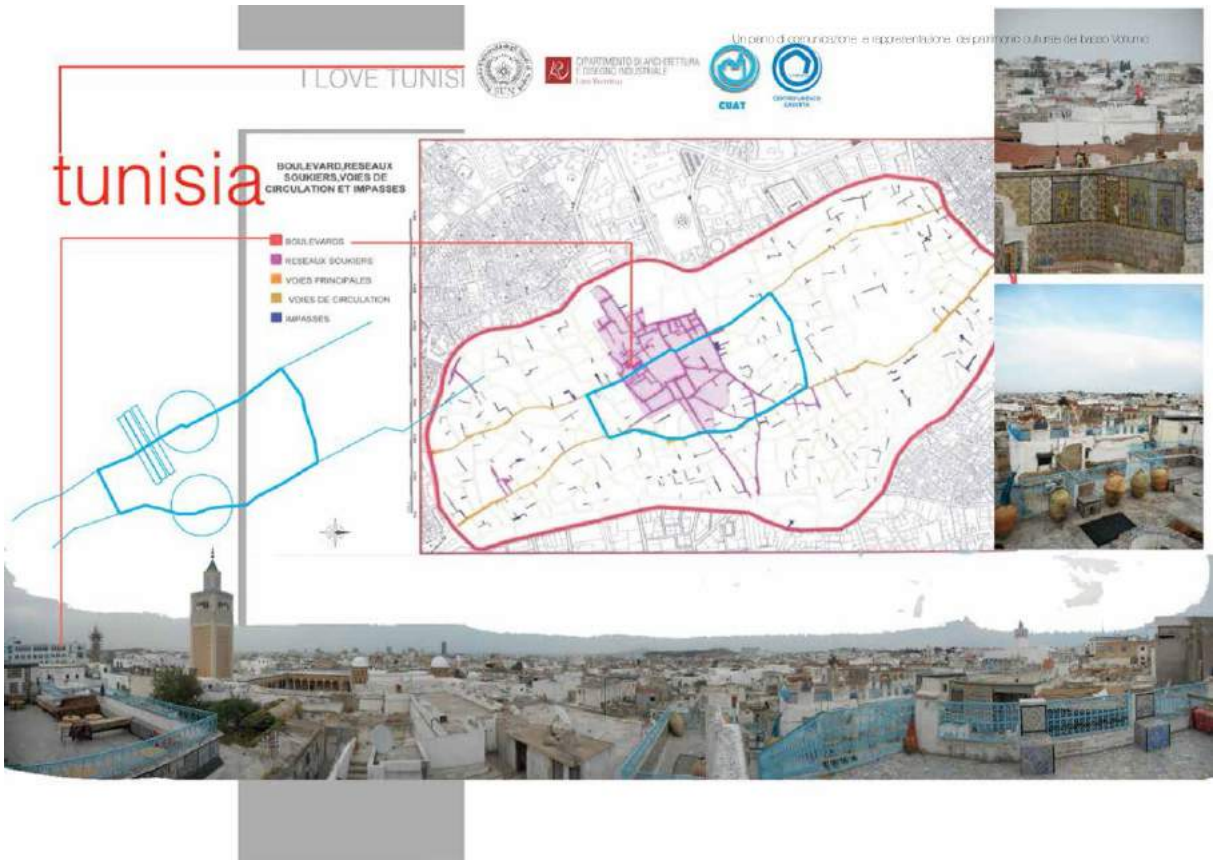

Figure 1. Communication Plan for the Medina of Tunis (source: Unesco Centre of Caserta)

The attributes that express the Outstanding Universal Value include not only the buildings but also the coherent urban fabric of the town. The exact boundaries of the property need to be clarified.
For the aspects of integrity, at the time of inscription, 50% of the built heritage of Tunis was considered to be in a bad state of conservation or almost in ruins. Individual monuments and the cohesion of the ensemble of the urban fabric have remained partially vulnerable to the effects of socio-economic change. A buffer zone is proposed in order to better protect the surroundings of the property.
For the aspects of authenticity, the Medina of Tunis (with its central part and two suburbs, North and South) has conserved, without significant alteration, its urban fabric and morphology, as well as its architectural and architectonic features. The impact of adaptation to new life styles and its demands is relatively slight and the different restoration and/or rehabilitation interventions have not affected the intrinsic value of its functional and structural authenticity, even if the buildings remain vulnerable to the accumulated change of materials and building techniques [5].
As a result of a constant alarm state of the old town of Tunis, the National Heritage Institute decided, in October 2012, the launch of a vast project of inventorying the built heritage under the direction of the conservator of the Medina Tunis and the historical complex of Sidi Bou Said. To achieve this goal two workshops were created with the aim to follow the project with multidisciplinary team of historians, architects, conservators and technicians. The preservation of the Medina of Tunis is a special unit within the National Heritage Institute, which is part of the Division of the Conservation of Monuments.
The main tasks of the team work are the management, preservation and development of the historical center of Tunis, its Medina, its neighborhoods, as well as the historic village of Sidi Bou Said.
Il principale obiettivo dei due atelier è quello di definire lo stato di conservazione della Medina e di Sidi Bou Said al fine di accertare le ragioni della situazione critica e a volte catastrofica dello stato di conservazione di questi due siti che è degenerata negli ultimi decenni.
The main objective of the two workshops is to define the conservation status of the Medina of Tunis and Sidi Bou Said in order to ascertain the reasons for the critical situation and sometimes catastrophic state of conservation of these properties, which is degenerated in recent decades.
There is a 2014-2018 five-year plan of action. The main objective achieved in the first three years of work, summarized in these pages, is the protection, conservation and enhancement of the historical heritage which is of great value to the collective memory, and is the founding basis for a sustainable development model for the city. The adopted methodology is characterized by flexibility in order to enable the different actors to intervene without difficulty and to offer, from different professional backgrounds, the ability to integrate the work of different workshops and shares common values [6].
At the end of 2014 it was launched a cooperative public notice to all public and private institutions, and cultural associations in order to join the project and to strengthen the commitment to the preservation and enhancement of historic assets. Moreover, this project wanted to open simultaneously a broad debate on sustainable development addressed, among other things, to the socio-economic, security, cultural and environment aspects of the territory.

Figure 2. Medina of Tunis, photo and site visit by the author, 1-3 April 2016

The mission of the team of curators of the Medina of Tunis is to guide short, medium and long term operations of management. The project aims to develop an action plan that define the works of restoration, rehabilitation and enhancement of the cultural assets.
As for the diagnosis of cultural heritage, this is done on the basis of a working inventory. It is necessary the cooperation between all the different actors working for the preservation of historical assets.
It must be noted that the inventory of assets is a long-term project. This will be the basis for a possible observatory on cultural heritage in the Medina of Tunis.
Il gruppo di lavoro ricorda che il patrimonio si esprime attraverso numerose forme:
The working group recalls that heritage is expressed in many forms:
- The material and intangible traditions and expression
- The social, ritual and holidays events
- The know-how linked to traditional crafts

In order to realize the inventory it will be necessary to set up a multidisciplinary team composed mainly of architects, historians, craftsmen, anthropologists, sociologists, artists.
Moreover, it is necessary to associate to the inhabitants of the Medina of Tunis, local associations and institutions able to identify, define, and the preserve the elements of this heritage.
It is a scientific study concerning the knowledge of the needs and expectations of the inhabitants.
It is necessary to promote the work. Thus the local community can start sharing strategies for the socio-economic development of the area, and social cohesion policies can be encoraged.
The socio-economic analysis is carried out according to the following elements and through a multidisciplinary approach:
- Integration and territorial polarity
- Demographics
- Sociology
- Real dynamics territorial and administrative organization.

It will follow the Action Plan of Action, after defining the operational tools needed to carry out the execution of the plan in compliance with the regulatory framework on the conservation and enhancement of heritage and land management.
During the investigation carried out by the author in July-August 2015 and April 2016, together with the Coordinator of the Institute of Conservators of the Medina of Tunis and the President of the UNESCO Club of Tunis, the principles of the Communication Plan for the Medina were defined through the promotion of a set of thematic routes that are represented in the project tables shown in the illustrations dedicated to the case study of Tunis.

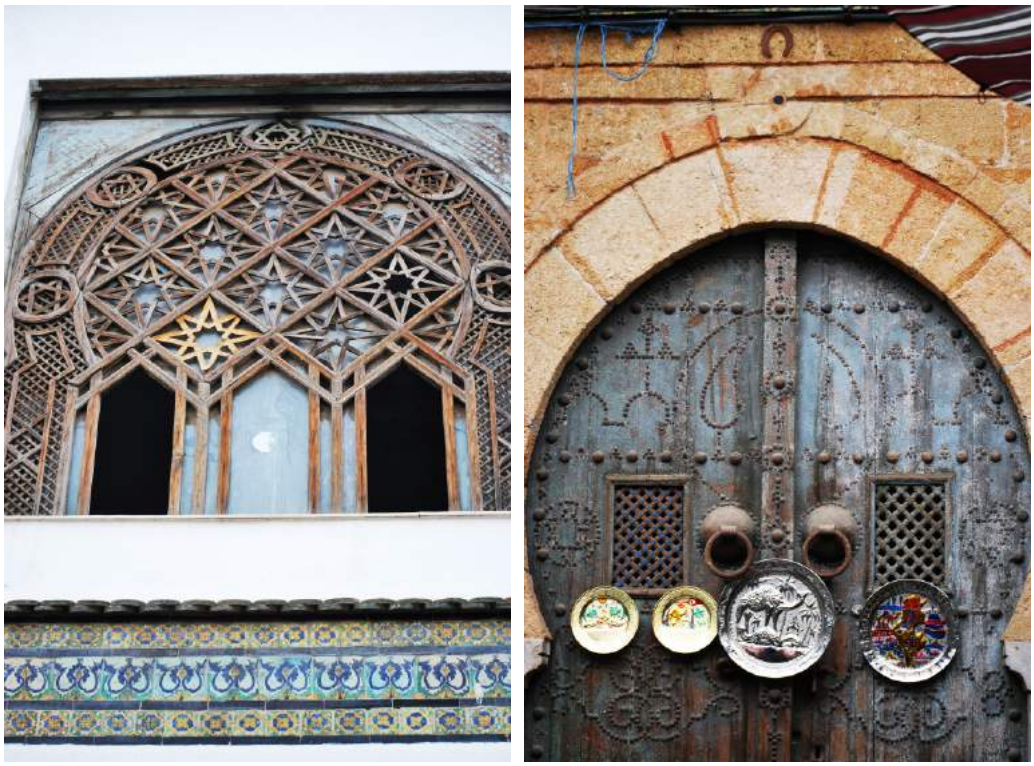

Figure 3. Medina of Tunis, photos and site visits by the author, 1-3 April 2016 and 6-13 April 2016

This approach seems to be a reference model that can be exported and adapted to other geographical context because it is linked to the multidisciplinary method which roots in the analysis of places and local traditions.
The archeological area of Carthage was inscribed in the World Heritage List in 1979 on the basis of the following criteria:

Criterion (ii): Phoenician foundation linked to Tyre and Roman refoundation on the orders of Julius Cesar, Carthage was also the capital of a Vandal kingdom and the Byzantine province of Africa. Its antique ports bear witness to commercial and cultural exchanges over more than ten centuries.
The tophet, sacred place dedicated to Baal, contains numerous stelae where numerous cultural influences are in evidence. Outstanding place of blossoming and diffusion of several cultures that succeeded one another (Phoenico-Punic, Roman, Paleochristian and Arab); Carthage has exercised considerable influence on the development of the arts, architecture and town planning in the Mediterranean.
Criterion (iii): The site of Carthage bears exceptional testimony to the Phoenico-Punic civilization being at the time the central hub in the western basin of the Mediterranean. It was also one of the most brilliant centres of Afro-Roman civilization.
Criterion (vi): The historic and literary renown of Carthage has always nourished the universal imagination. The site of Carthage is notably associated with the home of the legendary princess of Tyre, Elyssa-Dido, founder of the town, sung about by Virgil in the Aeneid; with the great navigator-explorer, Hannon, with Hannibal, one of the greatest military strategists of history, with writers such as Apulée, founder of Latin-African literature, with the martyr of Saint Cyprien and with Saint Augustin who trained and made several visits there [7].

The site benefits of a number of legislative reforms of protection since 1885.
Its protection and security is guaranteed, among other things, by the Law 35-1994 concerning the 'protection of the archaeological heritage and history of traditional arts' and the Ordinance of 16 September 1996 for the creation of the 'Cultural site of Carthage'.
A Unit of Heritage of the National Conservation Institute is responsible for the preservation and management of the property.
The management of the site is currently integrated in the urban development plan of the city.
Between 1980 and 2001, for the inclusion of the archaeological area of Carthage in the UNESCO list were funded around $ 215,000 international funds for the following operations:

- development of the site management tools, such as the Management Plan;
- activities related to the knowledge and involvement of the stakeholders of the territory, or international symposia, conferences, expert missions to assess the state of conservation and management of the site.

Also there were financed through this budget, advice for restoration works such as, for example, those related to the baths of Antonio [8].
Since 2006, the World Heritage Centre was informed of the decision to downgrade certain areas of the Archaeological Park of Carthage.

Figure 4. Carthage Punic port, photos and site visits by the author, 1-3 April 2016 and 6-13 April 2016

The World Heritage Centre launched the process of inventory of the property inscribed in the World Heritage List, requiring at the management body of the property to precisely define the boundaries of the Unesco site. In 2011, during the twenty-fifth session of the World Heritage Committee was presented a report on the state of conservation of the archaeological site, for the first time after its inscription in 1979.
At the request of the Committee was organized a joint mission UNESCO WHC and Icomos between 24 and 28 January 2012.
Experts highlighted two main issues: the development of unplanned infrastructure in the area surrounding the site and the negligence of the authorities responsible for the management and protection of the property.
The highlighted priority was to update, adopt and activate a plan for managing and enhancing the value of the archaeological area, which had been prepared at the end of 1990 but which had never been adopted and forwarded definitely to UNESCO.
The experts therefore suggested to coordinate and deal with all the studies developed from 1993 onwards, including the Management Plan of 1998 and the updates that were made in 2003.
Also they proposed to compare these management tools with the Urban Plan of the city.
The Management Plan must also include forecasts in relation to the management of cultural tourism.
At the moment, the visibility, the interpretation and presentation of the site is unclear as a whole.
Managers should realize brochures, poster and information displays which are capable, through the definition of visit and interpretive itineraries, to let visitors understand the historical development of the site and the importance it has played as part of the Mediterranean culture [9].
The Management Plan must include a detailed strategy in the short, medium and long term for the restoration work on the archaeological excavations in which link together in a synergistic way all the actions of protection, enhancement and management.
These actions will blanned by the Institut National du Patrimoine and put in force by the Unité Carthage de l'Agence de mise en valeur du patrimoine et de promotion culturelle
These will have to coordinate with the Administration of Carthage and dialogue with the main public and private actors, including cultural and business associations.
These consultations should address both the area of the archaeological excavations, that the buffer zones, which are both subject to recovery operations, of financial and real estate nature.
The Unesco-Icomos Commission defined the priority measures to counter the disastrous effects of the changes of recent decades.
Areas and monuments indicated by the Commission and in need of urgent attention are: the circus, the Borj Boukhris area, the denied area of the Roman villas Park and the area situated to the north of the Maalga Cisterns.
At the time of inscription of the archaeological site of Carthage on the World Heritage List in 1979 no plan was presented to the nominations dossier. An initial plan for the site and its buffer zone was defined thanks to Decree No 85-1246 of 7 October 1985 [10].
The property of Carthage was included in the 'Archaeological Park of Carthage - Sidi Bou Saïd' with much larger area than that of the archaeological site.
On 31 January 2012, the National Heritage Institute transmitted to the World Heritage Centre the plan in which the property limits were clarified in the framework of the inventory of the archaeological park perimeter defined by the Decree of 1985.
It was therefore defined a buffer zone presented to the World Heritage Committee at its thirty-sixth session in June 2012.

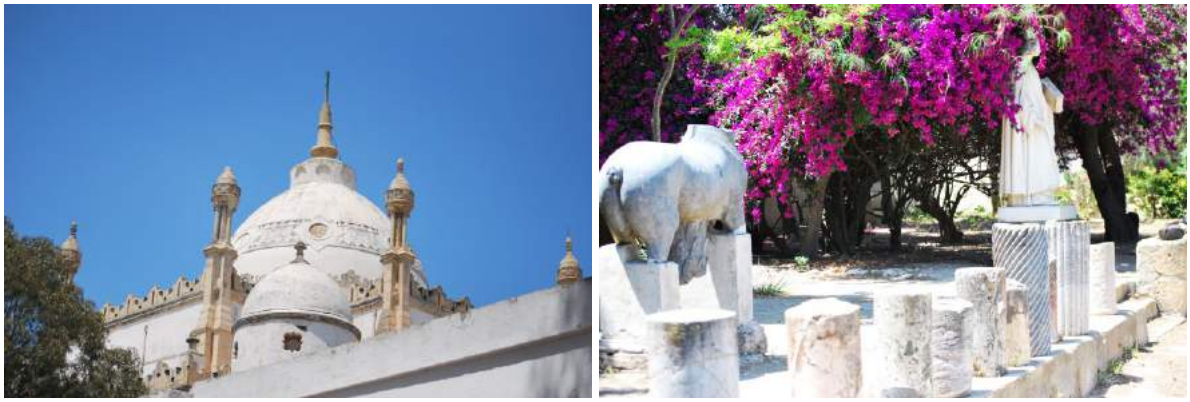

Figure 5. Archeological park of Carthage, photos and site visits by the author, 1-3 April 2016 and 6-13 April 2016

In the 'Archaeological Park of Carthage - Sidi Bou Saïd' of the great interest is the blue and white village close to the archeological site. The town takes its name from a Muslim religious figure who lived in this city.
In fact between XII and XIII Century a.C. Said ibn Khalef ibn Yahia Ettamini el Beji arrived in the village of Jabal el-Menar and built a sanctuary
After his death in 1231, the religious figure was buried there. In the eighteenth century Turkish governors of Tunis and wealthy citizens will built several residences.
The city is an interesting tourist attraction, known for its heavy use of the colors blue and white everywhere in the city.
It can be reached via the railway line Tunis-Goulette-Marsa, running from Tunis and arrived in La Marsa.
Sidi Bou Said still has the reputation as a city where many artists lived, or at least visited the city. These are: Paul Klee, Gustave-Henri Jossot, August Macke, Saro Lo Turco e Louis Moillet.
Several Tunisian artists of Sidi Bou Said, who are members of the Ecole de Tunis (painting school of Tunis), such as Yahia Turki, Brahim Dhahak e Ammar Farhat.
Sidi-Bou-Said is the best preserved village around the Mediterranean coast of Tunisia.

Figure 6. Sidi Bou Said, photos and site visits by the author, 1-3 April 2016 and 6-13 April 2016

Figure 7. Sidi Bou Said, photo: Roberto Di Fonzo (source: Unesco Centre of Caserta)

The gardens of villas that host exhibition centers and art galleries are interesting to visit.
Ne è uno splendido esempio la residenza del Barone d'Erlanger, diventata il centro delle musiche arabe e mediterranee, ricca di pregiate collezioni di strumenti musicali e antichi arredi (Palazzo Ennejma Ezzahra).
It is a splendid example the residence of the Baron of Erlanger, which became the center of Arab and Mediterranean music, rich in valuable collections of musical instruments and antique furniture (Ennejma Ezzahra Palace). Also interesting are Dar El Annabi and the hotel de charm Dar Said.

Cultural district as a network to promote the properties

The author proposes the establishment of a 'cultural distric' caractherized by the Medina of Tunis, the archeological area of Carthage and Sidi Bou Said, which can be promoted through a 'plan of communication' in order to develop and improve cultural tourism in the area.
Successful examples speak of institutional or informal relational, social and cultural networks that have the ability to let circulate, transmit and share knowledge, experiences on issues and projects in geographical areas, even extended and fragmented, with common characteristics always connected with the genius loci of the territory.
This net of relationships and knowledge often results in the creation of 'cultural districts', also named local tourist system, which put in relationship various properties, belonging to more or less extensive geographical areas, within which different itineraries are suggested. The new routes include not only visits to the heritage and natural heritage but, also, the intangible one that is discovered, for example, through food events, and shows related to traditions and local products [11].
The search for the 'sense of place' has become a characteristic element in strategies for managing the assets. In the case of sites of excellence, recognized internationally, to preserve the historical identity of the territory, however, becomes a difficult challenge, because their reputation often involves excessive flows of visitors.
While, therefore, the delegates to sites' management often use the brand to develop shared projects on a large scale, and to access more easily to funding sources, other strategies must be identified to avoid that anthropological pressure damage the natural and built heritage.
Policies that have limited these issues, not reducing - and sometimes even increasing the flow of visitors - point to the creation of 'cultural districts'. The territorial networks so defined - if combined with a strategy to rediscover the historical background and the definition of a local distinctiveness - facilitate the segmentation of the tourism market. Also, they research and to envisage authentic experiences that will enable tourists, as noted by the World Tourism Organization, to enter into contact with the culture and the historical values of that place [12].
To avoid creating false expectations on the tourist experience that could adversely affect the management of assets, for example through excessive presence of visitors who do not respect the values and traditions of a community, it is appropriate that the promotion of destinations shows clearly their peculiarities.
In this sense, the specific characteristics of the territory must be properly presented, both in terms of tangible and intangible heritage, as through a detailed publicity of tourism services, so that the relationship between residents and visitors can contribute to a mutual cultural enrichment as well as to the economic development of the involved communities [13].
In a highly competitive tourism market, it is very difficult to differentiate the barriers between the real value of tangible assets and the scenario driving cultural and tourist experiences. Two elements - seemingly contradictory but actually interconnected - define the success of a destination according to the Australian Heritage Commission. The first is the definition of a set of infrastructure and tourism services in line with international standards that promote the attractiveness of the area. The second is the fragmentation of services and the identification of market niches that enable to meet the needs of tourists, who are often more exigent [14].
In both cases the need for infrastructures and services, while respecting the local heritage, should not alter the nature, traditions and lifestyles of places, which characterize that community. Local residents can advise tourism as negative if they do not benefit of their living space and if the places of collective identity are not sufficiently respected.
In addition, overcrowding of some particularly popular destinations, diminishes the appreciation. Visitors careful to respect local traditions would like to enter increasingly into contact with the lifestyle, habits and customs of their host communities. In other words, they are no longer satisfied with an impersonal experience, far from the local context in which they have chosen to spend their vacation [15]. In fact, history teaches that no culture can survive long in isolation, without contact with other traditions and influences. Tourism, in this sense, is the most common means of exchange between people from different geographical areas [16].
Instead of this, the promotion of the territory often is unclear, with a message that does not define its true identity. The use of the brand is, in some cases, more subject to political marketing that to the

identification and celebration of national identity or to the specific typological and symbolic value of local heritage [17].
The UNWTO, as quoted in the Manila Declaration of 1980, specifies that economic profit is not the only aim of tourism. In a broader sense, however, tourism has, as main purpose, the objective to improve the quality of life of local populations without altering the identity of places [18].
The same economic revenues must not create social imbalances between different social groups within the community. Strategic policies, in fact, should move towards an equitable redistribution of benefits from tourism and, where possible, alleviate poverty and misery of the weaker strata of the local population [19]. In this sense, as suggested by UNESCO, it is appropriate that tour operators are involved in the process of planning and management of assets, and work in partnership with institution bodies, professional associations and voluntary organizations for the development of the territory [20].
The evidence and international best practices, in fact, show that education programs for the management of the heritage of local communities, if they have no actual evidence in the economic development of the territory, they hardly ever reach the desired goals.
Programs for environmental protection, extended to sustainable tourism, affect both the host communities and visitors. In fact, the 'Global Code of Ethic for Tourism' adopted by UNTWO in 1999 suggests that the States - through their own decentralized administrative structures - take appropriate measures to facilitate the dissemination of correct information regarding tourist destinations, with strategic national and international communication. The main objective is to spread among the visitors the highest respect for the culture, traditions and heritage of the town and the Country they visit. The increasing attention to the new communication tools with innovative technologies can positively contribute to the spread of knowledge and values of a community. For this reason, it is becoming increasingly important the involvement of local human capital, who is depository of historical background and local identity [21]. In order to concretely realize the proposal of the 'cultural districts', the author considers it is essential to build a collective project, which involves institutional e non-governmental representatives, such as Universities, Research Centers, entrepreneurs, local communities, cultural, voluntary and category associations operating in the area of reference, as suggested by the European Landscape Convention, the Budapest Declaration on World Heritage and the Council of Europe Convention on the value of cultural heritage for society. The international cooperation among the Research Centre of the Campania Region on Cultural Heritage, Ecology and Economy (Benecon) – institutional partner of Forum Unesco University and heritage – the Department of Architecture and Industrial Design at the Second University of Naples, the Unesco Centre of Caserta and the Unesco Club of Tunis can be helpfull in this direction.

Figure 8. Tunis, photos and site visits by the author, 1-3 April 2016 and 6-13 April 2016

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