THE ENVIRONMENTAL QUALITY OF OPEN SPACES IN THE MEDITERRANEAN AREA

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Abstract

The research on urban quality is one of the issues on which European policies are focusing their interest, both promoting innovative approaches for environment and energy, and pursuing policies of conservation and enhancement of natural and cultural heritage. This approach is strictly connected to the inseparable binomial "environment and innovation".
The presence of adequate open spaces in the Mediterranean city contributes to the urban quality through the creation of representative places of current and new needs linked with liveability, social aggregation, security and communicability. The Mediterranean heritage is based on the interconnection between open and enclosed spaces. The openings allow entering of light, ventilation, green and water streams by composed perceptual sequences as in the tradition of the Roman city.
Complex spaces necessarily must reclaim the traditional role as nodal elements of the city, not only in terms of usability and comfort, but also of cultural identity. Therefore, they add value to the urban tissue, particularly where its environmental, social and economic balance is compromised. In these circumstances, in fact, open spaces can play a meaningful role in the activation of revitalization processes, not only in architectonic-environmental key, but in the social one, too.
Starting from the centrality of open spaces in the Mediterranean city, authors propose a reflection on the attractiveness, in terms of potentiality, that such sites can have in the urban sustainability strategy: from the energy and environmental quality to the organic restructuring processes of network systems with particular attention both to ecological aspects and to other problems connected with water, air and soil that are vital for biodiversity conservation and, more generally, for the health of the whole area.

Keywords: environmental comfort, visual perception, technological innovation, environmental networks.

1. Introduction (M. I. Amirante)

The research on urban quality is one of the issues on which the European policies are focusing their own interest, on a hand, promoting innovative strategies about environment and energy, on the other hand, pursuing policies of conservation and enhancement of landscape and cultural heritage according to the inseparable binomial "environment and innovation."
For years the group of research of Technology of Architecture of the SUN (Coordinated by Prof. Arch. M. Isabella Amirante) has worked on the themes of the technological innovation and the eco-friendly rehabilitation of the existing heritage, leading researches financed in collaboration with national and international Organizations (ENEA, the Region of Campania, RehabiMed-Spain, ABITA, Benecon, SITdA, INBAR..).

Sustainability and architectural bio-compatibility

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Abstract

Nowadays, sustainable design represents a special architectural stance steadily gaining ground. Choice subjects include the rehabilitation of existing constructions, interventions, extensions and remodellings, forming a set of context conscious architectural solutions which preserve functional and historicist schematism by creating within it *a new image,* an instance of typologically neutral, architectural meta-language.

To illustrate this point of view, the paper focuses on the first steps toward sustainable design undertaken by our architectural design office in Romania, guided by principles present in works such as Foster's Reichstag or Michael Hopkins' intervention on the New Parliament – Westminster, London. The new strategy of approaching this subject presents itself in myriad variations involving a new definition of functionality and the idea of modernising old imagery through rehabilitation. In Romania, a country where continental architecture is strongly conditioned by local specificity on multiple levels, the examples chosen show specific difficulties related to climate, orientation and site-specific conditions; the efforts of the design team, comprising architects and engineers, were geared toward solving the maximum number of energy savings problems which arise during the lifetime of the building.

The aforementioned examples also illustrate a possible description of the expressive potential of architecture, depending on the site, materials and construction techniques opted for, within an overall sustainable vision. The reconciliation of technological imperatives and opportunities with preoccupations of a cultural, spiritual or environmental nature represents one of the most challenging creative problems facing architecture today.

By analysing possible paths of evolution and the relationship between function, technology, cost, spatial development and architectural expression in a particular social context, it is possible to highlight the optimal relation between contemporary architecture and bio-compatible technologies, and, at the same time, to draw attention to the importance of future directions of architectural design investigation.

Keywords: Sustainability, technology, space development

1. Introduction

When the first passive house was finished – 20 years ago, the builders' society welcomed this visionary step with a mixture of fascination and scepticism. Nowadays, there is no doubt that energy-conserving buildings are comfortable, but what is more surprising is the fact that the details are relatively simple, sometimes even inspired by and modelled after traditional architecture.

"*The passive house is a construction which, in time, maintains its interior temperature at a comfortable level, whether in winter or in summer, without any another necessary means of air warming or cooling. Even when the interior climate needs assistance, such a building doesn't exceed a heating energy consumption of 15 kWh/(m²year), and its primary energy consumption – the production of hot water and electricity included – is no greater than 120kWh/ (m²year)*"[1]

The main problem, however, lies in the implementation of development methods and strategies which should be regularly promoted in design and constructions, so that climate protection and resource-saving could be taken into account on a larger scale.

This study attempts to portray the first steps taken in Romania in recent years in the direction of adapting architectural design and implementing sustainable principles in construction. The process of introduction to architectural design strategies in building sustainability in Romania began after Romania's admission to the EU. As a result, 2007 saw the introduction of the first standards referring to the obligation of respecting certain levels of minimal heat loss through the building's envelope. The concept, in its integrity, is the result of the added performance of the envelope's components, depending on site specific conditions and the position of the building on the site, but also on the new technology used to equip the building. However, this concept is an ongoing process of improvement, as the sum of the components may be used in the most cost effective way while still remaining flexible enough to adapt to architectural design requirements.

2. Sustainable Architectural Design

The process of designing a building is a collaboration between architects, structural engineers, systems engineers, economists, geologists, topographers, technology experts and, of course, energy auditors. They have to investigate aspects of the existing natural and built environment into which the new building will be integrated, and calculate the impact of the future construction. The design process, evolving from concept to a particular volumetric composition, has to take into account all of these factors, resulting in a systemic approach. In the end, the building itself is a system: the constructive parts of the building, working together, develop a certain behaviour from the point of view of the energy consumption, which should be anticipated and improved on. The architects pay attention not only to the volumetric composition, but also show a keen interest in the building's "skin", its envelope (a thermal active element, an air proofing tissue - from the sustainable point of view), and in the configuration of the heating, air conditioning devices and electrical systems.

2.1 Building envelope

One of the most important items playing a decisive role in the construction of sustainable houses is the building envelope. Its components (walls, roof, terraces, floor finishings, ceiling insulation, etc.), should have thermal conductivity values under 0.15 W / (m²K), which can be achieved with almost any construction material - brick, wood or metal. However, this goal value depends on minimising thermal bridges – a problem easily solved by adding layers of thermal insulation on the exterior sides of constructive elements such as walls or horizontal slabs. Nowadays, architects can have their pick from an ever increasing variety of thermally insulating materials or subassemblies with included passive technology.

Figure 1. Sutasului Str. Office Building

In the example designed by our office, the walls and terrace were insulated with a 10cm thick layer of expanded polystyrene. Construction legislation in Romania stipulates that walls should be insulated with layers of at least 8 cm, while the minimum thickness of thermal insulation for terraces should be 12cm. Expert studies in building energy also highlight the need to increase the thickness of the thermal insulation layers for terraces (from 10 to 12 cm); the basement too should be insulated with 5cm exterior layer.

Figure 2. Sutasului Str. Office Building

2.2 Glazing

The windows should have a value of the coefficient of transmission "U" no more than 0.8 W / (m²K), with a transmission of heat radiation (g) of 50%. One of the best solutions is the triplex window, although they tend to run the expensive side. Double glazed windows have a 0.5 W / (m²K) coefficient of transmission, and the system is rapidly evolving: windows with four layers of glass (and vacuum between the panes) allow for values of less than 0.3 W / (m²K). Moreover, in combination with cling films available in various colours, this type of glazing can be used as a façade design component.

2.3 Air proofing envelope

Envelope tightness helps improve performance in key areas of the building: it raises the level of protection against noise and ensures thermal comfort. A wind test applied to the doors of a sustainable building should show air losses no bigger than 0.6 of the building's volume per hour ($n50 \leq 0.6\ h^{-1}$) at a pressure of 50 Pascals. Moreover, the efficiency of the ventilation unit with a heat exchanger (responsible for drawing heat from the interior air and reusing it) applies only to buildings with reduced air losses. At the same time, an adequate shaping of the geometrical volume can facilitate interior air circulation.

For the given example - an office building in Bucharest, this circulation is seasonal: the cardinal point orientation of the façades is used in order to achieve types of natural air circulation appropriate for either summer or winter. [Figure 1]

One of the main design priorities is the quality of interior air. For sustainable buildings, the system of recovering heat from the air may produce values around n_{elf}, HR ≤ 75%. To ensure a convenient level of interior comfort, fresh air must be introduced into the building at least 16.5ºC through the consumption of an energy of $p_{el} \leq 0.45$W h /m³. Furthermore, the building's envelope must be as tight as possible (<3%), with a maximum pressure of interior noise of 25dB (A). These types and systems of ventilation are already commonly featured on the construction market, but where the simplicity of conception and fireproofing detailing are concerned, the situation could be improved.

2.4 Heating and air conditioning

Generally speaking, energy conserving houses are cheaper when it comes to energy consumption for producing heat or cold air. When it comes to heating systems preferred for this type of building, energy saving is achieved with an adequate central heating unit, and a well-designed distribution and transfer system.

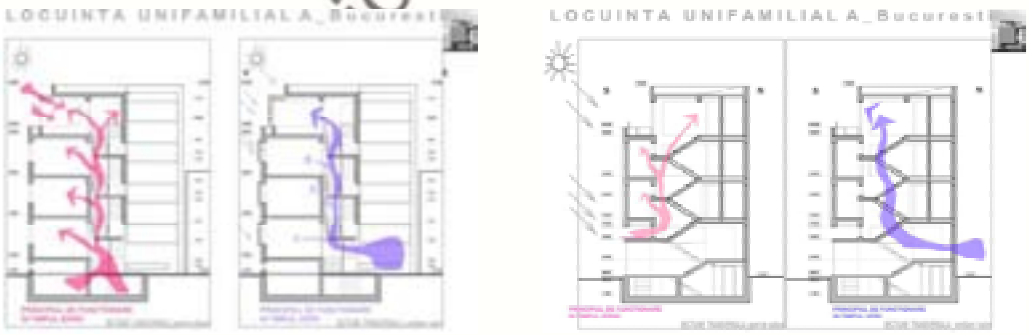

Figure 3. Sutasului Str. Office Building

Heat can also be distributed via natural circulation of air inside the building. Hot water becomes a major source of energy consumption. In the years to come, heating systems will be even more adapted to buildings with low energy demands; consequently, the necessity of switching to non-conventional energies will become even more pressing. Only a small step will then separate us from truly passive houses which, instead of consuming, actually produce energy.

2.5 Electrical systems

Power saving technologies are interested in all consumer devices and aim to reduce energy consumption by various means, mainly by design. The entire building is designed to take advantage of natural lighting throughout the day and to ensure that the volumetric composition allows interior heat to be maintained during winter, and natural cold air ventilation of interior spaces during summer.

3. Sustainable Architectural Design Shapes

Berlin's Reichstag [Figure 4] is an early example of sustainable building and architectural bio-compatibility. During the design process, Norman Foster had the opportunity to work on energy saving details and, at the same time, to apply another energo-conservative principle: cost reduction through material recycling and re-use.

The structural qualities of steel are known to be superior in comparison with concrete: a tonne of steel can support a structure far larger than a similar quantity of concrete. Steel present in existing constructions is sufficient to guarantee no shortage of the material in the foreseeable future. Steel fabricated from reclaimed materials could be added to already existing stocks.

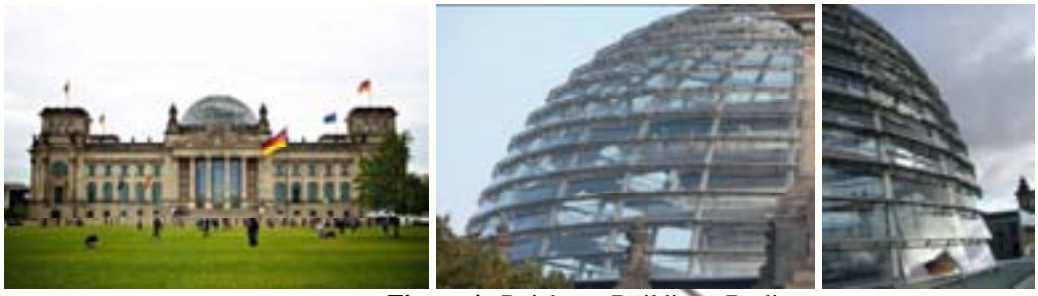

Figure 4. Reichstag Building - Berlin

This fact indicates that the energy already incorporated into construction materials is not too grave an issue, since it can be reclaimed by adopting design strategies which re-use construction materials and recycled components. Actually, 50% of all extant steel comes from recycling, and the analysis of the material's lifespan, applied to the complete process of steel production, yields positive results.

When compared with the total amount of energy used by the building, the energy incorporated in construction materials is insignificant. The energy required by the building process (production of materials, transport and execution) represents only a fraction of the energy consumed for heating, lighting and ventilation during the building's lifetime. Normally, the rapport between incorporated energy and energy consumed during the lifetime of a building is normally 1:10.

Following the active principles of bio-compatibility in architecture, our design studio has attempted to apply them for the design of the Extension of National Library – Bucharest [Figure 5]. Situated on one of city's most important boulevards, but mostly facing North, the access wing of the Library is a subtle architectural intervention, integrating itself into the existent architectural ensemble of the Library and its surrounding park.

Figure 5. Extension of the National Library - Bucharest

The building proposes a direct connection between the access area, the waiting area (situated closer to the old Library) the upstairs reading area and a cafeteria located on the first basement level. Opting for a basement-level cafeteria has freed up space inside the access wing for a split-level reading room facing North and enjoying a view of the park. Due to its underground position, the cafeteria has double qualities: a good level of sound insulation and discreet natural lighting coming up from the ground floor level. This space distribution seems the most adequate response to the extension's proposed function. Natural lighting is ensured throughout all working hours by the shape of the access wing – a quarter of a cylinder – and by using the split-levels in the interior design building section.

The basement is heated, so that its stable thermal mass works as a catalyst for the natural circulation of air inside the building, warm in the winter and cold in the summer time. Buried 1.5 m below ground, where the temperature is constantly around +15 degrees Celsius, the underground level works like a natural thermal regulator.

Figure 6. Extension of the National Library - Bucharest

Above ground level, the access wing's envelope is mostly composed of metal and glass, an ensemble which, through careful orientation, fulfils natural lighting requirements. From the first rough sketches, the project has revolved around the concept of a steel skeleton, whose slender elements provide a delicate counterbalance to the old Library's solid volume, and house a space benefiting from optimal interior lighting and natural air circulation. [Figure 6]

The production of bio-climatic coatings is one of the specific sectors of sustainable innovation, aimed at renewable sources of energy. Vertical closing and covering are the "edge" on which the application and experimentation of innovative technologies are focusing today. The sustainability of building technology must be assessed while keeping in mind all contributing phenomena in order to bring the sum of energy consumption and pollution to the lowest possible level.

For the design of the Parliament Building, The Hopkins Studio (working with Arup – one London's most sophisticated engineering teams) dealt with sustainability issues by combining design and scientific research. Michael Hopkins distinguished himself for his interest in environmental sustainability applied to different kinds of materials, from steel and glass to stone, brick and wood. His recent designs, in fact, attest to his versatility of expression, ranging from the use of brick for the Inland Revenue Building and of stone for the London Parliament, to that of wood for the university campus in Nottingham. These examples show that sustainability is not merely an effort to minimize energy consumption through rethinking the functionality of buildings, but also the matrix which links technology and architecture within a global innovative process.

4.Conclusion

Analysing the possible evolving directions of the relationship system between function, technology, costs, spatial development and social context, one could make better use of the present architecture-technology ratio and even plant the seeds of future paths of development.

Climate has always engendered specific architectural characteristics. The studied examples illustrate some of the latest attempts in Romanian architecture (inspired by previous instances of sustainable design in European architecture) to adopt design strategies taking into account climate and orientation so as to achieve low levels of energy consumption. These strategies are used in conjunction with technical innovations, functional requirements and careful detailing in order to produce buildings which behave like living organisms, and allow for a broad range of architectural expression. Reconciling technological imperatives and opportunities with broader human preoccupations and environmental concerns is one of the most stimulating and provocative problems facing architecture today.

Picture sources

Personal archive: figures 1, 2, 3, 5, 6

Website http://www.flickr.com/creativecommons/by-2.0/ : figure 4

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Such themes, object of researches aiming at developing a friendly behaviour among improvement of the housing quality, energy saving and technological innovation, have concerned the reading and control of the characters and quality of the natural and built-up environment, with application to the different scales from the territorial system to the building system and the eco-friendly technologies for the rehabilitation and maintenance of the built-up environment, starting from the critical reading of the synergies/interferences between building and surrounding environment.
The management of this process has been investigated following the principles and the conceptual rules of the voluntary instruments of eco-management, considering the new paradigms proposed by the voluntary norm and the requirements required by the binding legislative apparatus, in the attempt to give a critical reading of such themes of interest. Starting, in fact, from the Environmental Management System (inspired to ISO 14.000 and EMAS international standards), they have been examined closely the Quality Management System (ISO 9000) and other instruments applicable to the building sector, among all of them the Energy-environmental Certification (proposed to the attention of the institutional, academic and professional world by the Directive 2002/91/EC, the Legislative Decree n° 192/95, the Legislative Decree n° 311/06 and the Protocol ITACA).
Making indicators of evaluation in order to favour the technological innovation, constitutes a prevailing interest of the researches done that, considering as inseparable the binomial building-context, investigate the complex balance between housing emergency and environmental quality of the built-up space, the relationship among fruition, comfort and open spaces organization, the use of innovative technologies for the rehabilitation in energy key of the residential building, the relationship among the requirements established by the norms and the performance aspects noticed within the technologies of architecture and environment, in order to foresee hazard and appraise the demand and planning ways for the rehabilitation interventions and maintenance.
So, the contribution shows the different declinations of the theme of the environmental quality of open spaces in the Mediterranean area, starting from the close examinations lead by the members of the group of research SUN within the respective works of research to the different scales of observation: territory (R. Franchino), urban (F. Muzzillo, C. Frettoloso) and building (A. Violano, M. Cannaviello).

2. Territory and open spaces: Multisensory perceptive quality (F. Muzzillo)

New interpretations widen the perceptive dimension of architecture over the only sight, including a perceptive complex in a whole where all senses interact.
Including in the perception, besides what is seen, all that our body can perceive in its temporal variability with smells, movement, touch, up to even consider the changing sensations of comfort that there are when light and shade vary, let consider architecture not as an isolated element, but as a part of an articulated cooperation with the nature and built-up environment [1].
The reference to a traditional Mediterranean architecture in the south of Italy results so convincing, because it strengthens the sense of belonging to a natural context for the reconstruction of an integrity of relationship between architecture and perception of the context, it is inserted in. If commonly at the term "integrity" an ethical meaning is given, when you speak about an open space/territory you mean all those typical values that are inserted in a complete picture of all its parts: "integrity", then, has the meaning of something that has been never compromise completely, it is substantially still a whole.
Integrity is produced by many territorial features: first of all those ones of the natural environment itself, given by the features of the original elements such as the course of the rivers,

the configuration of the reliefs and valleys, the orographic placement, proximity or distance from the sea, etc.
The mutability of the natural components that are dynamic, as they are transformable in the time and with different combination in the perception, contributes to a multisensory perception in the agricultural areas in the south of Italy . Then, the first criteria of interpretation of a design seem to be the intention to favour naturalness and inconstancy in the temporal dimension. It is even more important that the idea of mutability of open spaces contributes to the matrix of the formal solutions and vegetation is selected for expressing the sense of instability of the place at the best.
Introducing in a sequential way a visual and, more widely, a physical perception of variegated sensations of heat, cold, airy, illuminated and sheltered, it is possible to introduce again the construction of an organic system of static and dynamic open spaces and induce a variability of morphological, bioclimatic and perceptive components [2]. The verification of the everlasting, mutual and continuous process of action and reaction between green areas and context imposes, in the time, a special investigation of the multiform and variable relationship among the parts. A well structured and articulated management derive from it, able to exalt and increase the levels of biodiversity, the processes of spontaneous species reproduction in the long times, an interaction among areas "with a closed process", with an unusual botanical character whose identity must be kept, and areas "with an open process", destined to show the characters of becoming, succession and temporal alternation.

2.1. Green areas, clean energy, connectivity. (C. Frettoloso)

The planning of non-built-up spaces, but also the perspective of rehabilitation of the existing open spaces, often disqualified for either carelessness or absence of a plan clarifying their ways of use, create many problems about not only the formal aspects of the design, but also and above all those conceptual ones, that is linked "with some invariant - *nature, arts, memory, society* – that, time after time, prevail and give value to the proposed interventions" [3]. Interpretative criteria are referred to the role that open spaces traditionally have played like nodal elements of the city system, not only in relationship with fruition and comfort, but also with the cultural identity, so attributing an added value to the urban tissue. A value that is shown also in terms of capability, open spaces, playing a meaningful role in the start-up of processes of city revival, both in architectural-environmental and expressly social key, whereas the environmental, social and economic balance will result jeopardized.
The open spaces organization in the rehabilitation interventions must satisfy specific functional needs dictated by ways of collective life more and more oriented to an increasing flexibility that doesn't mean, as it often happens, the lack of a planning choice. It will mean, rather working on the identification of the surfaces and comfort of the spatial elements, according to an integrated approach to the design, where the technological and functional aspects are necessarily interlaced with those social and environmental ones.
"The Sixth program of action about the environment invites to the development of a thematic strategy on the urban environment with the aim to contribute to a better quality of life, through an integrated approach focused on the urban areas [and] contribute to a high level of quality of life and social comfort for the citizens, through an environment, where the level of pollution doesn't provoke harmful effects for either the human health or the environment, and through a sustainable urban development" [4].
Further ambits of reflections referred to the environmental sustainability are opened together with the problems, which we could define "acquired", that is related to the accessibility of the place in relationship with its specific functions, also in comparison with the typologies of streams that cross and surround the open space, the problems connected to safety, illumination and cleaning.

Such a comparison with the quality of life in its complete meaning has addressed the local administrations and planners' business, on a hand, to qualify (and quantify) the contribution of green areas in microclimatic and ecological terms, on the other hand, to work on the functional integration - high technological systems (energy production systems, infrastructures for the sustainable mobility, performant surfaces). It must be observed, however, that such an innovative push towards urban open spaces has found, only recently, thanks to the programs linked with Agenda 21, applications in different Italian local realities while, in the rest of Europe, it is possible to find a longer planning experience.
From several years the city of Barcelona is a reference for the experimentation of urban policies and services to the citizens that take care for the environmental sustainability and offers interesting indications to Europe for improving the quality of life. With its sixty urban parks, where the use of the green area has been oriented not only to improve the fruition of the spaces, but also to strengthen their identity, in the last years it is focusing on the problems linked with the sustainable mobility. Just last March, within Live design, that promotes the electric mobility in the Catalan capital city, the first station of recharge of electric motorcycles, Mobec Point, has been inaugurated in the district Poblenou.
Perhaps it must be added a new challenge concerning common spaces reinterpretation in communication key to this push towards quality with respect of sustainability. How could the squares, once main places of exchange, enrich their performances in the digital era? Could working on the connectivity and interactivity stimulate new forms of fruition of the open space and, above all, contribute to the quality of life? *"The city as a high-technology favela"*, enunciated by A. Branzi, even if within a wider and more articulated speech about the opportunity to re-think the city in more flexible and reversing terms [5], even not being an answer to such questions, surely, I believe that it simply suggests a reflection on the communication dimension of common spaces design.

3. Open spaces at the service of building: the designing criteria from the Protocol ITACA 2011 (A. Violano)

The approval of the National Protocol ITACA has given an indication to examine closely the evaluation theme of the interrelations established between building and surrounding environment, starting from the analysis of the environmental quality of open spaces and the opportunities of "environmentally friendly design" that understands (or it should understand) renewed management models of the ideal-constructive process more and more linked with the respect (sometimes slavish) of the cogent requirements (whose observance according to the law is imposed), voluntary requirements (non-compulsory specific techniques approved by an organization recognized to develop normative activity) and recommendations (performance characteristics required by the current good practice).
Since April 2011 several Regions of Italy have been able to count upon a renewed (rather than new) instrument to value the energy and environmental sustainability of the buildings, not only Residential, but also for public (and private) Offices, according to the Directive 2010/31/EC that foresees, within 2020, a "quite zero consumption" for the public buildings, that are among the first ones to have to contribute to the wastage cuts in a period when the crisis is not only environmental but also economic.
Besides understanding new technical UNI norms about energy and comfort (UNI 11300) and the "National guidelines for the energy certification", the instrument has improved the computing methodologies and modified some evaluation indicators among which the Quality of the site indicator.

Starting from the assumption that the outdoor environment is not only an "environmental" heat sink, since the material and energy streams that are established between building organization and surrounding environment influence (in some cases they produce impact) the energy-environmental behaviour of the building-plant system, that is strongly conditioned by the type-morphological, building material and construction and performant characteristics of open spaces, particular planning attention must be paid to the definition of the qualities required to these spaces. Protocol ITACA 2011 - Residence (as well as the P.I.-Offices, whose difference consists for some indicators of the performance scale) evaluate apparently the "Quality of the site" only through six indicators:

- A.1.5 – *Reuse of the Territory*, in terms of reinsertion in the productive/housing cycle of areas temporarily or permanently denied to the use for damage, disposal, degradation; it becomes, however, necessary the preventive verification of the compatibility with its new appropriate use (residence, offices,..) [6];
- A.1.6 - *Accessibility to public transport*, according to which they prefer the sites better served by the public transport network, to reduce the use of the private means of transport without imposing a "sacrificed mobility" on the citizen;
- A.1.8 - *Functional mix of the area*, according to which the quality is higher for those sites already endowed with infrastructures for business, education and health and sports facilities, leisure time and culture facilities: the urban areas!;
- A.1.10 – *Proximity to infrastructures*, valued positively in relationship with the presence of primary (electricity, water, gas, sewerage,...) urban infrastructural networks, in order to reduce the need to carry out the new ones;
- A.3.3. *Well-equipped shared outdoor areas*, appraising its equipment for rest, play and sports;
- A.3.4 - *Support to the use of bicycles*, as much preferred as higher it is the relationship between the number of the bicycles parking places and the number of the prospective users of the area (*Best Practice*: guaranteeing 1 place out of every 5 residents).

Anyway, a careful reading of the instrument makes it deduce that some of the proposed criteria involve the planning ways of the areas surrounding the building and therefore its environmental context:

- B.3.3.- *Energy produced in the site for electric uses*, involves indirectly the planning of open spaces where the energy production system from renewable source is not "on building" but "on earth";
- B.5.1 - *Drinkable water for irrigation use*, wishes the maximum cut of the use of drinkable water for the irrigation of green areas, which brings to a suitable planning of the use of the spaces and meteoric waters recovery and storage systems, not only on building scale, but also on open spaces scale;
- C.3.2 - *Solid waste produced in operational phase*, must be interpreted, from the planning point of view, as the suitable and integrated presence/planning of collection centres to collect different typologies of waste on the base of their appropriate use;
- C.4.2. *Ground permeability*, evaluate the closing of the water cycle in relationship with the typologies of surfaces, for which the design must prefer permeable, transpiring, eco-friendly finishes;
- C.6.8. *Heat island effect* invites to maximize the shaded areas enjoyable in the summertime privileging green areas. So, it becomes useful the use of the "Matrix of site" that connects natural ventilation to sunny open spaces, in order to guarantee suitable comfort conditions all seasons.

Totally, out of 34 selected criteria, 11 concern the conformant and performant characteristics of open spaces at the service of the residence: nearly a third of the criteria!

This happens because the planning attention for open spaces is kept by the awareness that these are complex spaces with the role of a connective tissue of the urban system, not only for the mobility of both material (things, animals and people) and immaterial (energy, data, information,...) streams, but also for the psycho-physical comfort (health) and social comfort (cultural identity) of the modern man, who has got the city as his own prevailing habitat.

Therefore this is our invitation: Let's change the way to plan! So, we will be able to contribute to improve the quality of this habitat not transforming the things, but the way to use them.
In a world that is living a period of strong crisis, a possible exit is turning the sacrifice of few unaware people into a sort of *participated crisis*: "supplies are limited (and) the idea of a rationing (is) correct, (but) it must be definite by those who will suffer the consequences of this" [7]. As we want to say: when you plan "if you make a wall, think of what you leave out." [8]

3.1. The control of the "heat island" phenomenon in urban spaces (M. Cannaviello)

The importance given by the Protocol ITACA to the phenomenon known as "Heat Island" represents the aknowledgment of the importance of an evident effect of the urbanization on the local microclimate, that in the summertime determines not only problems of comfort in open spaces, but also a remarkable increase of energy consumptions for the summer cooling system. Considering that the main causes of such a phenomenon depend on concentration of energy use, variation of the atmospheric wetting caused by the decrease of green areas, lower air circulation caused by the assemblage of buildings and greenhouse effect caused by the atmospheric pollution, one of the factors that mostly influences the phenomenon is represented by the radiative characteristics of the built-up surfaces, that determine the absorption of a large quantity of solar radiation, that is then given to the surrounding environment, in the form of heat, determining a consistent rising of the temperature. This means that the characteristics of both the flooring of open spaces and the building shell have a conclusive effect on the urban heat island. Besides, this phenomenon increases by the geometric conformation of urban centres, generally characterized by tall buildings in comparison with the road width, so it determines a "canyon effect" that traps solar radiation through multiple reflections between vertical closings and roads. It is really this conformation, typical of densely inhabited spaces, to let air cooling happen at night much more slowly than in the adjacent rural areas.
One of the strategies of control and mitigation of the heat island effect could be that one to reduce the canyon effect intervening on the plane-volumetric characteristics of the buildings and on the dimension and conformation of open spaces, in order to individualize a correct relationship between average height of the buildings and road width, but this planning strategy is applicable only in the case of ex-novo constructions. When they intervene in consolidated contexts, already densely urbanized, the easiest way consists in appraising carefully the radiative characteristics of the surface finishes of both urban floorings and buildings, to think about its possible substitution with more appropriate materials.
For the choice it is particularly important the reflection coefficient of the materials themselves also defined as albedo, that expresses the relationship between the quantity of reflected heat and that incident one. The capability to reflect or absorb the incident solar radiation depends mostly on the colour of the surface. The use for the façades or, worse, for the building coverage of surface finishes characterized by low reflection coefficient (dark or middle-dark colours) determines, in the summertime, extremely adverse consequences not only on the building itself, in terms both of interior surface temperature as well as comfort, and of energy performances, but also on the comfort of the urban spaces near that building, contributing to increase the heat island phenomenon. This has lead, especially in geographical areas characterized by very hot summers like Los Angeles City, to the diffusion of a technology as the "cool roof" one, that foresees a coverage characterized by a surface finish able to reflect most of the incident solar radiation and, at the same time, issue, especially at night, thermal energy in the infrared. The final aesthetical effect is, simply, that one of a very clear coverage, whose image inevitably brings us back to the construction traditions of many countries in the Mediterranean area, for which the use of clear colours has strongly represented a typical element for centuries.

Moreover the role of the green area is strategic, it can have, beyond the decorative value, a conclusive function on the microclimate control and, therefore, on the heat island phenomenon, as it contributes to absorb a part of the solar radiation. A green area that, if in densely urbanized situations, as those ones of the Mediterranean area has difficulty to find free non-built-up spaces, can try to rehabilitate abandoned or emerging spaces, through the creation of gardens or urban gardens, or to change completely to find new surfaces to be exploited on the "skin" of the existing buildings. In this way the use of the green area would allow to rehabilitate from the energy point of view, but also from the aesthetical point of view, both the building façades, becoming therefore vertical green, and the coverage, through the realization of garden roofs.

4. Conclusions: the role of the networks in open spaces rehabilitation (R. Franchino)

In order to intervene on the development of the urban territory, the rehabilitation interventions of the existing open spaces must necessarily be faced with particular attention to an environmental friendly behaviour. In this viewpoint the vision of the territory changes, it must be conceived as an organization endowed with a dynamic balance achieved through the technological control of complex functions. The friendly and sustainable territory must be configured, therefore, as an enjoyable safe environment and with high standards of quality, and the consequences of the transformations that assure such conditions mustn't be a burden for the future generations.
At urban scale this rehabilitation for the sustainability, therefore, must consider the territory as a tissue where the border between artificial and natural environment cannot be noticed and each process must be checked, so that its impact and consequently the irreversible degradation induced is as low as possible in relationship with the links of the process itself. Today the problems of degradation and pollution are reflected on all environmental subsystems: water, air and soil, and the technicians are more and more engaged in finding solutions of rehabilitation, not only to intervene "to treat" particularly serious cases, but also "to prevent" possible future problems. Such rehabilitation interventions must consider, besides, also the ecological aspect of the biodiversity conservation to protect the natural processes, the survivorship of the ecosystems are based on, in order to protect the present species and conserve the biodiversity.
In facing the problems of the rehabilitation of the existing open spaces you must consider that currently the human activities are developed in technological complexes integrated with the environment where they are situated and through more and more complex relationships, many of which are based on energy exchanges or products and on material storage or disposal. These exchanges or distributions are supported by continually active networks or non-continuous vectors that determine two ways of relationship; between them the networks have a prevailing role for their characteristics of continuity, availability, flexibility and measurability of the service.
In the urbanized areas the traditional "network distribution" happens through infrastructures that can include: communication networks, relationship networks, energy supply networks, networks for the integrated cycle of the waters, networks for the solid waste management.
A network is a firm, programmable and repeatable system of performance supplies, information interchange, products storage, energy transmission, carriage of things and people, arranged and built in such a way that, unless accidental breakdowns, it is always available on users' request. As the infrastructural networks form on the territory a mesh made up of nodes and connections that aim at establishing relationships with all material and energy streams, it is important that in the interventions of urban environmental rehabilitation they are connected with the ecological and landscape networks that play an essential role in this kind of interventions.
Therefore, in the ambit of the interventions of the territory rehabilitation they propose to reserve an important role to the reconfiguration of the network system, so that from the integration

among the infrastructural, ecological and landscape networks, a new type of network is created, that can be defined as "environmental" [9]; it must consider not only the supplies and streams of material and energy, but also the needs of water, air and soil environmental subsystems. The concept of environmental network doesn't define a network that is physically or for performance different from a tout court infrastructural network, but an infrastructural network that is managed, from planning to construction, operation, disposal, with a special viewpoint of insertion in the environment and qualification of the environment, with friendly and sustainable ways.
This is for conservation and rehabilitation of the natural resources existing on the territory and connection between environmental and landscape values of the areas for an overall enhancement of the territory.
It results, therefore, essential to individualize the links of the energy and mass networks with the environmental base on which they do the service in a way to optimize some configurations for which the networks can be defined as environmental in relationship with the various typologies of urban and territorial contexts.
In the rehabilitation interventions, studying the control of the transformations of the environment with aims of conservation and preservation, through the close examination of the environmental networks [10], means to face it with an integrated approach without reducing it to sector problems that involve complex, interrelated, diversified, and specialist aspacts.
Proposing the study of the networks with the environmental viewpoint means to approach a complex model that can be lead to an easily assimilating synthesis and it makes us be conscious of a very important matter: in the phases of planning, construction and operation of networks connected to infrastructures, single buildings or urban complexes, quality, safety and reliability can be added, which can valorise the environment and not damage it.
Enhancing the environment means to reach levels of quality that it had before human-made interventions happened in the time, that is, in some cases, bring its quality at even higher levels, if possible.

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SARDINIA'S HISTORIC DISTRICTS RENOVATION MANUALS

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Abstract

The historical-traditional Sardinian architecture, represents an important and interesting example from the settlement point of view and the construction in the Mediterranean area.
At the moment, a significant part of the pre-industrial built-up area is strongly threatened by the abandon and the renovation intervention which are not very consistent with the typical techniques and materials of the local building tradition
The renovation Manuals (5 territorial manuals and 2 thematic manuals) and the Atlas of construction culture of Sardinia, have been elaborated lately, at a local and regional level, under the scientific-operative coordination of the Department of Architecture of the University of Cagliari. They are a fundamental tool for the knowledge and critical analysis of the culture of living and the traditional way of building in the various areas of the Island, and to define a virtuous model of good interventions on Sardinia's architectural and identity heritage
Even if it is totally aimed at the Regional scale, the project of the renovation Manuals related to Sardinian historic districts, from a methodological point of view, takes a) an extra-local value as regards the approaches to the traditional heritage recovery problems at different scales (urban, building and material-constructing) and b) the definition of some guidelines to operate on the built-up area.

Keywords: traditional architecture – renovation manuals – typology – technology

1. Introduction

The historical-traditional Sardinian architecture, represents an important material heritage of the Mediterranean area, from a cultural point of view (through its specific versions against some of the big living theme) and from the point of view of the "use" (still being inhabited and being the repository of the peculiarities of recognisability of places and communities).
On the other hand, the historical-traditional Sardinian built-up area seems to be threatened from the deep crisis which alters the secular balance between society and territory. It represents, mostly in the strongly rural areas, one of the main causes of the increasing phenomenon of the abandon and the consequent deterioration. All of this, together with the loss of knowledge concerning the traditional building, and the difficulty to operate on the consolidated built-up area (according to a maintenance and renewal approach and also taking into account the techniques and the materials typical of a specific area) expose the pre-industrial architecture to inappropriate modifications which alter (often in an irreversible way) its substance and its qualities.
However, the historic districts of the various Sardinian cultural aspects, are the expression of a strong identity by means of a substantial homogeneity and the repetition of the characteristics of its basic architecture. They are really important places from the living space qualities point of view and – most of all – they are still able to express an extraordinary interesting potential of use, as well as a material heritage of absolute value.
The project of knowledge of the Renovation Manuals [1] - concerning the local culture of building, the preservation and the renewal of the traditional Sardinian built-up areas – is to be included in such a context. It also represents an important chance for the economic and cultural development of the Regional territory founded on its own peculiarities.
The Sardinia's historic districts Renovation Manuals are articulated into: 5 territorial manuals for sub-regional areas which are characterized by the homogeneity in culture of living and building; 2 thematic manuals aimed at studying and at the specific analysis of row-hearth and stone which play the starring role in Sardinian traditional construction; the Atlas of construction cultures and the related analysis. Their objective is to define the geography of living and pre-industrial building of Sardinia; they also represent an operating tool conceived to define some guidelines for the renewal and maintenance of the traditional architectural heritage.
The need to establish a protocol, shared with the technical community, in order to define the good lines of intervention, gives the series of Manuals a starring role against the operating strategies for the urban improvement and renovation. Nowadays, this is even more important, since the renovation is often financially supported by public institutions (European Community, Regions, Municipalities).

2. Results expected and Users of the Manauals

The results expected from the manuals writing, can be ascribable to cultural and use reasons. The structure of each territorial manual is supported by graphic and descriptive sheets of some case study of typical elements of the

traditional building (roofs, intermediate floors, masonry, opening systems etc.). This structure allows a detailed path of knowledge through which the recurring types of the various cultures of building can be identified and recognized. Moreover, the technical community (focusing on the active protection, maintenance and sustainable modification of the traditional built-up areas) considers the manuals as an useful tool for an aware operating approach, from the knowledge and the methodological point of view.
The natural users of the Manuals are the settled community and the world of the experts with its double articulation between thought and practice. The Manuals pay a particular attention to the first group of users, since the community owns the most part of the traditional-historic heritage and is the starting point for each renovation intervention.
Through its representative system at various scales, the Manuals have the task to clarify to the "not-expert" world, the cultural, use and economic values related to the pre-industrial architecture.
For the technicians, the Manuals are a tool to facilitate the knowledge and the transmission of the methodological intervention approaches more consistent with the traditional culture of building and codify most of the historical building procedures which have only been passed through the "site's practice school".

3. Structure and contents of the Manuals

Since the first years of the twentieth century, the settlement cultures developed in the regional territory and consolidated in each territorial area being culturally homogeneous, have been the object of study in the territorial manuals and in the critical Atlas of construction cultures.
The material-constructing datum represents one of the definition criteria of the homogeneous territorial areas. It allows to distinguish the areas of the raw hearth construction (basically the plans of Campidano, Cixerri and Sarrabus) from the others typical of the stone construction, even if some built-up areas are the interesting result of an interbreeding.
The cultural and geographical areas represent another element of definition and individuation of the territorial areas object of study. In fact, a distinction among the settlement areas of the centre-south hills, the northern hills, and the farthest habitats of south-west Sardinia has been made.
The territorial Manuals are articulated into the following thematic sections:
- Knowledge of the settlement and pre-modern building;
- Analysis of the recurring deterioration problems;
- Definition of a methodological approach and the subsequent guidelines for the renovation interventions according to various critical and invasiveness scales.

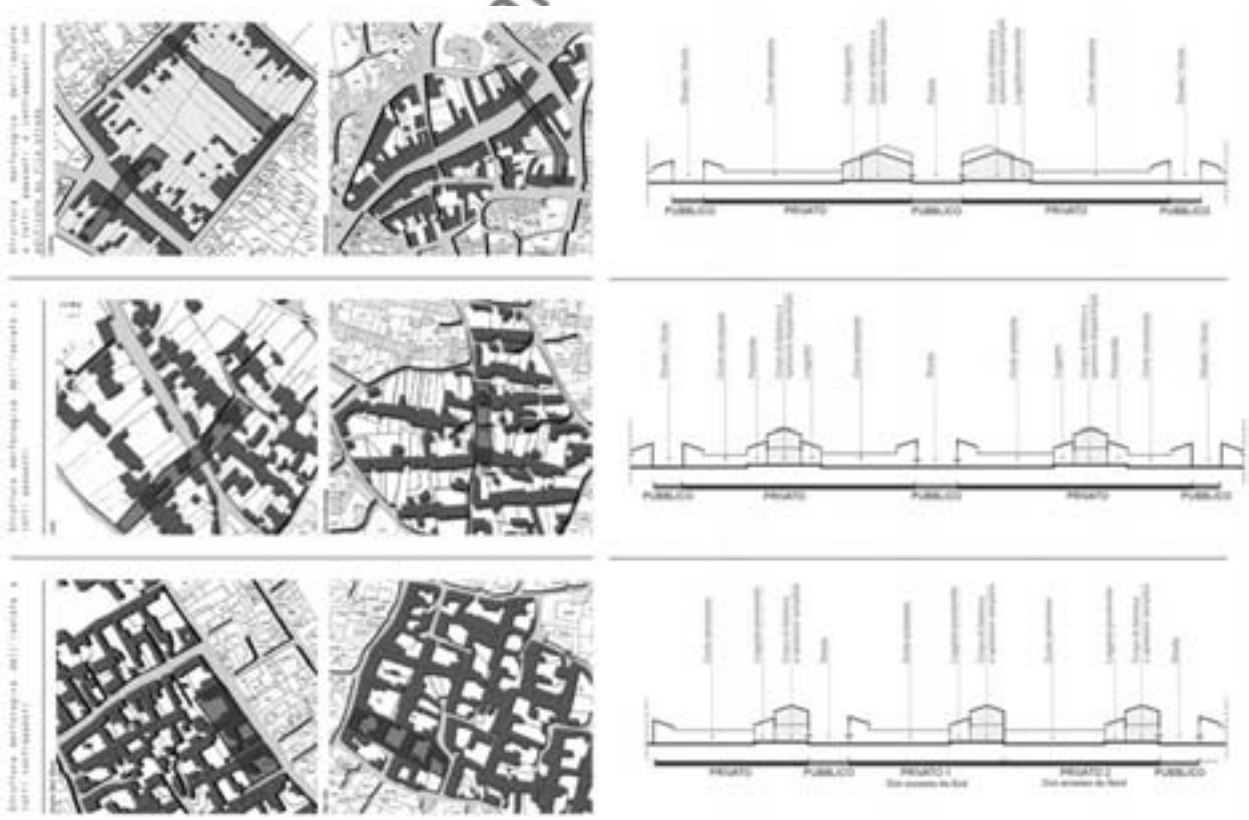

Figure 1. Urban structures of raw hearth areas [2]

The traditional architectural heritage has been investigated at the morpho-typological and technology scales with the help of synoptic diagrams, typological schedules and detailed sheets, in order to associate the systemic nature of the traditional heritage and the really strong relation among urban shapes, building types and cultures of construction.
With these helping elements, the following items have been investigated:
At a urban scale, the settlement rules, such as the position of the iso-oriented residential buildings, the relations between public and private spaces, full and empty;
- At a typological scale, the main parameters have been defined in order to obtain a typological classification of the built-up heritage. This has been done by identifying the reference types at a regional scale (such as the courtyard houses and the elementary cell houses) and then the specific interpretations in which each of them are articulated at a local level and the processes of increasing and division.
- At a material-constructing scale, the main elements of the traditional building, such as masonry, roofs, intermediate floors, vaults, openings, stairs as individual elements and as components of the most complex system of the building organism.
For each territorial-cultural aspect, the followings have been elaborated:

- Interpretations of the urban shapes based on some cadastral maps of the first years of the 20th century, in order to reinterpret the settlements before the changes brought by the technical culture of the project, from the second post-war;
- Typological schedules highlighting the basic building types, the sub-types and the dynamics processes of development and increasing;
- A collection of hundreds of houses raconté through summarizing records that highlight the distribution, structural and constructing aspects;
- Axonometric breakdowns of the houses that relate the typological characters to the building ones;
- Summarizing schedules and specific technological sheets to have a more detailed picture of the main building elements.
The analysis of the recurring deterioration and pathologies essentially refers to the study of the technological deterioration from a double point of view:
- deterioration of the structural systems as a whole;
- deterioration of the manufacturing elements in their individuality and of the constituent elements.

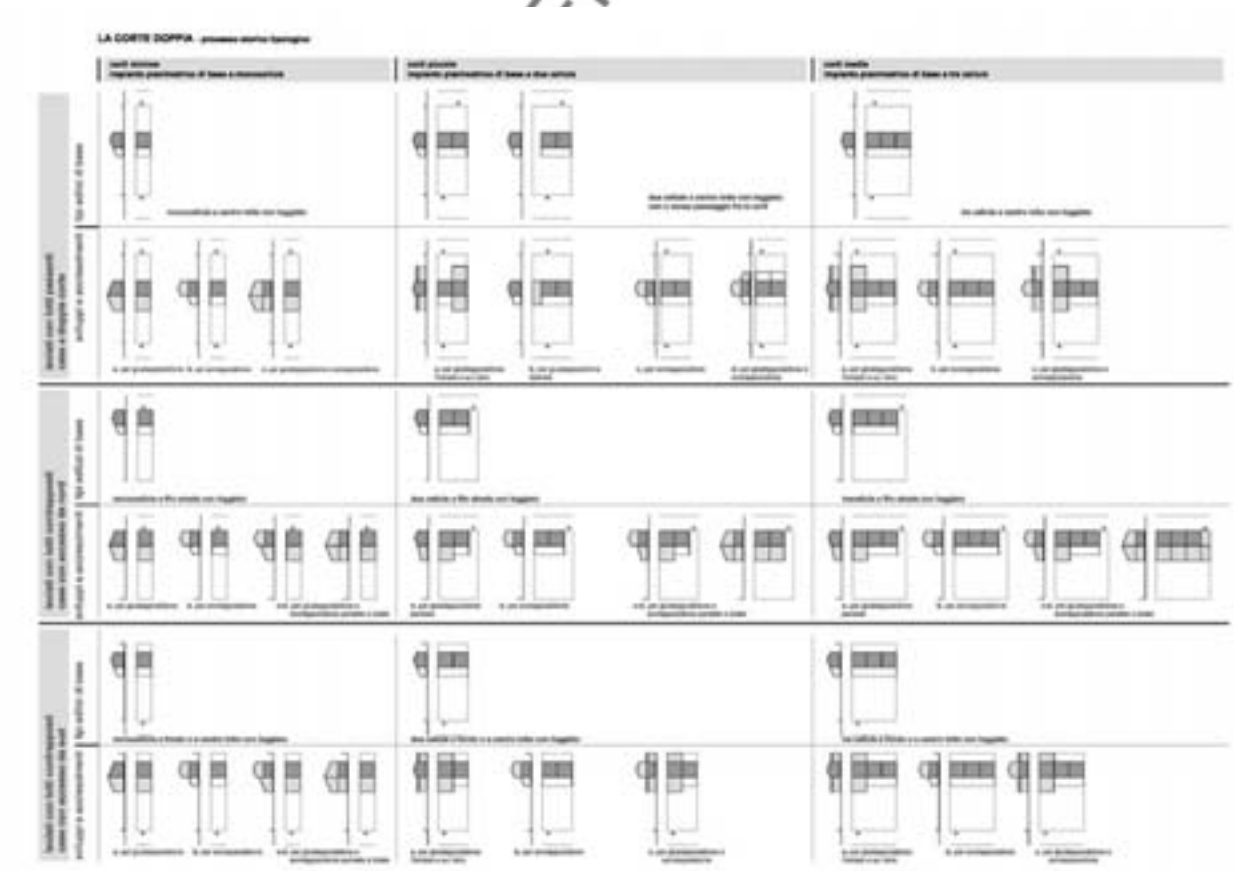

Figure 2. typology sinoptic table of court houses of Marmilla region [3]

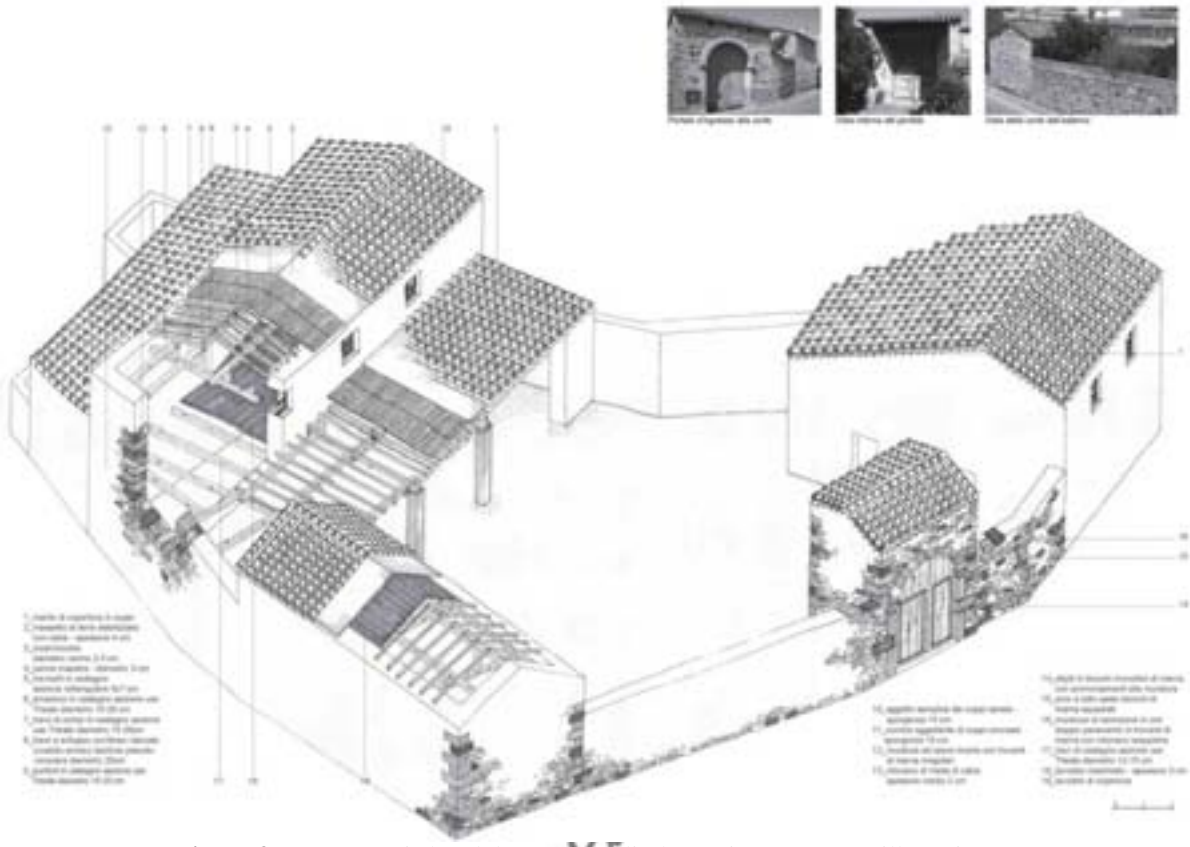

Figure 3. Axonometric breakdown of Cauli's house in Pau - Marmilla region [4]

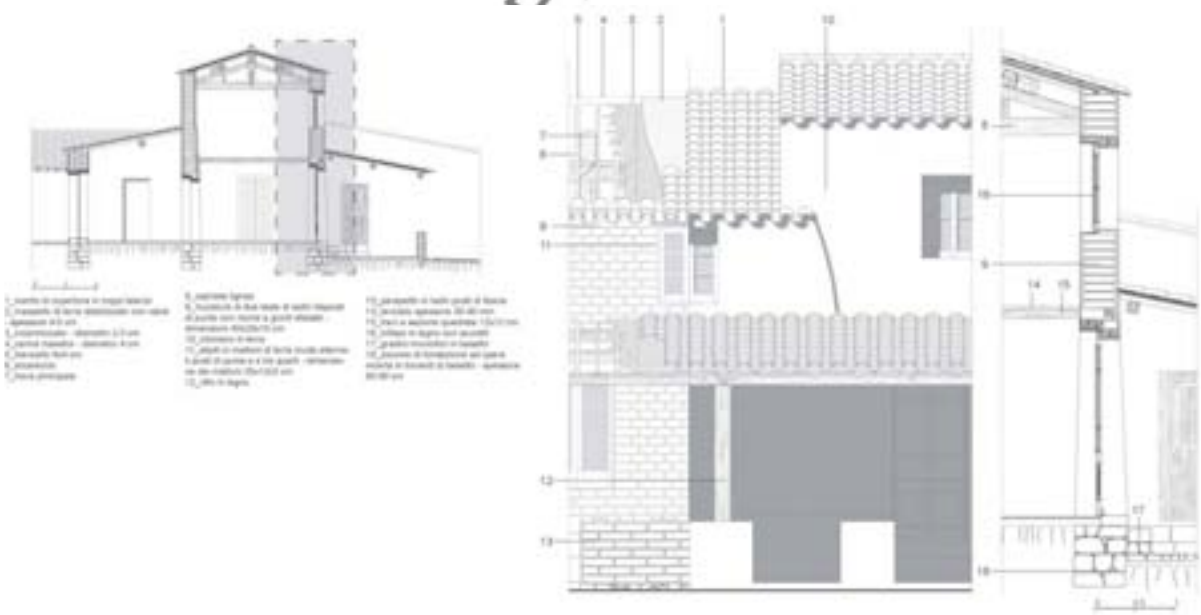

Figure 4. technological schedule of raw heart houses in Uras – central Campidano region [5]

The recurring pathologies such as the degree of mutual connection among the walls composing the wall cell, the consistency and the monolithicity of the walls as a whole, the relations between the pushing structures and the wall cells, have been investigated since they are at the basis of the more relevant deteriorations of the traditional manufacturing and they also represent the most difficult problems in renovations.
Each deterioration category of the structures has been shown, highlighted and analysed with the help of specific schedules and interpretation layouts.

At the same time, the main approaches to renovation – related to the above mentioned pathologies – have been pointed out. The proposed intervention guidelines are inspired by the principles of the minimum sustainable intervention and the maintenance, recognizing the nature of "construction box" of the traditional manufactures.
The analyzed techniques propose that the original material is preserved whenever it is possible, and the elements damaged in an irreversible way have to be replaced according to little invasive methods and not altering the original building system.
The intervention techniques aimed at the consolidation of the wall boxes, are investigated. The goal is also to eliminate the stresses coming from the covers, to award and consolidate the wooden horizontations which are deteriorated and/or structurally undersized, to consolidate the opening structures, to create a package for the ventilated roof that mix together the contemporary performance needs and the needs to maintain and protect the building heritage, a basic closure etc..

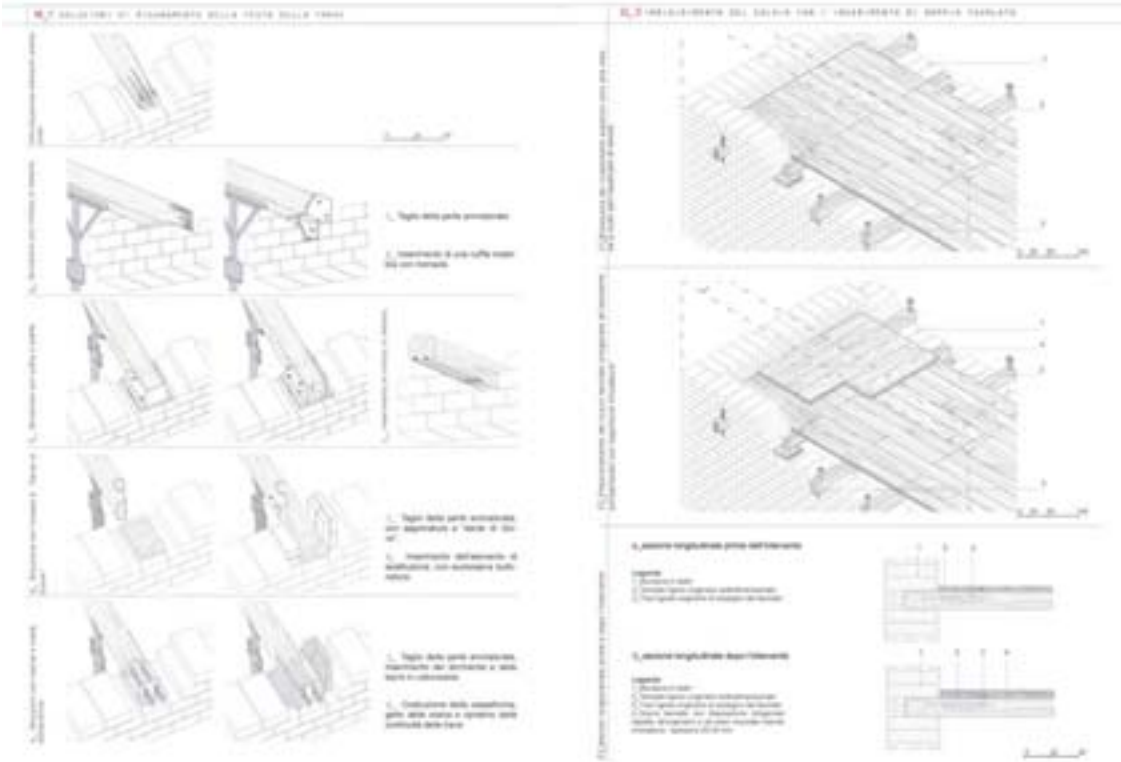

Figure 5. exemple of restauration schedules [6]

4. Conclusion

The summarizing sheets and schedules are integrated and allow to have a complete picture for each manufacturing element, from the original construction point of view and its form of deterioration, and the related methods of intervention, leading to a more immediate and aware renovation approach.
The sheets describing the methodological intervention lines do not want to solve all the problems related to the renovation of the historic heritage. They propose some operational and direct approaches and techniques concerning the recurring deterioration cases.

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BIOCLIMATIC APPROACH IN URBAN OPEN SPACE RETROFIT INTERVENTION: THE CASE OF PRATI AREA IN ROME

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Abstract

Modern climatic comfort needs and technologies aimed at energy self-production impose a wide perspective in the management of urban space and existing building fabric in Italy; this perspective should address energy efficiency, environmental, social and financial sustainability on a medium/long term period in relation to the built environment and in between spaces, in other words, in relation to urban reservoirs. In light of these considerations the main objective of this research was to evaluate and compare how the air temperature variations in relation to fluid-dynamic phenomenon in urban contexts can influence energy consumption related to climate construction in the Mediterranean. By means of an open confrontation on the solutions that are undergoing experimentation in Italy and in the rest of the Mediterranean countries, a research on the Prati area in Rome was developed, with an interdisciplinary group that tackled the complex relationship between potentiality and limitations of the current Mediterranean urban form model, following an innovative approach aimed at defining action scenarios that ought to be implemented acting on building's façades, outdoor paving systems, green in between spaces and ventilation. In order to accomplish the above mentioned objective we used a series of numeric and calculus simulations that took into account urban morphology, identified and evaluated in each case, in order to deliver an optimal understanding of urban form implications, with reference to building's height and densities, surrounding vegetation height and density and paving systems' characteristics.

Keywords: urban open space, retrofit, microclimate, environmental design

1. Introduction

Modern climatic comfort needs and technologies aimed at energy self-production impose a wide perspective in the management of the building fabric and of the existing open space system; this perspective should address energy efficiency, environmental sustainability and bioclimatic comfort problems also form a social and economical point of view on a medium/long term period. This kind of consideration is capable of exploiting all the efforts that collectivity makes not only in terms of expense items – in this regard it is important to point out that at present these structures are highly *energy intensive* – but also in terms of investments for a new action model on a rich, complex and extensive existing building fabric that needs to be managed just like the consolidated building fabric; such investments need to take into account the binding need for energy efficiency and biophysical and bioclimatic aspects' valorization for the overall environmental sustainability of the system.
In light of these considerations the redevelopment of the spaces "between" buildings [1] represents an interesting field of research; such spaces are represented by the network of urban spaces that, even within a wide typological, morphological and use variation, still represent, in the Mediterranean context, privileged fields where numerous outdoor activities take place [2].

Figure 1. Site analysis

It therefore appears important to define intervention strategies that, a part form satisfying basic needs related to use and aesthetic qualities, to safety and air quality, have the aim of improving environmental compatibility and users' multi sensory comfort, paying special attention towards thermal and hygrometric comfort. The latter is, in fact, a key aspect that affects the actual use of outdoor spaces mostly during summer time when maximum use occurs, period during which overheating is common and the effect of UHI, Urban Heat Island - that is the difference in temperature between urban areas and low anthropization level contexts [3] - becomes relevant.

2. Definition of the research field and the research objectives

Research and action on the Rome XVII Municipio territory are moving towards this direction; it is a commitment that pays particular attention towards public buildings, outdoor spaces, marginal areas and urban voids in order to improve bioclimatic performance in terms of summer heat dissipation, thanks to a redevelopment project that fosters the use of passive cooling systems and innovative materials and vegetation. Starting with the analysis of the microclimate-morphology relationship of spaces we then went on defining environmental comfort improvement strategies, even in urban areas with pronounced historical qualities, high level of compactness and consolidated character, suitable for low impact surgical actions, respectful of the context. The ultimate goal was to determine a set of best practices and design solutions that could be repeated and adapted to other similar conditions present on the territory of the City. Moreover the Prati district appears as a representative sample of an urban typology, densely populated areas with courtyard blocks, which are characteristic of the building expansion model in many Italian and foreign cities during the 1800-1900s, and therefore allowing for an application of the collected observations to many similar areas.
In the Prati area, the main surveyed area encompasses the urban reservoir defined by viale Mazzini, from piazza Mazzini to piazza Montegrappa, up to the Tiber, including the facing square and the National Boarding School courtyard. This area was chosen because it allowed to consider, within the same system, various contexts representing the urban typology: the wide street lined with trees – viale Mazzini; the secondary paths with an urban canyon like character [4], represented by the neighboring streets; the open space with trees – piazza Mazzini; the paved open space in the area in front of the National Boarding School; and the paved courtyard of the National Boarding School Itself.

Figure 2. Annual solar radiation on roof covers; reference roof cover: National Boarding School roof

3. Analytical-cognitive phase

The research methodology included a site analysis preliminary phase. The main climatic factors, represented by the average air temperature, solar radiation, wind speed and humidity and the related seasonal and daily fluctuations were determined; this data was determined looking at the related meteorological stations, but they will have to be integrated with on site measurements. Then the morphological characteristics that best show the relationship with the microclimate were identified: form and size of open spaces and surrounding buildings; building density; SVF, Sky View Factor (defined by Steemers, [5] as the three dimensional measurement of the solid angle of sky view from an urban space, which determines the radiating heat exchange between city and sky); shading; the reflection and emissivity characteristics of materials and surfaces present in outdoor spaces (facades, roofs, paving systems); vegetation quality through an accurate survey of the existing vegetation.
Afterwards we considered different possible indicators that could describe the microclimatic conditions and the thermo hygrometric comfort of the site, operating through MRT (Mean Radiant Temperature), and PET (Physiological Equivalent Temperature). The first parameter measures the average of temperatures for surfaces in an environment, that are involved in a radiating thermal exchange and it represents the influence of the urban reservoir, the morphological system and the materials on microclimate [6]. The second indicator, specifically developed for exterior spaces, defines the temperature as users perceive it, taking into account overall environmental

meteorological factors, thermal balance and thermoregulation processes of the human body, and therefore delivering a comfort value estimate that can easily be understood [7]. Its accuracy, together with the other outdoor comfort indexes, has recently been questioned [8] since it underestimates the strong adaptation capability of users to variable outdoor conditions and therefore it may result in an excessively negative evaluation compared to the actual perceived sensation; despite this, the PET allows us to define at least the trend of comfort with a fair amount of accurateness. Then we moved to the next step which was to analyze the possible space morphological transformation strategies, deriving from reference literature and analysis of significant case studies that can be applied to the specific context; since it was impossible to perform invasive actions variations on surfaces, integration of vegetation and shading device implementation were considered. The possible actions operable on surfaces include: exterior paint or substitution of plaster coating on facades and roofs and the introduction of new materials on roofs and paving systems; allowing both color variation and innovative systems such as "cool pavements" and "cool pigments" that present a high reflecting coefficient and high emissivity which lower heat gain [9]. Moreover, we hypothesized the implementation of green areas in punctual, linear and spread configurations of ground cover or trailing vegetal elements and the integration of artificial shading devices: horizontal or vertical, movable or fixed.

4. Evaluation-instrumental phase

After this preliminary phase, characterized by information gathering procedures, we went on assembling a computer model within suitable simulation software, where previously collected climatic and morphological data concerning the research field could be merged. Such a model allows us to calculate the indicators related to microclimate and comfort (MRT e PET), selected both during the system's initial stage, highlighting problems and faults, and following the implementation of the design strategies analyzed, in order to evaluate their effectiveness and highlight the relationship between microclimate and morphology. The strategies can be considered both singularly and within a system, in order to define implementation scenarios and classify them based on invasiveness of the actions, on financial feasibility and environmental compatibility. The above mentioned analytical-evaluation phase, still in progress, will lead to the conclusive definition of several good practices, derived form the considered scenarios, repeatable and adaptable to other similar conditions present on the territory of the area and to urban typologies and adequate climatic conditions.

5. Considerations on the outcomes (present state problems; evaluation of possible scenarios)

At the moment we are calculating the microclimatic and comfort indicators in respect to rounded climatic conditions obtained form the reference meteorological station, whereas a detailed assessment will be carried out after we have identified, by means of field measurements, the most realistic surrounding conditions that will allow to "calibrate" the software model on the initial condition [10]. It is nevertheless possible to make some considerations on the results that have been obtained until now and to indicate the possible outcomes of the research.
The current survey state analysis has highlighted problems and merits related to the close interdependency between morphology and microclimate in consolidated urban spaces. In the specific, it appears quite evident that microclimate in the piazza Mazzini and viale Mazzini area is strongly influenced by the vegetation present on its surfaces, that acts as a stabilizing and climatic control mechanism, mostly in the summer time. In fact, the presence of linear patterns of trees guarantees air cooling thanks to the shading property of trees themselves, to the evaporation of their foliage and to their radiant temperature, which is also very close to the radiant temperature of the human body (25° - 30°), although their density tends to partially reduce summer ventilation. On the contrary, along the neighboring streets, despite the fact that direct sun radiation is limited by the surrounding buildings' shadows, the UHI phenomenon appeared consistently; this is caused both by the high density of buildings, that corresponds to a low SVF factor and a low ventilation, and to the low reflection coefficient and the high emissivity of cladding materials, mostly represented by dark plaster coating and asphalt. The square in front of the National Boarding School and the courtyard of the same building appear overheated instead, due to the lack of shading devices and to the low reflective coefficient of the paving.
Although a detailed evaluation of the improvements to the microclimate obtained through the implementation of several requalification scenarios will only be operable at the end of the research, we wish to point out how by substituting the materials used for boundary surfaces of the urban space – simply changing color or using "cool pigments" for facades and roofs and "cool materials" for roofs and paving – it is possible to obtain good results in terms of air temperature reduction and UHI mitigation, and they are certainly low cost solutions that can easily be executed. The use of "cool materials" in particular has proven to be extremely effective for a substantial MRT reduction, although it is still hard to evaluate the influence that wearing and dirt can have on the performance of paving systems and their price is still quite high compared to equivalent traditional products. Also the use of artificial shading devices appears suitable for areas where direct sun exposure is considerably high; when dealing with high building densities, which correspond to a low SVF factor, it is preferable to use material with reduced thermal capacity and movable systems, more expensive and harder to manage, but bearing the advantage of favoring

night heat dispersion of close surfaces when they are in the closed position. The integration of vegetation, possibly local, brings forward several advantages in terms of MRT control, air cooling and shading, in addition to the well known aesthetical, use, perceptive, psychological and air quality control advantages, but it is equally important to consider the use of maintenance systems that will guarantee their healthy development and it would be desirable to use "transition" shading devices during the period of time needed for the plants to reach their optimal mature stage of growth.

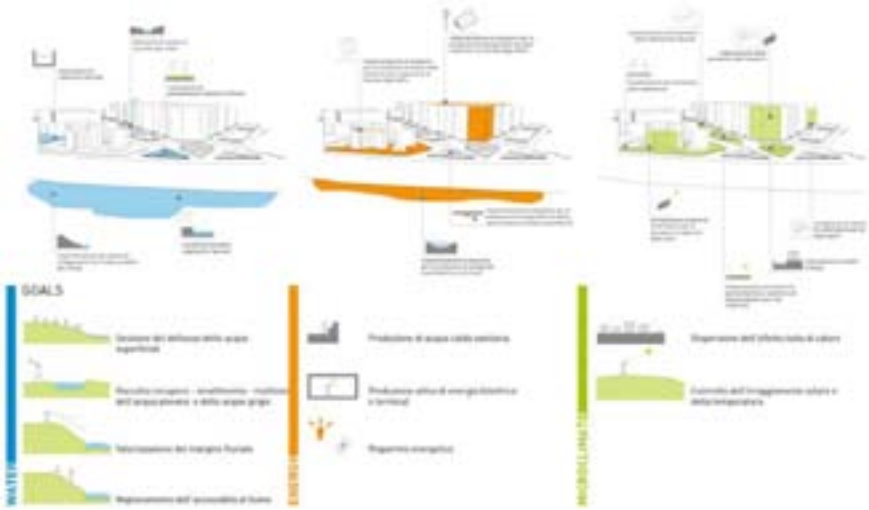

Figure 3. Design strategies and goals

6. Conclusions

At the present state of research, the strong interdependency between morphology, microclimate and comfort in outdoor spaces is confirmed, and therefore we need to integrate these parameters in the redevelopment strategies in addition to the usual functional, design and economical considerations. Moreover we were able to point our how even small variations in the choice of materials, vegetation and shading devices, applicable to strongly consolidated urban contexts, can considerably contribute to the improvement of thermo hygrometric comfort and to UHI phenomenon mitigation.

A further development of the research could examine more in depth the interaction between users and microclimate, taking into account not only the user's physical conditions and the activities they carry out, but also and most of all their capacity to adapt to outdoor condition variability, deriving from physiological, psychological and cultural conditions. Moreover, in a system perspective, it would be desirable to consider the existing relationship between indoor and outdoor microclimate, evaluating how sustainable redevelopment design strategies applied to outdoor spaces have direct consequences also on indoor comfort levels, and they can therefore be integrated with buildings' passive bioclimatic control systems.

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THE GALEB OF SOUTHERN TUNISIA: FROM TRADITION TO INNOVATION

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Abstract

The *Galeb of Kebili* is a sun-dried and unfired brick belonging to the construction tradition of the homonymous "oasis city" of southern Tunisia, obtained by mixing water, burned gypsum-rich Sahara sand and palm wood ash.
In order to improve its mechanical properties, the use of pieces of palm leaves as reinforcing fibers was evaluated. Preliminary results appeared promising. In fact, although the presence of fibers into mortars led to an increase of open porosity and a reduction of flexural and compressive strengths, an improvement of flexural behaviour of gypsum mortars was detected. Further enhancements should be likely obtained increasing the length-to-width ratio of the fibers by reducing their width.

Keywords: desert building, gypsum, local materials, fiber reinforcing

1. Introduction

Tunisia, especially its southern oasis, includes some of the most important richness of the architectural and environmental heritage in the Mediterranean area.
The "oasis cities" are, generally, located in a desert environment characterized by a beautiful natural landscape but also by aggressive climate conditions: extreme temperatures, severe drought and strong sandstorms blowing from various directions [1,2]. Vernacular architecture, that has its origins in nature, represents a result of human creative genius [3], using local natural resources for surviving in this extreme surrounding.
In these cities, the oasis is commonly used as a first protection against the harsh weather. It creates a specific microclimate reinforced by a particular urban typology which helps to reduce wind force and providing shades for reducing the aggressiveness of the high summer heat. This urban typology is characterized, especially, by a compact urban tissue, narrow and curvilinear streets covered in some parts creating shadow areas, and traditional homes with inner courts and introverted rooms creating a specific bioclimatic effect withstanding the harsh external desert climate [4].
Kebili, Touzeur and Nefta represent emblematic examples of "oasis cities", which are characterized by a peculiar architecture based on the use of local building processes and construction materials.
The *Galeb* of *Kebili*, as well as the *Galeb* of *Touzeur*, and the palm wood represent some of the typical local construction materials used in the oasis cities of southern Tunisia.
Tha *Galeb* of *Kebili* is a sun-dried, unfired brick (size, about 15x15x30 cm) obtained by mixing: (1) water; (2) Sahara sand, fired using palm wood waste as combustible; (3) resulting palm wood ash. The typical steps of the traditional production process are shown in Figure 1.
The Sahara sand used in the *Kebili* region is essentially a gypsum-rich raw material. Gypsum, a rock-like mineral commonly found in the earth's crust, is one of the oldest construction materials [5]. In fact, it is extracted, processed and used by Man in construction or decoration in the form of plaster since Pre-Pottery Neolithic (ca. 7200-6000 B.C.) [6]. A plaster was discovered in Çatal-Hüyük in Asia (central Anatolia, Turkey) in an underground fresco (7000 B.C.) [7]. Gypsum plasters were also common in construction in the grasslands and steppes of northern and eastern Syria, in the drainage area of the Tigris and Euphrates and further east [8]. During the time of the Pharaohs, gypsum was used as mortar in the construction of the Egyptian pyramids (3000 B.C.) [9].

Large deposits of gypsum (gypsum crusts) are present in widespread areas of northern Africa, including southern regions of Tunisia [10].
In last decades, the introduction of the modern construction economics has led to a relinquishment of traditional materials and techniques in the architecture of the southern Tunisian regions.
Recently, several international projects aiming to recover both building traditions and cultural identity of this area also through an innovation process meeting sustainable architecture, building and culture, have been activated[1].
In this paper we report the preliminary results of a study aiming to better understand and innovate the *Galeb of Kebili* manufacturing process. In particular, possible improvements in the brick's physical and mechanical properties, using pieces of palm leaves as reinforcing fibers in the starting mixture, have been evaluated.

Figure 1. Typical steps of the traditional *Galeb of Kebili* production process:
(a) excavation in the sand of the combustion "chamber"; (b) sand firing by palm wood combustion; (c) fired sand and palm wood ash mixing; (d) rough sieving of the mixture; (e) bricks forming; (f) bricks drying.

2. Experimental

Samples of Sahara sand, either raw or burned, and palm wood ash coming from Bechri (Kebili region, Tunisia), were used. Fibers, having dimensions (length x width, cm) of 1x0.1 and 2x0.1 as mean values, were obtained by cutting palm leaves with a thickness of about 0.40 mm.
The mineral composition of the raw sand, roughly estimated by X-ray diffraction (XRD Philips PW 1730 apparatus, rad. CuKα1), thermal analysis (Netzsch STA409 PCLuxx apparatus), and micro analysis (Oxford INCA 200) was as follows: about 97% of $CaSO_4 \cdot 2H_2O$ and 3% of minor phases, mainly SiO_2. Morfological analysis was carried-out by electron scanning microscopy (SEM) using a Cambridge S440 instrument (Micrographs in Fig. 2).
Four different mortar mixtures were prepared using burned sand (S), burned sand with palm leaves ash (SA) and burned sand with ash and 1% (w/w) of fibers with different length (SAF1 and SAF2). To obtain normal consistency and good workability all the mortars were obtained using a water to sand ratio (w/w) equal to 0.5. The composition of all the tested mortars was summarized in Table 1.
Mortars were cast in 4x4x16 cm prismatic moulds, compacted and cured for 7 days in a climatic chamber (MSL, mod. Humichamber EC 125) at the following conditions: 25°C and relative humidity of 65%.
Some physical properties were determined; in particular, the porosity accessible to water, defined as the ratio of the volume of the pores accessible to water to the bulk volume of the sample, the real density and the apparent density. All these parameters were measured according to the RILEM prescriptions [12].

[1] In 2004, an integrated program aiming to valorize Sahara and Southern Tunisia regions, titled "Study, preservation and valorization of Tunisian Oasis Cities", has been promoted by the Architecture Faculty of Mediterranea University of Reggio Calabria and supported by the Italian Ministery of Foreing Affairs [11].

Figure 2. SEM micrographs at different magnification of the raw sand.

Table 1. Mortars composition

mortar	palm wood ash	water/sand	fibers length (cm)
S	no	0.50	-
SA	yes	0.50	-
SAF1	yes	0.50	1
SAF2	yes	0.50	2

Mechanical characterization of the mortars was carried out following the European Standard UNI-EN-1015-11 [13]. Both the three-point flexural tests and compression strength tests were evaluated using an Instron 5566 compression machine, with a 5 kN load cell. The rate of loading in each test was 0.6 mm/min. All the results reported below are the average value of three specimens.

3. Results and discussion

Table 2 summarizes the physical parameters evaluated for all the manufactured mortars, compared with a traditional handmade *Galeb* of *Kebili* brick coming from Bechri, Tunisia (GK). As it appears from the data, both fibro-reinforced mortars (SAF1 and SAF2) exhibit an open porosity widely greater than the ones exhibited by the mortars without fibers (S and SA). The increase of porosity is probably related to the presence of the fibers, which affect the mortar workability and are responsible for the presence of micro cavities, where the precipitation of gypsum cristals is inhibited. The slight difference in porosity between the mortars manufactured with and without palm wood ash (SA and S, respectively) is probabily related to the different porosity of the ash compared with the binder matrix.

Table 2. Physical properties of cured mortars.

Mortar	Apparent density [g/ml]	Real density [g/ml]	Open porosity [%]	Water adsorption [%]
S	1.20	1.89	36.43	30.45
SA	1.22	1.95	38.45	32.05
SAF1	1.14	2.16	47.06	41.14
SAF2	1.06	2.03	47.83	45.18
GK	1.27	1.88	32.60	25.70

Moreover all the samples manufactured in laboratory, even if without fibers, are more porous than the brick coming from Kebili (see Table 2). This is probably due to both the different seasoning conditions (temperature and relative humidity) and to the millenary skills of Tunisians artisans.
As expected, the rising of total porosity in the fiber-reinforced mortars affect negatively the mechanical properties. As a matter of fact, inspecting data reported in Table 3, both the flexural and the compressive strengths of all the reinforced mortars appear to be lower than those without fibers.

Table 3. Mechanical properties of cured mortars.

Mortar	Flexural Strenght, R_f (MPa)	Compressive Strenght, R_c (MPa)
S	1.19	3.59
SA	1.45	5.29
SAF1	1.11	2.30
SAF2	0.91	2.22

The worsening of mechanical properties is also due to the weak bond between fibers and binder matrix. Indeed, when the fracture occurs, the fibers undergo a pullout phenomenon, because the anchorage strain is achieved before than the mechanical resistance of the fiber (see Figure 3).
Nevertheless the presence of short fibers, above all in the SAF2 sample, results in a change of the post-cracking behavior, as the fibers provide a crack-bridging action. Cracking of a hardened gypsum mortar, in fact, occurs as a propagation of a defect inside the binder matrix. The fibers bridge action consists in a break of matrix continuity with a consequent reduction of defects propagation [14]**.** Results obtained from three point flexural tests (see Fig. 4) confirm that SA sample exhibits a typical brittle-like behavior, whereas the fiber-reinforced mortar SAF2 exhibits a behavior close to a ductile-like one.

Figure 3. Surface fracture of specimens SAF2.

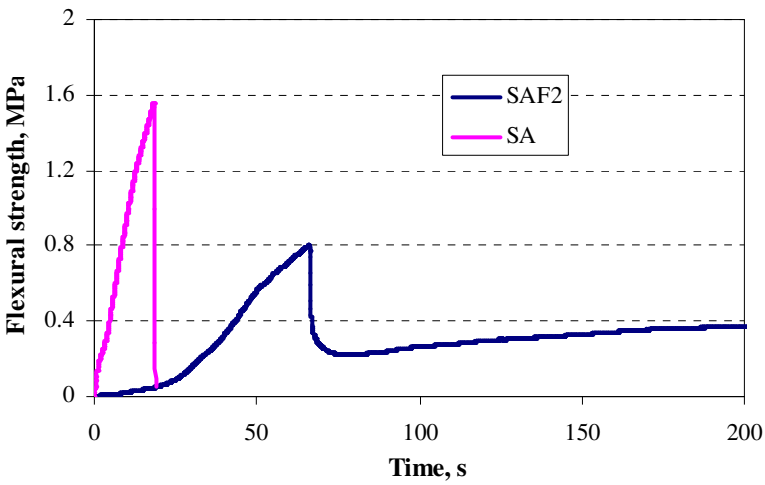

Figure 4. Effect of fibers on the flexural behaviour of gypsum mortars.

It is interesting to note that best results in flexural and compressive strenghts were obtained in correspondance of SA sample, meaning that the presence of palm leaves ash gives a strong contribute to the mechanical resistances. Therefore the role of the ash and its components should be investigated.

4. Conclusions and future perspectives

Preliminary results concerning possible improvements of the *Galeb of Kebili*'s mechanical properties by using pieces of palm leaves as reinforcing fibers, seem to be promising.
In fact, although the presence of fibers into mortars led to an increase of open porosity and a reduction of flexural and compressive strengths, an improvement of flexural behaviour of gypsum mortars was detected. Further enhancements should be likely obtained increasing the length-to-width ratio of the fibers by reducing their width.
Additional investigation is needed for better understanding the contribution of the ash to the physical and mechanical properties of the bricks.

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THE VERNACULAR ARCHITECTURE OF THE TUNISIAN OASIS-CITIES: ELEMENT OF A SPECIFIC CULTURAL LANDSCAPE

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Abstract

Le Città-Oasi della Tunisia sono localizzate nel sud del paese e, particolarmente, a sud-ovest, in un paesaggio cultutrale specifico ed ecezzionale.
Le palme da dattero, elementi fondamentali della ritualità fondativa della Città-Oasi, rappresentano, per i loro abitanti, un importante simbolo di vita e di ricchezza. Esse, inoltre, costituiscono i più importanti schermi naturali in grado di contrastare le difficili condizioni climatiche della particolare ambientazione desertica. I palmeti, infatti, permettono che si realizzia un micro-clima assolutamente differente rispetto alle condizioni esterne, consentendo la creazione di ampie zone d'ombra e conseguire l'attenuazione delle significative azioni dei venti spesso, anche molto forti.
All'interno delle Oasi, la temperatura è, quindi, addolcita e l'aria è più fresca e umida, il che, facilmente ne spiega la forte ricettività insediativa.
La particolare condizione microclimatica favorita dalla presenza di tali piantumazioni, e la complessiva migliore vivibilità delle realtà ambientale delle oasi, è altresì migliorata dalla tipologia urbana del tessuto dei centri in esse insediate.
L'adozione di questi accorgimenti, costituendo la risposta adattiva alla necessità di protezione della popolazione insediata alle aggressive condizioni climatiche esistenti, al contempo, ed altrettanto significativamente, caratterizza e definisce la particolare tipologia dell'impianto urbano che, strutturandosi, univocamente, sul carattere del Luogo e della sua natura, influenza la definizione del linguaggio, della tipologia e dell'identità di un' architettura vernacolare eccezionale.

Keywords: vernacular architecture, cultural landscape, identity

1. Introduction

The Tunisian Oasis-Cities, located in the south part of the territory, represent specific areas, known especially by their vernacular architecture which promises the better living conditions in such extreme climate like desert. The vernacular architecture of these Oasis-Cities is characterized, specially, by specific urban morphology and construction typology. It is also specified by its particular location and microclimate in exceptional cultural landscapes which have significantly contributed to its local identity.

2. Location

The oasis cities of Tunisia are located in the south part of the territory, particularly, in the south-west at a latitude between 32° and 34°30' and a longitude between 7°45' and 11°45'.
Touzeur and Kebili are one of the most important oasis-cities in the Tunisian South, considering their territorial extension with both quality and quantity of their palm trees products. These represent the most important local economic resource.
In Southern Tunisia, apart from the Oasis-Cities of Tozeur and Kebili, exist other realities represented by the Oasis-Cities of Gabes, Gafsa, Mednine,Tatawine…. However, the quantity and quality of the palm products is not comparable to Touzer and Kebili. Therein, they are highly appreciate and usually exported to foreign market.
Generally, the Tunisian Oasis-Cities are divided into three categories according to their locations respectively:
- Desert Oasis-Cities: such as Kebili and Touzeur, are well known by high quality palm products and specific building material for extremely aggressive desert environment.
- Mountain Oasis-Cities: such as Tamaghza and Mides, are usually located on mountain slopes, which well protected from the strong winds. They are also well-resourced as building materials but the quality of palm products is not as good as the desert Oasis-Cities' palm product. The climate conditions in these regions are less aggressive.
- Coastal Oasis-Cities, such as Jerba, Gabes and Mednine, are located in the South-Eastern part of the country. In this area, Oasis are smaller and the climate is less aggressive. However, the sea water has negative influence on the quality of palm fruit.

3. Climate

3.1. Temperature

Throughout the year, the average temperature in the Oasis-Cities is around 20.9°C. In summer (June, July and August) the temperature can reach up to above 55 ° C, and with variance of 30°C between day and night. However, during the winter (December, January and February), the temperature values generally, does not exceed the +13.1°C and can even drop to -3°C.

3.2. Evaporation and relative humidity

Inside the Oasis the evaporation rate is usually between 2,520 and 2,550 mm/year. However, outside the Oasis it can reach the values between 4,300 mm - 5,000 mm/year due to the lesser plantation coverage. With the increment of the temperature, the relative humidity, which is generally between 50% and 80%, can go down maximum 30% during the summer.

3.3. Ventilation

The Oasis-Cities are exposed to various directions of wind, especially from the North-East, with an average speed around 9 km/h, but sometimes the speed of wind can be increased up to 113 km/h.
The wind blows, across the Tunisian south, for 120 days per year. The Sirocco covers the summer season, from May to August, with an average duration of approximately 45 days. In the spring (March- May), the sandstorms are blowing from the east and north-east, with an average duration around 50 days. These storms are threatening the seasonal agriculture and the life comfort of local habitants. Because of that, people in that region have created different landscape solutions to withstand the aggressive weather conditions.

3.4 The rainfall

The Oasis' regions suffer from the almost total absence of rain. The amount of water is very low and sporadically distributed. The average rainfall is about 90 mm per year, of which 2/3 fall irregularly in the autumn and the beginning of winter. In these regions, there is phenomenon which occurs usually every twenty years which resulting the draught and flood that disturbing the normal life.

4. Cultural landscape

"In 1992 the World Heritage Convention became the first international legal instrument to recognise and protect cultural landscapes. The Committee at its 16th session adopted guidelines concerning their inclusion in the World Heritage List.
The Committee acknowledged that cultural landscapes represent the "combined works of nature and of man" designated in Article 1 of the Convention. They are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal." UNESCO

The Oasis-Cities of the Tunisian South are characterized by the presence of various cultural landscapes, which is considered as one of the most important resources for local habitants.
Such cultural landscapes include especially:
- Vernacular architecture: It characterizes and identifies these regions by a specific and particular construction approach in aggressive environmental conditions. The palm wood and the earth represent the most specific natural building materials, traditionally, used in the construction of these cities. These architecture and technical material potentialities testimony the wealth of this exceptional local building culture;
- Agriculture cultures, special cultivation of date palms: Date palms are the most important and suitable plants in these regions. They have good resistance against high temperatures and water shortages. In southern Tunisia, there are more than 10 million of date palm trees. The palm products, particularly those named as Deglet Ennour, are considered as high quality fruit and they represent the first natural resource of the primary sector of the Oasis-Cities. In autumn, more than 500,000 T of dates are collected, of which 3/4 are addressed for the foreign markets;
- Natural landscapes, such as deserts, mountains and chott: These surroundings represent specific elements of the Oasis-Cities environment of the South Tunisia. These natural landscapes characterize these regions by an aggressive natural environment but also by a particular charm and beauty.
- Festivals and crafts: The Tunisian Oasis-Cities are characterized by specific local traditional cultures which are clearly recognized during the numerous Festivals such as the International Festival of Douz, and also in their various crafts. During these Festivals, a lot of customs are celebrated such as matrimonies, the folk dance and poetry, and also different local crafts are exposed, such as tapestry and ceramics. These local traditions contribute to the specificity and the particularity of these cities.

These various and rich cultural landscapes represent way of life of the local habitants and also attractive elements for an important number of tourists, which significantly contribute to the economy of the territory.

5. Vernacular architecture

The Oasis is the primary economic resource for the local Oasis-Cities inhabitants. It promises the better living conditions in such extreme climate like desert.
The palm trees, the basic elements of the Oasis-Cities, are an important symbol of life and wealth. They constitute the most important natural protection able to withstand the harsh desert weather. The palm trees, in fact, constitute a micro-climate which is completely different of the external one, allowing the creation of large areas of shadow and achieving significant dam against the action of winds.
Inside the Oasis, the temperature is softened and the air is cooler and humid, which represent the importance of this landscape elements.
This particular microclimate contributes, by the presence of such planted areas, to better overall living conditions in these environmental realities. This specific microclimate is also strengthened by the type of the urban morphologies of these cities, which are usually compact and characterized by a mesh of narrow streets of irregular shapes (Figure 1). The principal streets are always perpendicular to the direction of prevailing winds. Some parts of these streets are often covered by palm trees trunks and a layer of earth mixed with clay, creating areas called "*Bortal*" (Figure 2).

Figure 1. Curvilinear Street in Kèbili Louta

Figure 2. "Bortal" in Kèbili Louta

These urban morphology solutions are the most appropriate to facilitate the circulation of air and limit the exposure to strong winds and sandstorms. The adoption of these approaches constitutes the adaptive response to the need of the settled population for protection against these aggressive weather conditions. These approaches define also a specific language for the local architecture of these regions. This particular vernacular architecture is characterized especially by:

- Local buildings are usually composed of one or two levels, with the exception of the mosque. This allows to limit exposure of buildings surfaces to the aggressive weather conditions;
- The use of local materials: It creates an effective harmonic continuity with the existing natural landscape and provide an exceptional bioclimatic architecture;
- The use of substantial wall thickness: It helps to achieve, in terms of thermal inertia, a good level of interior comfort considering the unpleasant external temperatures;
- few and small openings: especially on the external fronts, which are used to reduce the contact with the outside for both micro-climate and social-privacy goals;
- The inner courtyard: represented especially in the central void of "El Huch" (the courtyard house) which represent the important identity of the Oasis-Cities.

"El Huch" is the habitation unit of the Oasis-Cites. It is, by excellence, the symbol of the social life in these regions. It represents the most appropriate and adequate constructive response for the particular environmental climatic conditions and for the specific social-culture of these regions. It is characterized by a Compact morphology, almost without openings on the outside and a large openings and permeability, inside the courtyard. This represents the connective and the orderly system of the relationships between the different locations inside the house.

"El Huch" is generally composed of:

- "El Sguifa": is the first area in a house. It is the place of articulation between the inside and the outside and between the private life and the public life. Its role is to protect the privacy of "El Huch". All the traditional houses are made of one "sghifa" or more, in which guests are received.
- "Oust Elhouch": is the inner court in which the different rooms open inside it. It is a central void in the open air, which organizes and distributes the different locations. It gives the particular configuration of the oasis house typology which generates a favorable microclimate.
-"El Biit": is the meeting place or the rest area for the family. It has a rectangular shape with a width between 3.00 and 3.50 meters, which correspond to the measurements of palm trunks used as horizontal structure, and a large length which can arrive at 9 meters. The main "Biit" is oriented, often, to the east. It includes a "Raf" (mezzanine), which represents the children's room and a "maksoura"(under the mezzanine), which represents the parent's room.
-"El Makhzin": is delegated for the preservation of food products, especially the palm dates which can last more than an year.

6. Conclusion

The vernacular Oasis-Cities architecture, included in an exceptional cultural landscape such as the Oasis-Cities of South Tunisia, is considered specific and unique. These characteristics have contributed to the creation of its particular aspects and identity. Today, this vernacular culture has been degraded because of the invasion of the modern and contemporary architecture. New foreign materials and architectural languages are damaging their specificity and their identity. That's why various researches should be acting to protect, develop and innovate this exceptional heritage.

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Approach to classification and evaluation of naturally cooled buildings and analysis of what impact passive cooling systems have on architectural design

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Abstract:

Passive cooling systems are the combined technical solutions and design strategies used to promote low carbon cooling. The aim of our research is to evaluate the performance and efficiency of these systems, why and when they do not function correctly, and to assess what impact they have on architectural design. This methodological approach allows us to compare passive cooling systems in contemporary architecture in different parts of the world and to analyse the posture regarding the integration of passive cooling systems.

Keywords: Passive cooling system, low carbon cooling, building-system, an architect's posture

1. Introductıon

1.1. Article plan

The aim of the present research is to estimate the efficiency of passive cooling systems, the reason for their success or failure and what impact they have on architecture. Thus, an analysis and evaluation methodology was set up to verify the viability of passive cooling systems in contemporary architecture. Two *tools* were set up to evaluate the buildings: firstly, a data matrix, which we shall call a *critical database* that allows for comparisons to be made between qualitative and quantitative data, and secondly, *files* on each building that contain both quantitative data and a critical analysis of their architecture. The *files* serve as instruments of communication. Moreover, the architectural appraisal they contain aims at understanding the architect's posture[1] regarding the integration of passive cooling systems. To explain the methodological approach, we will use the French Lyceum of Damascus, Syria, designed by the architect Yves LION, as an example.

1.2. Why is it important to do a research on the passive cooling systems?

Some data about Air Conditioning are essential to explain the necessity of this type of research: in 2007 the global market for AC increased by approximately 14%. Even more worrying is the fact that in 2008 China became the world's largest market for air-conditioning [1]. We can easily imagine the consequences on energy demand.

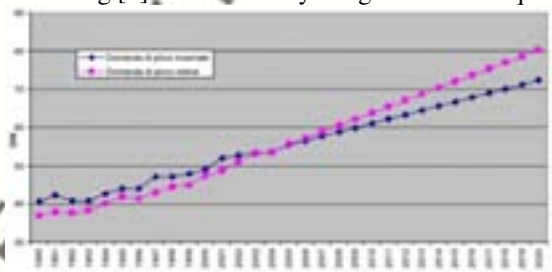

Figure1. Previsions of electrical consumption in Italy MAP [2]

Other important confirmations can be obtained from this graph, diffused by the Italian Ministry of Productive Activities. We can see that in 2004 summer energy consumption exceeded the winter energy consumption. In the Mediterranean area the necessity of cooling are more important than the necessity of cooling [3].

1.3. The issue of research

Few architects have employed passive cooling systems in recent years. The problem is that the scientific literature and technical solutions are rare or in experimental phases. It is difficult for an architect to propose solutions that haven't been tested. Passive cooling systems were common in vernacular architecture, but architects have stopped using this knowledge. In hot climatic regions, vernacular architecture has often been studied to guarantee summer comfort. In the past, physical activity in houses was more important. In winter, users covered themselves or Lit fires. In summer, they could only reduce physical activity. The comfort temperature in houses was about 16°C in winter. Today the comfort temperatures are different and vary from 21/22°C in winter to 26/27°C in summer [4 p. 18]. Contemporary architects, to respond to contemporary comfort demands, have preferred to abandon vernacular construction rules in favour of AC systems. The reason is that it is not easy to adapt vernacular constructive solutions to contemporary comfort demands without research and experimentation.

We consider that the number of contemporary buildings that adopt passive cooling as a design strategy to promote low carbon cooling is very limited [3]. The PHDC[2] research group, for example, estimates that no more than 50

[1] Dictionary definition. Posture: a mental or spiritual attitude, from: http://dictionary reference.com/browse/posture [20/05/2011]

[2] Passive and Hybrid Downdraught Cooling [http://www.phdc.eu/]

buildings cooled by evaporative cooling systems have been built worldwide over the past 15 years [5 p. 47]. The problem, was that we had to analyse buildings that are localized in different parts of the world. Our methodological approach aims at comparing and evaluating summer bioclimatic buildings performances, as well as understanding the integration of passive cooling systems in architecture. The adopted method has led us to compare buildings with different functions in different parts of the world. We have put into place a number of indicators that will enable us to make critical analyses and comparisons of different buildings. These indicators will also help us to analyse both summer and winter bioclimatic performances.

2. Methodology adopted for building analysis

To resolve our problem, we have developed a methodology that permits us to evaluate the buildings as systems, the objective of which was to guarantee the thermal comfort of users. Our *systemic* approach [6] permits us to study buildings and their architectural devices[3]and to interpret them as an engine that guarantees the thermal comfort of users. We consider "*that a dynamic and responsible interaction between inhabitants and architecture can lead to important energy and carbon reductions, and consequently that buildings do not consume energy, inhabitants do through the medium of architecture*" [7]. Therefore, evaluation must take into consideration not only technical solutions, but also the comportment of users and social aspects. E. RECHTING and M. MAIER [8] define the complex systems as models composed by linked devices that aim to obtain a result. We analyse buildings as complex systems composed by different devices: technical, usage, social, and so forth.

2.1. Methodology-based research

The analysis was carried out by dividing the building into progressively smaller architectural devices, starting with territorial implantation and concluding with design details. The functions within the building system were also analysed, based on J.L. LE MOIGNE's systemic approach, by adapting the method's four precepts to our problem. The aim of this division into individual elements was to analyse each element following its function within the whole system. In order to evaluate and divide the building up we followed the method used by S. HANROT [9]. The vertical break-down of buildings gave rise to a matrix of both quantitative and qualitative data, which we designated as the *critical database*. The evaluation of the architectural devices followed S. HANROT's method [10], with critical appreciation for them ranging from 1 to 6: 1=very poor, 2= poor, 3= sufficient, 4=good, 5=very good, 6=excellent. Hence, by using these grades, the bioclimatic performances of buildings could be evaluated. A satisfactory mark [3] corresponds to a well-designed device that was congruent with the building system. The lowest grade means that the device has reached a *critical point* – the point at which a single factor causes the non-functioning of the building system - where the building was unable to guarantee user thermal comfort.

2.2. The critical database

The critical database is a data matrix analysed at different definition levels. It contains technical and quality data as well as critical analysis data and the grades that enable us to evaluate the bioclimatic buildings performances. The critical database is broken down into the following definition levels: Territory => latitude, longitude, the climate, etc. Group of buildings => orientation, etc. Entities=> morphology, volume, etc. Systems to improve user comfort => cooling, control strategy etc. Divisions => outward vertical divisions, etc. Constituent parts => inert materials, types of glass, etc. One of the aims of the critical database is to compare different passively cooled buildings.
Given that over 60 architectural devices have been analysed, the amount of data is too large for easy comparisons to be made between any two buildings. To resolve this problem we chose the most significant indicators - those which are badly designed or built can jeopardize the bioclimatic functioning of a building - and created a radar chart that had 12 indicators and the average mark attributed to each element. The most important indicators are:
Morphology of the group: defines the shape and the layout of the buildings in the global operation. *Usage*: defines the use of the building at the time of researching. *Functional plan*: defines the organizational structure of the building. *Shape coefficient*: defines the ratio (adimensional [11 pp. 52-74]) between the outside surface and the volume of a building. *Rate of active glazing*: defines the ratio between the glazed surfaces and the peripheral floor shape. *Relationship between the passive cooling system and the climate*: defines whether the passive cooling system used is appropriate to the site's climate. *Natural lighting*: defines what percentage of daylight penetrates the building. *Thermal inertia*: defines the capacity of keeping a stable temperature. *Functioning of the passive cooling system*: defines how passive cooling systems function and how they are adapted to the building. *Control strategy of building services, both automatic and human*: defines the control mode of passive cooling systems and how they relate to the whole building. *Partitioning*: defines the internal barriers preventing air flowing through buildings. *Solar protection of vertical surfaces*: defines the presence and quality of sunscreens.
If one or more of these indicators is badly conceived or implemented, then the entire building system cannot guarantee the thermal comfort of its users. The image that this radar chart provides concerning the French Lyceum in Damascus is easily interpreted.

[3] Dictionary definition of "device" : a machine or tool used for a specific task, from: http://dictionary.reference.com/browse/device+ [20/05/2011]

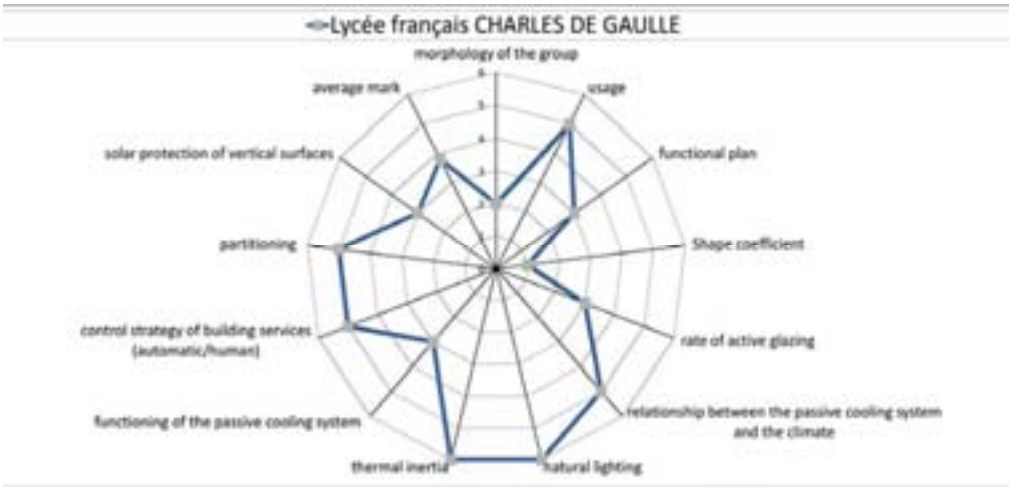

Figure2. The radar chart of Lycée Français Charles de Gaulle, Damascus.

The building is well conceived and built, although one badly-ranked indicator underlines certain weak points. The critical indicator is: Shape coefficient. The building is composed of little pavilions that are connected by exterior corridors. The problem is that the external surface of the building is very large. Moreover, the absence of thermal insulation, linked to the shape coefficient can jeopardise the thermal comportment of the whole building. One of the most unusual devices of this building is the control strategy. The architect has decided to adopt the human control strategy as an educational instrument. The users open and close the solar chimneys following instructions displayed in every classroom. If the users do not make correct use of the openings that are studied to guarantee natural ventilation at night time, the passive cooling system does not work, and the classroom is too hot the next morning. In other places, this system of functioning is not highly regarded, but considering the educational purpose of this building we have decided to give it a good grade for this device.

2.3. Comparison of two different buildings

This methodological approach has enabled us to compare different buildings in different parts of the world. In this article, we are comparing the French Lyceum in Damascus with the CII Institute of Quality, Bangalore, India; the building contains offices of the Indian industry institute.

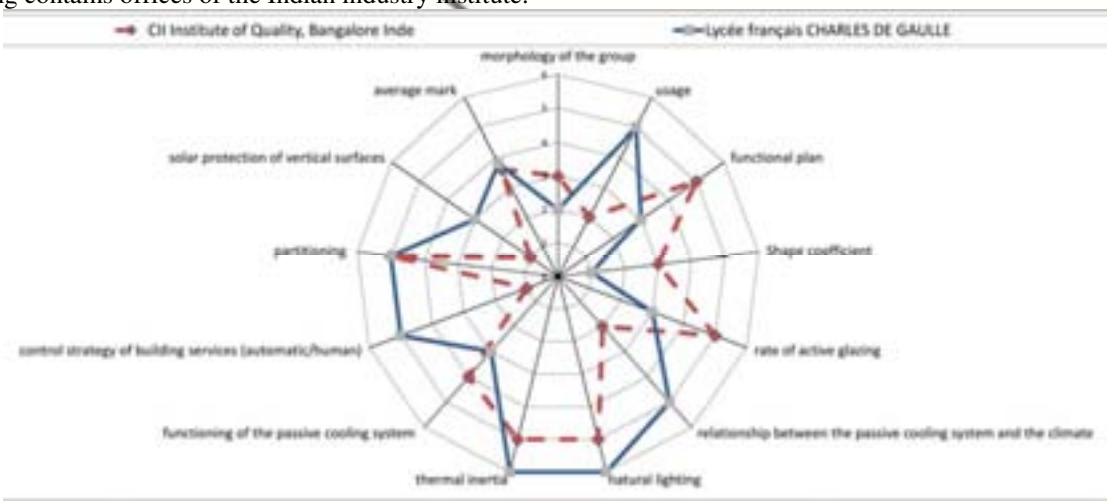

Figure3. The radar chart of comparison between the French Lyceum and the CII Institute of Quality

The graph shows us that the two buildings have a similar average grade, but the Bangalore building has different problems, in particular the control strategy and the solar protections. The solar protections are insufficient, because the building faces west, a problem that can jeopardize the working of the system. The most important problem is that the passive cooling system has a human control strategy. This is a problem because users start the evaporative cooling system only when they are in thermal discomfort. The passive downdraught evaporative cooling system can maintain the comfort temperatures, but cannot lower the temperature, in the extreme climatic conditions of Bangalore. However, if the control system were automatic, it could start functioning before discomfort temperature levels were reached. Thus we can see, in this case, how control strategy can jeopardize a building's entire system, depending on the analysis of the usage linked to the type of building and the type of passive cooling system.

2.4. Methodology adopted to analyse the posture of architects in relation to the integration of passive cooling systems

We use the same classification that G. BAIRD uses in the book *The Architectural Expression of Environmental Control Systems* to analyse the posture of architects in relation to the integration of technical systems "…*'building system integration can also be used as a means of visual expression'… Level 1: Not visible, no change. The system or subsystem in question is not in view to the building user, and therefore modifications of its physical form are esthetically irrelevant. Level 2: Visible, no change. The system is exposed to public view but not altered or improved in any way from what the purely functional application requires. Level 3: Visible, surface change. The system is visible to the building's occupants and has had only surface alterations made to it, with its other physical aspects remaining unchanged. Level 4: Visible, with size or shape change. The system is visible to the user of the building and has been given a size and/or shape other than what is simplest and most economical. The surface treatment and position may remain unchanged. Level 5: Visible, with location or orientation change. The system is exposed to the view of the occupants of the building, but its position has been altered from what is functionally optimal. The shape or surface, however, may remain unchanged.*" [12 p. 12]. By applying Baird's system, the Damascus lycée obtains a level 3 and the Bangalore IIC Building a level 5.

2.5. The impact of passive cooling systems on buildings typology

We try to analyse what is the impact of passive cooling systems on architectural design. Y. MANSOURI in his research works [13], has linked the typology and the topology of natural ventilation systems to the typology of buildings. Starting from his works we have modified his typo/topological grid to adapt it to all the passive cooling systems. This image permits us to better understand the architectural constraints generated by passive cooling systems.

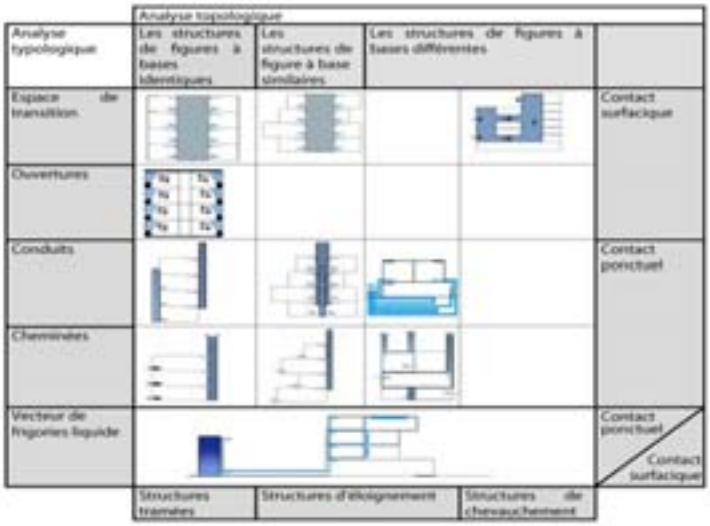

Figure4. Grid of typo/topological analysis of passive cooling systems

3. Files of buildings

To improve the knowledge of buildings and to communicate the analytical results, we used the second *tool* that we created. While the data matrix enables us to understand the way passive cooling systems function, files on buildings allow us to focus on their architectural aspects and communicate the results of the research.

3.1. Content of files

The building files layout derives directly from the critical database, and is divided into four parts: A synthetic, analytical description of the building appears on the first page, along with the file index, the building's geographical and climatic positions and a *synthetic logo* of the building that facilitates understanding of how the building functions, the typo/topology of passive cooling systems and the level of integration of passive cooling systems.
The second and third pages contain the radar chart and the psychometric analysis of the climate of the site. The third part details the devices based on the critical database analysis, with some images helping us to understand better the synthetic analysis. The fourth part is devoted to architectural reviews that aim to investigate the architect's posture in relation to the integration of passive cooling systems. Previous analyses have allowed us to understand the bioclimatic functioning of the building. The methodological approach that we used has enabled us to assess the different architectural devices. The architectural reviews aim at replying to another question: what is the impact of passive cooling systems on architecture? The files contain the images and graphs, which illustrate and explain the analyses more clearly and coherently. Moreover, when data is accessible, the results of pre-construction simulations and the real performances of the buildings, as well as post-occupancy assessments, are presented and analysed. These supplementary analysis have added to our knowledge of the building and to the design orientations taken by architects to obtain the final results.

Figure5: The first page of Damascus and Bangalore files, emphasis on synthetic and typo/topological logo.

4. Conclusions

It was possible to compare two different buildings thanks to the critical database. The architectural appraisal has enabled us to understand the decisions made by the architects. The data matrix has allowed us to understand better the functioning of passive cooling systems in the same way as the files have allowed us to give prominence to the architectural aspects and the architect's position regarding the integration of cooling systems in his project. Although only two buildings have been compared in this article, our methodological approach will enable us to compare many buildings and to know when, how and whether passive cooling systems work well or not. We aim to create a database of rules that will allow the architect to reduce errors to a minimum.

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Mediterranean Architecture and Building Materials in Modern Greece

Dr. Fani Vavili – Tsinika, architect, professor[1], Meropi (Iro) Karantaki, architect [2]

Abstract

For years, architecture was directly connected to the sense of place and consequently to the materials produced in that place. Nowadays, in an environment that is very competitive because of the variety of new materials, which is constantly seeking new solutions to ecological problems, and is under the influence of the trend of an international and global architecture, the significance of local materials in the Mediterranean region has to be redefined.

This paper discusses and examines the relationship between local materials with modern architecture and new construction methods in the Mediterranean region, specifically in Greece. Initially, we try to identify and examine the basic characteristics that shape the architectural identity in Greece. Subsequently, we focus on the one that deals with the use of local - traditional materials. More specifically: Mediterranean materials currently used in Greece are presented, references to Greek and foreign architects using native materials partially or entirely are being examined, and also an attempt is made to compare Greece with examples of other Mediterranean regions. Apart from that, this paper examines the positive features of Mediterranean local materials in relation with the landscape and their contribution to sustainability. It includes the efforts that are made to combine traditional materials with new technologies and the consequent new forms, characteristics and qualities that arise. Examples of modern materials are presented that have evolved and integrated themselves smoothly and seamlessly into the traditional Mediterranean style, in order to create today's contemporary architectural industry. We conclude by discussing whether or not the modern mutations of Mediterranean architecture can contribute to and resolve some of the problems of contemporary architecture.

Keywords: Greek architecture, traditional architecture, local materials, innovative construction methods

1. Introduction

The Mediterranean area has been a distinct geographical entity since the origins of human history, with particular geomorphologic and climatic features. From antiquity to the present, cultural trends of East and West intersected and influenced each other and, in combination with the natural environment, the climate, the light and the sea, they have defined a very special way of life and, consequently, a unique architectural style. It is noted that the architectural elements are tied together with nature to form a functional and aesthetic whole. The great diversity of nature, the beautiful beaches, the harmonic curves of the hills, the countless islands, the bright sun and the clear atmosphere, create a measure, intimate and human. (Γιακουμακάτος 1997: 100) Furthermore, we easily discern the relationship of Mediterranean architecture with the place and thus the materials it produces (earth, mud, stone, wood, glass). The concept of the "spirit of place" (genius loci) was adopted for the first time by the ancient Greeks, for whom "place" referred to the immutable qualities and senses of a site that was associated with a local spirit or deity. (Weston 2003: 89)

It is natural that the above facts have exercised, and continue to exercise, a significant influence on the shaping and development of Mediterranean architecture and the arts in general and that they determine their particular characteristics. From the past and the study of hitherto architectural and urban projects, we will try to determine those features that have decisively influenced, and continue to influence, Mediterranean architecture and specifically, the architecture of Greece.

2. Features of Greek architecture

The following are the main features that, as far as we are concerned, define Greek architecture, as well as that of the Mediterranean.

- The use of local materials. The spirit of the place (genius loci) pervades every architectural work; the artificial is in absolute harmony with the natural, is part of the landscape as if it was always there, and also supplements it.

- Architectural unity of interior and exterior space. The interior space extends to the open space, surrounds it or vice versa, and together they form a unity of life.

- Balance and harmony of architectural expression. Rich sense of plasticity with a human and intimate measure. The massive and excessive are unmatched in the Mediterranean atmosphere, the light, the shape, and the dimensions of the landscape.

- The balanced matching and combination of elements of West and East, the harmonious reconciliation of rationality, technology, and innovations of the western world with the religious spirit and history of the eastern world.

Considering the past and looking back at history, we can easily identify the practical applications of the above to architectural works of ancient and traditional Greek architecture. But how are things nowadays?

The relationship between indoor and outdoor environment is an important qualitative feature of Greek architecture and one notices that this communication can be achieved in various ways. Examples include galleries, roofed verandas, semi-open spaces, large windows and, of course, the most representative element, the atrium. From the formal structure of ancient houses

around the courtyard until present times, the atrium has always been a special feature of Greek architecture. (Fig.1) (Αθανασιάδου, Conference papers 2007: 221-222)

Fig. 1: The atrium of an ancient Greek house. (http://www.tmth.edu.gr)

Fig. 2: The atrium of the Archaeological Museum of Thessaloniki. (http://www.amth.gr/)

Fig. 3: The atrium and the peristyle of the Byzantine Museum of Thessaloniki. (http://www.greekarchitects.gr)

Fig. 4: The residence of A. Kouvela in Santorin. (http://www.ntua.gr/arch)

In modern architecture, architects take the concept of the atrium; they decompose it and recompose it, creating new ideas and new questions as to what the atrium means and what its function is. (Αθανασιάδου, Conference papers 2007: 224-228) Such examples are works of P. Karantinos (Archaeological Museum of Thessaloniki, 1962) (Fig.2), K. Krokos (Byzantine Museum of Thessaloniki 1989-1993) (Fig.3), A. Kouvela (residence in Santorini 1994-1997) (Fig.4).

Regarding the plasticity of form and the human measure in scale, it is briefly mentioned that it is present in the classical proportions of the buildings of antiquity (Acropolis, Bassai, Mycenae) (Fig.5), in the two-storey houses with tiled roofs or stony roofs of mountainous continental architecture (Halkidiki, Zagoria, Metsovo) (Fig.6) and in the densely built-up structures of the Cycladic islands (Santorini) (Fig.7). The main purpose of both classical and folk Greek architecture was always to create structures that integrated with the landscape. Greek architecture never used an excessive scale in order to impress or to impose itself on people, but always gained respect through the simplicity and purity of volumes. (Γιακουμακάτος 1997: 103).

Finally, the harmonic matching and combination of Eastern and Western culture, as a result of economic and socio-political conditions, is found in the scattered monuments and structures all over Greece, remnants of civilizations that flourished at times in the region.

Fig. 5: The Lion Gate, Mycene, 1200 BC. (http://bama.ua.edu)

In this paper, our attention is focused on the first characteristic, the relationship between architecture, place and local materials. We will study the interaction of native - traditional materials with modern construction methods, and the prospects for their development.

3. Use of local, Mediterranean materials

Stone, bricks, wood, straw, marble, ceramics, lime, glass, reeds, sand, clay are the materials found mostly in Greek but also in Mediterranean architecture. Nowadays, not just the use but also the development of these materials is a gamble for every restless composer and creator. An attempt to combine them with the use of new tools, combinatorial methods and industrial-type processes, produces a new, interesting architectural style. The gabion stone, the wood paneling, the apparent brickwork, the translucent marble, the alabaster, the bearing glass and the glass bricks, copper, carbon fibers, sensors, the standardized and industrialized production, even the technique of reusing - recycling materials, are some examples that try not only to adopt the traditional Mediterranean style, but to evolve it and integrate it smoothly and seamlessly into the contemporary architectural industry.

Fig. 6: Traditional continental (Macedonian) architecture, Halkidiki. (http://www.panoramio.com)

3.1. Blending traditional materials with modern techniques
3.1.1. Earth, mud and the cave house

We start by examining examples of materials that, without losing their original composition, blend with technology, bringing interesting results.

Earth, as a building material, is typical and very common in Mediterranean architecture. A representative example of earth architecture is the cave house, which appears from antiquity, in great numbers in the Mediterranean area (Tunisia, Turkey, South Italy, Spain, France, Greece) (Maalouf 2002: 65-66). Regarding the Greek area, these cave houses are present on the island of Santorin (Fig.8). Inside the pliable but strong building material of earth, the inhabitants dug their homes and sometimes their whole villages. The local volcanic materials mixed with lime create a very strong mortar that allows the creation of a canopy (an important feature of the roof of the cave houses) (Fig.9) without the support of wood or iron. An underground construction, like the cave house, is more resistant to weather conditions, providing a comfortable environment both during summer and winter. It also consumes less energy because the energy costs are reduced for further cooling and heating in the respective periods (Ανδρεαδάκη-Χρονάκη 1985: 25-39). For these reasons, the cave houses in Santorin are still preserved today, many of which have been converted into guesthouses inhabited by locals and tourists.

Fig. 7: The densely built-up structures of the Cycladic islands. (http://users.ntua.gr/kamy.pdf)

Fig. 8: Cave house in Santorin. (http://dspace.lib.ntua.gr)

Fig. 9: The interior space of a cave house with the canopy. (http://dspace.lib.ntua.gr)

Fig. 10: Plinthos Pavilion designed by Mab Architects. (http://www.mabarchitects.com/)

3.1.2. Terracotta brick

Another example is the clay brick, which is made from soil, particularly from clay. For many centuries brick has been one of the main building materials in Greece. Nowadays, with the support of new technologies, we can develop new properties of this material, as for example transparency. Indicative is the example of Greek Mab Architects, who experimented in this respect with their work "Plinthos Pavillion"; a structure where the brick is placed in its other direction. The predominantly hidden holes of the bricks, in a construction, are exposed in this example, creating a permeable surface that allows the flow of light, air and sound (http://www.mabarchitects.com/) (Fig.10).

3.2. Developing materials

3.2.1. Stone, dry and gabion stone

Apart from the use of the material as it is, the development of traditional materials can bring even more impressive results. With the help of technology, new forms can easily arise, flowing, curved, modern, post-modern, and deconstructed, not far from the traditional standards, but definitely following a new, modern vocabulary and resulting in a new syntax of the architectural language. Subsequently, we are going to examine some modern products that can be thought of as an evolution from traditional materials.

An illustrative example is the gabion stone (also known as sarzanetia or gabion baskets) derived from the technique of dry stone. The dry stone is an integral part of Greek cultural heritage and therefore a distinctive element of the Greek landscape. In the technique of dry stone, stones are placed neatly one beside the other or on the other with the wedges being the only binding element. Usually stones are used from the surrounding area, thus eliminating transport issues whilst also cleaning the soil. (Αρακαδάκη 2004: 55-56) The dry stone is a technique that is implemented primarily on the terraces of the Greek countryside (Fig. 11), since it protects the soil from erosion; it makes barren land cultivable, and fixes the boundaries of the properties. The stones on the walls keep the soil from reducing the inclination of the ground and allow the land to absorb rainwater. (Αρακαδάκη 2004: 58)

Today gabion stone (Fig.12) is used mainly in irrigation-port projects for the construction of dams and retaining. It's usually heavy-type galvanized wire (or sometimes plastic wire) filled with fragments of rocks, debris or common stones in various sizes, offering a function of the ratio of shading, ventilation, lighting, level of privacy, green surface and an architectural expression that balances nature and building. Examples of the use of gabion stone occur mainly in other Mediterranean countries (The Igualada Cemetery, outside of Barcelona, Catalonia, Spain, by Enric Miralles and Carme Pinos (1984 – 1994) (Fig.13) and the SSM Concert Hall by NSMH architects, in Istanbul, Turkey (2008-2009) (Fig.14)).

Fig. 11: Dry stone terraces, Xelidona Mountain, Central Greece. (http://www.panoramio.com)

Fig. 12: The Gabion stone. (http://www.selectmaterialscom.moonfruit.com)

Fig.13: Igualada Cemetery, Barcelona, Spain by Enric Miralles and Carme Pinos. (http://andrew-barcelonaabroad.blogspot.com)

Fig. 14: SSM Concert Hall and Sakip Sabanci Museum Campus, Istanbul, Turkey by NSMH architects. (www.archdaily.com)

3.2.2. Glass

Another form of evolution of material is found in the case of glass. Glass as a material has always existed in nature, formed by the melting of certain rocks at very high temperatures (particularly following volcanic eruptions). As a material of objects it has been used since ancient times by the peoples of the eastern Mediterranean (Egyptians, Babylonians), and the Romans first used it as openings' filler in the 1st decade AD. In the early 20th century, glass emerged as a building material and is now used not only as a filler but also as a bearing element, achieving a structural clarity and transparency in the construction (http://en.wikipedia.org/wiki/Glass).

Glass is used extensively in modern Greece. Beyond its normal use for filling openings, it is used in addition to and extensions of historic buildings, where it serves as a bridge connecting these buildings and contemporary architecture. It is a neutral solution, compatible with the history, authenticity and recognizability in accordance with the requirement of the International Charters on the restoration and enhancement of cultural monuments (Restoration of Museum of Jewish Presence in Thessaloniki, 1997 (Fig.15)). (Conference papers 2007: 129-134)

Additionally, the notion of glass has been constantly changing over the last few years, creating more and more modern materials such as the transparent panels of ETFE (Lamda Olympia Village, Greece (Fig.16). Moreover, materials are created that adopt and "mimic" the properties of glass (transparency), such as transparent ceramics that are made by mixing specific monomers, which results in them having the appearance of glass as well as being very strong, the translucent concrete (One Athens, Apartment building conversion in Athens, Greece, by Divercity Architects, in progress (Fig.17)), the transparent aluminium, etc. (Material World 2 2006: 222-223).

Fig. 15: Museum of Jewish Presence in Thessaloniki, view of the atrium before and after the restoration. (http://www.pmakridis.com)

Fig. 16: Lamda Olympia Village, Greece. (http://www.daviddexter.co.uk/)

Fig. 17: One Athens, Apartment building conversion in Athens, Greece, by Divercity Architects, in progress. (http://divercityarchitects.com)

Although in Greece the use of these materials is still in a premature stage, globally they appear in major projects both on a large and a small scale, and are selected by leading architects of an international caliber (Herzog & de Meuron, Foster and Partners, etc.). With the most representative and well known examples in Northern European countries, Asia (Italian pavilion at the exhibition in Shanghai with translucent concrete, 2010 (Fig. 18)), and North America we can still find some great examples in the Mediterranean world like the Inflatable Bubble Building in Barcelona by Cloud 9 (Fig.19) and Yapi Kredi Bank Academy in Istanbul by TEGET (Fig.20), both using the transparent panels of ETFE.

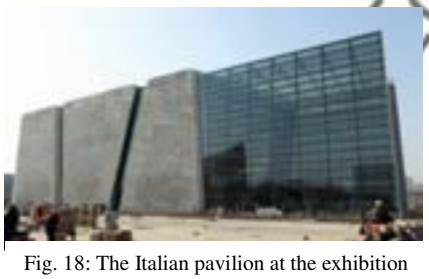

Fig. 18: The Italian pavilion at the exhibition in Shanghai in 2010 made of semitransparent concrete. (http://www.expo2010china.hu)

Fig. 19: Inflatable Bubble Building in Barcelona by Cloud 9, 2011. (http://inhabitat.com)

Fig. 20: Yapi Kredi Bank Academy, Istanbul, Turkey by TEGET, 2009. (http://www.architravel.com)

3.3. Reusing materials

Apart from the evolution or "mutation" of the materials, reusing them may bring equally interesting results. In Greece, the reuse of material occurs over the years, mainly in folk architecture: masts and timber from old ships were used as beams, columns or floors. Scrap jars, and pitchers were used as chimneys (kapasos in Cyclades, flaros in Sifnos (Fig.21)) or for the construction of ovens. Stones, cornerstones, lintels, thresholds, jambs, wood and tiles were used rationally but also with an innate sensitivity from old to new homes. (Φιλιππίδης 1982: 116)

In modern architecture, a good example of this is the work of Dimitris Pikionis, who used a large amount of second hand materials for the landscaping around the Acropolis. Marble curbstones dismantled because they were too old, ceramic fragments of roofs and decorative items, jagged strips and items from demolished buildings (Fig.22) (Πικιώνη 1994: 23). Pikionis himself collected these materials not systematically, but from random sources and he used them alongside typical building materials. His architectural approach was similar to that of collage, aiming to create a new separate and balanced

composition, but without destroying the value of the elements that compose it. His purpose was didactic and aesthetic, since the integration of older material in a new construction enables the coexistence of old and new.

Today, although the reuse of materials in constructions in Greece is relatively low, there are stockyards with demolition materials in many of the country's major cities. There, one can find stones, slates, pieces of marble, tiles, bricks, lumber-planks, old tanks and barrels of oil, iron outdoor staircases from old two-storey houses, old doors (wooden ones or ones with metallic frames), railings, tiles, marble sinks, wash basins and bathtubs (Πικιώνη 1994: 30).

The technique of reusing - recycling materials is also common in other Mediterranean countries. An illustrative example is the Warehouse 8B in Madrid, where the architects Arturo Franco Architects have restored the interior walls with its own old roof tiles, thus providing an economic and very special aesthetic solution (Fig. 23).

Fig. 21: Flaros, ceramic stove in Sifnos. (http://sifnos.wordpress.com)

Fig. 22: The area around the Acropolis by D. Pikionis. (http://www.greekarchitects.gr)

Fig. 23: The indoor brick walls made of old tiles of the roof of Warehouse 8B in Madrid. (http://allhitecture.com)

Fig. 24: A panoramic view of the apartment buildings of a common Greek city. (http://www.panoramio.com)

4. Conclusion

This paper is an attempt to examine the modern mutations of Mediterranean architecture and its interactive relationship with local materials. Making a special reference to Greek architecture, it highlights how these mutations contribute to modern architectural styles.

In contemporary architecture, after the industrial revolution and even more so today with the digital technologies, the standards have altered, bringing changes to the method of design. Unfortunately, twentieth century Greek architecture, especially after the fifth decade, lost its measure and identity in the development, as well as the character of its cities, in an effort to modernize the Greek society. The introduction of new materials (reinforced concrete, metal, plastic, etc.) and the modern techniques of construction, under the pressure of huge demand, resulted in an indifferent and uniform architecture. Economic factors, in particular, determined the choice of materials, making the Mediterranean nature of most contemporary works questionable (Fig. 24). Nowadays, considering these devastating effects and since the basic needs for housing have been met, it is time to reconsider the materials we use. Through the examples that are mentioned above we understand how using the Mediterranean materials and their mutations, we can achieve both contemporary forms in structures and a harmonization with the environment. In the context of the new technologies, these materials can broaden the creative artistic expression and claim a major role in the re-birth of architectural ideas, where light and heavy material, the transparent and the solid, traditional design and modern technology, which were initially contradictory, can now coexist and interact.

Of course not just the materials but instead the whole architectural approach should be reviewed. Perhaps it is time to recall those architectural elements that characterize our place, re-think, re-use them and integrate them in contemporary works. Not simply by imitating traditional forms, but by exploiting the strengths of the Mediterranean archetypes and, as a result, developing solutions that preserve the original spirit. The question is if meetings like this one can be creative enough to discuss and introduce an architectural vocabulary that will take into consideration the unique Mediterranean world.

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TECHNOLOGIES AIMED AT ECO EFFICIENCY IN THE EXPERIMENTATION OF MEDITERRANEAN SOCIAL HOUSING

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Abstract

Tackling the ecologic and energy efficiency problem in contemporary social housing projects and, in particular, the matter concerning natural management of fluid and thermodynamic processes in projects, which is a key issue in Mediterranean countries, means to design paying particular attention to the technological-constructive and performance implications. In particular, it is of the outmost importance to take into account the European Directives on building Energy efficiency and on energy end use, as well as the legislation apparatus that derived form them in all European countries. The main objective is to promote energy efficiency and to lower energy consumption in buildings while improving their overall environmental sustainability, considering local conditions and local climate, as well as rainfall in relation to indoor microclimate and cost related compatibility. In recent years, the new kind of design action required by the norms is undergoing experimentation, mostly in new and recovered residential areas that call for innovative and integrated solutions promoted by architects; these solutions require cross verifications on cooling, heating and lighting energy demand also in relation to the environmental factors' control with the threefold objective of respecting standards set by Europe, improving comfort standards through passive bioclimatic criteria and drastically lowering buildings' energy consumption, contributing significantly to the overall reduction of greenhouse gasses' emissions. Following this perspective we are presenting social housing case studies that are under construction in the central part of Italy.

Keywords: Social housing, Environmental sustainability, Energy efficiency, Technological innovation.

1. Introduction

I would like to spend some time explaining the portrayal that I will outline concerning some experimentations - to be more specific four experimentations - carried out in the last 5 years; all of these experimentations concern topics referred to two key words: "Technology" and "Environment"; these two words influence *innovation in housing plans,* where architectural quality, energy efficiency, environmental comfort, ecological management, high sustainability standards and low cost, design participation, participation to the execution phase, social justice…all become leading aspects. This innovation is becoming the core element of cultural – and potentially evolutionary – confrontation for contemporary society.
As a matter of fact, the search for possible evolutionary and innovation forms in the design of housing structures is nowadays an item which appears constantly on the agenda: innovation in designing residential space or housing, while respecting the economical feasibility and limiting costs, starting form the house itself, where we spend an average of 12 hour per day – which means half of our lives – is the true challenge of contemporary design.
The housing problem, in particular social housing, is a serious matter today: ISTAT data tells us that since 2001 the number of families has increased by 1.5 Million units; that 500.000 elderly live by themselves in rented houses when they earn between 500 and 1000 Euro per month; that 4.8 Million people between the age of 25 and 35 (students and young couples) are looking for places to rent and are not being successful or, worse, are not able to afford the rent; that 75% of the families who currently rent apartments earn 1400 Euros per month in total and that half of these families have a hard time paying the rent regularly; that today in Italy there are 7 Million poor, 2.5 of these poor live in extreme poverty – fact recently reported on the headlines of all local newspapers.
Another focal point that needs to be taken into account is that there is now a high percentage of the population, not only belonging to the lower class but also to the medium one, which needs a new *housing plan.*
Well, the complex matter concerning the *possible evolution and innovation of the housing plan,* which starts form acknowledging the need for new houses and places linked to living, but also a renewed way of conceiving the latter, has two central observation points: on one hand the urgent and binding need for *environmental sustainability*, that intimately touches everybody's conscience, no one excluded; on the other hand the need for a proper and balanced *technological innovation in the evolved and complex management of the architectural program*, that does not necessarily rise the costs, but on the contrary, is aimed at lowering them by integrating them from the very first stages of the design process.
But *why* in this cultural and political junction that sees Italy almost alone against the rest of Europe (if we don't consider some eastern European countries) in not complying to the agreement with the Member states on the so called "20-20-20 objective" for the reduction of toxic emissions, the increase of renewable energy use and the reduction of energy consumption; *why*, as I was saying, do we nonetheless feel the need to bring forward initiatives that enquire upon the experimental developments aimed at environmental control of the housing plan?
We can only answer to this question using affirmative and strong tones:
the ultimate objectives of new houses and of a new way of living on one hand, and the achievement of *environmental sustainability and energy efficiency in our architectural and urban realities* on the other, need to be totally integrated and, most of all, they are absolutely essential since – as the American economist and philosopher Jeremy Rifkin clearly points out – we are

about to reach the peak of what we could define as a problematic turning point, when we are finally all aware that the world energy demand is still almost totally satisfied by using non renewable resources (precisely 86% of the demand is satisfied by non renewable resources); a moment in time when we are aware that such resources will only be available for a few more years or decades and that by continuing to exploit those resources we are causing climatic and environmental disasters and incisively harming the health of all living creatures on our increasingly poor and small planet.
What I mean to say is the following: it is no longer enough to build new houses, or slightly improve the existing ones, the time has come to make them highly comfortable from an environmental point of view, lower their impact from an energy and ecological point of view and in any case to make them more affordable so that everyone can have access to them.
As the *United Nations Environment Program* proves, we have finally acquired the awareness that the means and the tools to *significantly lower* energy demand in architecture - that, as we all know, has been considered in the 2002 and 2010 European Directives and in a series of national and local laws in all the Member states - already exist, from both a design and a construction point of view; moreover the above mentioned energy demand could in some cases become so small that it would almost entirely, if not *totally*, be satisfied by the different sources of renewable energy. We now know that we are capable of *significantly rising* the indoor and outdoor quality, comfort and ecological effectiveness levels – to say it with one word the *environmental sustainability level*; often – and this is the most important aspect – improving and contributing to the enrichment and evolution of the expressive and spatial qualities of architecture.
Nowadays public housing is the privileged interface of environmentally sustainable and energetically efficient design experimentations, especially in respect to the fact that it has to carry out the hard task of serving as an example of the correct and responsible behavior we should have when facing such topics; in the best case scenario it should be a virtuous reference model, that demonstrates the possibility of applying "best practices" in order to enact principles that are nothing but hard to manage and enact. In this filed public housing has a privileged role and it is establishing itself all around the world – or we could say that it is reestablishing itself – as one of the main challenges that ought to be solved in our age, especially when the term "Social Housing" is associated to the adjectives "bioclimatic" and "environmentally responsible", or simply "sustainable".
A guideline composed by some experimentation cases led in Central Italy – in this case we are presenting four of them which were carried out in the last years and in three of these cases they have been constructed or are under construction – is the central role that a design strategy can and should play when the aim is achieving maximum environmental efficiency and improved energy efficiency on the territory and in urban areas, in buildings, outdoor and in between spaces, in building's technological tools and components, in processes and products, that time by time become the object of design experimentation in the noblest and highest sense of the word.

2. Bioclimatic housing experimentation for the Comune of Rome

In regards to the first experience I will present, it is important to point out that since 2004 the Comune of Rome has launched an ambitious series of competitions that highlight the experimental aspects linked to the environmental and bioclimatic topics that - in light of the 2002/91/CE EU Directive on building's energy and the related laws that derived from it and are being implemented in all Member States (read the DL 192/05 and DL 311/06) - are finally recognized as central and inescapable aspects of design strategies and actions and of public buildings' construction.
The first important call for competition concerned two public housing projects in the "Piano di Zona di Lunghezzina 2" area where, for the experimentation, two land plots with two 4 storey building blocks were chosen.
The criteria adopted for the design choices that characterized the winning proposal (a project by Arch. Thomas Herzog and Arch. Fabrizio Tucci), which is currently under construction, are based on the awareness that this experience represents the first public experimentation in Central Italy in the field of bioclimatic and sustainable design, and to this extent it acquires the role of pilot project and, once it has been built, of building-prototype.
The attention of the project was concentrated on the development of what designers call some sort of Decalogue of the building's main bioclimatic and bio-ecological behavior categories, as I summarized in the following list:

1. maximization of passive natural heating;
2. optimization of passive natural cooling;
3. extensive use of natural ventilation;
4. natural light control and improvement;
5. Thermo – hygrometric control and relative humidity mitigation;
6. natural insulation improvement;
7. evaporation processes' stimulation by means of vegetation;
8. proneness to the architectural integration of "active" solar devices, both photovoltaic - for production of electricity - and solar panels - for thermal Energy production;
9. ecological water management optimization;
10. application of advanced local waste collection ad recycling systems.

The total thermal energy requirement calculated with Energy-plus is equal to roughly 8 kWh/m^2 a.

3. Experimentation of an eco-efficient social housing building in Monterotondo

The second study case is represented by a public housing building, under construction since 2007 and completed in April 2010, located in Monterotondo (RM), in the Zoneing plan "Cappuccini" (project by Lorenzo Cortesini, Alessandra Battisti, Fabrizio Tucci). The strategic indications on the experimental aspects of the building from an environmental-bioclimatic point of view and in regards to its integration with plant design, and the design choice highlighting points, can be expressed as follows:

- The outline of the building reflects the desire to orient the building in the best possible position in relation to sun exposure and ventilation: therefore we tried to orient almost all the living areas of the house (living rooms, dining rooms and bedrooms) towards the south-west, whereas all the service rooms, the landings and staircases towards the north-east;
- the longitudinal spine of service areas, where the bathrooms , kitchens, access rooms, in built wardrobes and fixtures and ventilation towers of each flat are located, contributes during winter to the creation of a "buffer space", where all the plumbing and ventilation ducts are located and it also helps to contain heat dispersal originating form the most populated rooms of the house;
- "solar loggias" were built, one for each flat; during summer time they can be left open; whereas they can be closed during winter time to maximize the greenhouse effect;
- a set of "thermal storage slabs" were integrated to the "solar loggias", one for each loggia, and they were located in the tighter space of the latter, towards the exterior;
- a ventilation tower system was designed, the towers were connected to a set of exterior and underground "buried earths pipes" in order to offer passive ventilation and cooling to each flat;
- the presence of a "bioclimatic greenhouse-atrium, located at the core of the building, was a strategic choice since it can be closed by a louvered glazing system (with low-e glass) during winter, generating a greenhouse effect, whereas during summer it can be completely open in order to allow for cross ventilation to take place.

The overall thermal energy demand calculated with Energy-plus is around 10 kWh/m2 a.

4. Experimentation of a sustainable settlement in Parco Talenti, Rome

The third case study is a design experimentation carried out by the Itaca Department with the objective of defining some sort of ecologically and energetically highly efficient housing model that a well known Roman builder is about to construct in the urban recovery zone of Parco Talenti in Rome.
Salvatore Dierna and Fabrizio Orlandi are the Scientific Supervisors and the Operative coordinators of the experimentation are Alessandra Battisti and Fabrizio Tucci.
The ten major characteristics of the project, in terms of bioclimatic strategies and technological choices, can be synthesized as follows:

1) thermal storage greenhouses located on the south/south-west facades;
2) an underground "earth pipes" system to capture ventilation; the air is cooled underground and then channeled through the wind chimneys;
3) wind chimneys are used to channel vertically the air that is collected by the earth pipes, an then distributed to the various floors in the apartments. There area also expulsion towers integrated to the wind chimneys; these towers channel hot and stale air coming from the dwellings and they expel it from the top openings during summer. The system is closed during winter time;
4) a geothermal exchange system based on the thermal exchange between the fluid used for condensation (usually water or a mixture of water and antifreeze fluid) and the earth is used, taking advantage of the fact that the first layer of the earth's crust absorbs almost 47% of solar energy and that ground temperature varies according to many factors (weather conditions, stratigraphy, depth, etc.), but beyond 5-6 m in depth it can be considered constant throughout the year;
5) using low-e glass it is possible to retain energy dispersal and to optimize direct solar radiation collection;
6) a ventilated façade system in structural terracotta, like "argeton", that, as we all know, is a highly ecological material, which can be easily laid on panels which area easier to assemble and move compared to traditional brick walls;
7) using ecological thermal insulation panels in cork;
8) using wood painted with bio-ecological anti toxic mortars for the window frames of all the dwellings;
9) using wood soaked in natural resins for external panels made with sliding and adjustable brise-soleil;
10) using plant systems totally integrated to architecture, placed in dedicated accessible cavaediums, located in the central and internal part of the building, connected to the bioclimatic "dorsal" system of distribution spaces.

The overall thermal energy demand calculated with Energy-plus is around 10 kWh/m^2 a.

5. Experimentation on an energergy-environmental redevelopment in a IACP area in Senigallia, Ancona

The fourth and last experiment presented, which is also under construction, concerns the redevelopment of an existing IACP settlement called "Villa Aosta" in Senigallia (Ancona); this settlement is in an advanced state of deterioration, also from an energy and environmental point of view, and this is why the Itaca Department of "La Sapeinza" University has carried out an in depth study that supported all the phases involved in the design process and it also became the basis on which the construction drawings were elaborated by ERAP in Ancona, with the RUP Eng. Urbinati. Salvatore Dierna and Fabrizio Orlandi were the Scientific Supervisors and the Operative coordinator of the experimentation was Fabrizio Tucci.
The main strategies adopted are aimed at the optimization of acoustical and visual comfort, to the redevelopment of natural areas, to the containment of cooling and heating energy consumption, to the optimization of environmental comfort and to the reduction of water consumption.
In order to obtain a sensible improvement of the environmental conditions in the entire district "Villa d'Aosta", the program proposed rehabilitation actions on the buildings inside the area and the demolition and redesign of the two "L" shaped buildings on the edge of the area.
To improve microclimatic comfort and to lower energy consumption caused by summer cooing needs, we proposed a natural ventilation system composed by summer ventilation directional intake elements integrated to the acoustic containment barrier along the railway border. The air coming from the coast is captured at an altitude greater than 5m from the level of buildings'

roofs; this means that this air is free form dust and dirt, which can usually be found at lower altitudes. Afterwards the air is directed towards the buildings after passing through underground air ducts that lower the air temperature exchanging it with the temperature of the ground. At last the air is distributed to the dwellings through cavaediums connected to the stair shafts.
Outdoor space paving, highly permeable, is made with "Green Pav" and grass. This system, together with the location of green areas and the choice of plant species, guarantees, on one hand the natural absorption of water and on the other hand prevents the creation of humid pockets. Moreover part of the water is collected in special tanks located in the basement. Grey water will then be used for non-sanitary purposes.
The new buildings follow the footprint of the preexisting ones, but they have three extra floors on the south-east and north-west sides and two extra floors on the north-east side. These buildings are characterized by stair shafts that serve as winter thermal storage elements which, thanks to the greenhouse effect and to the vertical continuity of interior space, effectively move the rising flux of "passive" hot air that ought to be directed inside the apartments.
The facades are characterized by greenhouse loggias. These are closed and glazed during winter in order to favor the passive storage generated by the greenhouse effect and the direct transmission of heat inside the apartments. During summer the loggias are open in order to prevent the greenhouse effect from occurring and to favor the access of natural ventilation instead and to act as shading device and lower the air temperature.
The greenhouses are located opposite to the stair shafts and they accumulate solar heat gain on their roof during winter, involving the hot air fluxes created by the greenhouse effect generated in a rising pattern inside the apartments.
In all the buildings the cavaediums connected to the stair shafts cooperate to the rising movement of cool air fluxes during summer and hot air fluxes during winter and to the passive cooling processes that take place inside the stair shafts, respectively in summer and winter time.
The base, for both the new and existing buildings, is a strategic spot for the access of ventilation to the underground spaces of the buildings, which prevents the formation of humidity and favors a more effective cooling of the apartments on the higher floors.
The existing buildings located at the core of the settlement and facing the court are encumbered by the Superintendence; they will therefore undergo a rehabilitation process aimed at obtaining the maximum containment of energy waste possible and the partial addition of a floor for the two "I" shaped buildings.
The total thermal energy requirement calculated with an integrated combination of Trnsys and Energy-plus brings the current annual 204 kWh/m^2 to 70 kWh/m^2 for the intervention conservation buildings, the buildings encumbered by the Superintendence, where the aim is to improve their performance without modifying space and form; for the new buildings and the integrations the energy requirement is 29 kWh/m^2.

6. Conclusions

There is still a lot to be done in the road towards a growing presence of environmental awareness in the human behavior aimed at eco sustainable design and eco efficient cities at a human scale and respectful of nature.
But, what seams to emerge with great strength, is that contemporary culture, also in mass awareness, has embraced the urgency of a radical inversion of tendency towards these objectives; the theory-methodological path has been outlined with extreme clarity in the last two decades; in recent years design experimentation has finally reached an evolutionary phase (even if the *cases* of important actions, or at least the ones about to be put in action, are still very few) and technological innovation is not only undergoing a particularly productive period in terms of research actions, but also a period extraordinarily close to the practical translation of most of its results, in a position - and we must acknowledge this – far more advanced than the regulations, proving that the contribute offered by the technological culture of the project is increasingly important in contemporary Architecture when it comes to defining it as an "environmentally aware" process.
Of course it is also important to point out that, in terms of regulations, since 2005, in Italy the law apparatus for this discipline has made its appearance, actually this is indeed taking place, but with many deficiencies and recently – there is no use in denying this fact – with some back steps: *back steps* when we talk about compulsoriness to achieve concrete results, measurable in terms of environmental sustainability on one side (in this field there still is a total lack of legislation) and in terms of energy efficiency in Architecture on the other (which lacks incentives capable of measuring up to the problems); and, most of all, *back steps* when we come to talk about what the Sole 24 Ore newspaper has recently defined as the *Italian energy-environmental certification Babel tower*.
These days we are all attending and studying the possible outcomes of the National "Piano Casa" and the various Regional "Piani Casa", to understand, among other things, if it will be able to rise the percentage of public housing in Italy – and the one subsidized by the public - from the current 4%, to a percentage that gets closer to 20%, which is the European average, with peaks of 30-35% in some North European countries. The most important thing is to make sure that the improvement will not be a mere quantity increment, but that the *new designed and constructed housing will be animated and based on a social and environmental quality motion* also.
The most important thing is that our tendency, as designers, towards a reality made of environmentally and bioclimatically sustainable buildings, highly efficient in terms of thermal, fluid dynamics, lighting and acoustic control factors, never stops; on the other hand we want this tendency to grow stronger and to keep feeding from experimentations because, if it is indeed true that we have been ready for many years to design and build eco efficient buildings, the news is that – if regulation obstacles allow it – we are not too far away from being able to finally make such realities come true, *in a widespread pattern and at low cost*.

Design and technologies for integration of archeological resources in environmental design. The Strategic Plan of Marsala.

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Abstract

Cultural heritage has a strategic role for the progress of territories and the conservation of local identities. Often the action strategies are fragmentary and do not assure a valorization that should be economically sustainable and compatible with the peculiarity of the resources, and, more in general, of the territory.
The valorization should be structured as a systemic frame to sustain culture as a resource for the competitiveness.
The right models of governance and management are fundamental for the knowledge, the valorization and, the management of the heritage. A strategic and integrated planning as system to support actions and projects. In this way, it is possible to create new organization forms, as network and cultural systems, in which the cooperation of the actors encourages compactness of management, combined investments, sharing of resources and human capital, and involvement for the construction of the local identity.
Regarding this concept, the BEST Department of Politecnico di Milano and the PhD Course "Design and technologies for cultural heritage" are developing studies and researches about the process of strategic planning for the city of Marsala (Sicily, Italy).
The archaeological excellences of Marsala are a potential and catalytic element, and therefore they are considered as an instrument for a local development of the local system, which is structured both for a new urban, social and environmental settlement and for the improvement of the quality of the residential system, with the restoration of the real estate heritage.
The project of the archeological area of Capo Boeo is the driving force of this project.

Keywords: Strategic planning, Environmental design, Integrated cultural planning, Sustainable fruition.

1. Introduction. Systemic approach for the management of archaeological heritage

Coherently with the European approach to cultural heritage that has followed the Maastricht Treaty and with the role of the cultural resources with respect to social and economic consequences, a systemic approach of valorization and management has been structured to transform the archaeological resources of Marsala (town near Trapani, Sicily) in a catalytic element and an instrument for the development of territorial system for the urban, social, and environmental settlement, and for the improvement of the quality of residential system [1]. The widespread cultural resources of the territory - of which, in Italy, the archeological resources have an important, yet not valorized, role, - can be, if managed in a correct way, instrument for a sustainable approach to the territorial development. In fact, the cultural heritage has a strategic role for the development of the territory and for the valorization of the local identities. But very often the action strategies are fragmentary and not very effective, and they do not assure a economically sustainable valorization which is fit for the resources and for the territory.
The here presented model for valorization moves itself in a systemic frame to sustain culture as a resource for the competitiveness. Consequently it stresses the importance of governance and management models for the knowledge, the valorization and the management of the heritage. A strategic and integrated planning considered as system to support actions and projects in and for the territory. In this way it is possible to create new forms of organization, like network and cultural systems, where the cooperation between actors gives the possibility to create managerial unions for the investments, communion of resources and human capital, and to build the local identity. This model implies an advanced vision of governance which creates complementarities between planned valorization actions and tools for the management of the resources. In particular, it is a new, articulated and transdisciplinary concept that could be applied in general for the management of the territory and of its material and immaterial elements.

2. Governance for the valorization of archeological heritage

The concept of sustainable development, which "meets the needs of the contemporary generations without damaging the possibility for the new generation to satisfy theirs" [2], leads to consider the cultural heritage as local resource, rich , first of all, of different social values. From this point of view, the conservation of the cultural heritage is not a cost for the society, but a driving force for the local development. It is therefore necessary to structure a strategic policy of management of the cultural resources and a strategic planning of local systems, in particular for those territorial contests characterized by a lot of typologically differentiated resources. In the Mediterranean area these considerations are materialized through those material and immaterial elements of culture which are the backbone of

the local identity and create the landscape, together with the signs of history and of cultures, followed during the time, with the archaeological areas very often integrated into the local system to create a *unicum* with the territory. This Mediterranean characteristic represents a critical point in Italy, because while generally there have been improvements about the management of cultural heritage, with the passage from "protection" to "valorization", the protection and restoration of the archaeological resources are still considered final aims only. These activities are, indeed, steps of a more complex process for the valorization and the fruition of the heritage. In fact, thanks to these actions, it will be possible to act both on the archaeological heritage, which "gains voice" and communicates its inner values and meanings, and on the visitor who, accompanied during his itinerary of knowledge of the territory, can understand and choose the different itineraries and archaeological areas, increasing his sensibility and especially his sense of individual and collective responsibility for the heritage.

This sense of responsibility consists in the concepts of safeguarding and "active protection", going beyond the conservation and underlining the necessity to integrate the cultural heritage with the social and economic contest. The process of management of the cultural assets, especially in an archaeological area, must be integrated with the process of management of the other resources existing in the local system, with the process of management of the territory, with the valorization of cultural, environmental and landscape heritage, with the safeguard and fruition of historical centers, the new edification, the reuse of dismissed areas and with the processes of improvement of human and creative capital. In the contemporary contest the archeology is generally considered as important discipline but "out of date" and distant from the local feeling. Archaeological findings and areas are hardly object of common interest. This happens particularly in the areas diffused in the urban contest in a non-homogeneous manner, like spots on the leopard skin, which are hardly visible, and not rightly valorized and used, because considered often as obstacles for the building construction and urban development.

This is one of the difficulties encountered also in Marsala: the city offers a big variety of cultural and landscape resources, in which the archeological ones stand out. They are evidences of the Phoenician and Roman origins of the settlement. Marsala is situated alongside the excellent areas like the Mothia Island and Capo Boeo, which are unique in the west of Sicily for integrity and size. The Public Administration has indeed thought of proposing the candidacy for the recognition of these sites in Unesco World Heritage List. The city of Marsala welcomes the signs of the past, that today are "included" in the contemporary building and urban texture. We are talking about "small" sites, especially if compared with Segesta and Selinunte that can be find near Marsala. These small sites are less known and they are object only of occasional projects and actions of communication and valorization. These occasional projects are aware of the critical situation and conditions, and the demonstrated inability to create systemic frame to involve the collectivity. On contrary to the archaeological sites, and more in general to the cultural heritage, one method is fundamental: the *bottom up* approach, in which the local community functions as active part and as promoter of sustainable and entrepreneurial activity and projects. The insertion of the project of valorization in an integrated system of resources, just in its net organization it finds the strength to improve the attractiveness and the territorial competitiveness.

In this way, the Public Administration of Marsala has been moving on to structure a Strategic Plan and to define a project of cultural planning for the requalification and valorization of the local system, stressing the importance of the resources offered by the city, like the history, the sea, the port, the wind, the landscape, the monumental heritage, the wine and the food. Both generally, and in this specific case study of Marsala, these actions are found on economic approaches which aim is to achieve the principles of effectiveness and efficiency, following the logic of social enterprise theorized by Dioguardi [3]. The collectivity is involved in the actions of the territory and driven to know its own territory, developing the sense of belonging and of identity which implicitly leads to a more correct and respectful use of the resources. The economic development occurs thanks to the promoting activities, the internal and external communication and the consequent fruition of the heritage, which, if correctly valorized and completed of services for the collectivity, could be catalyst not only for the local, but for the visitors and the stakeholders as well.

Until the Seventies archeology was considered as a discipline of the activity of diggings destined to find evidence of the past, and the activities of conservation and valorization were considered independent from the actual discovery. More recently - before in the international context and then in Italy - a new approach has been structured thanks to a new awareness: the moments of the excavation and research are linked with those of conservation and valorization, which are considered as integrated steps of the research activity and can offer great input for a correct fruition of the archaeological area, and for the knowledge of the territorial processes which have led to the creation of the local identity [4].

Considering the definition elaborated in the normative field, the "valorization" is meant as a set of activities which aims to promote the knowledge of the cultural heritage, ensuring the best conditions of use and public fruition, and promoting and sustaining the actions of conservation [5]. It is evident that the concept of valorization is a *trait d'union* between heritage and consumer: to valorize means to give voice to the heritage, creating new relationships within the contemporary contest. Consequently it grows the importance of the communication and of communication tools. In the field of archeology, the implementation of these principles is especially true for the "parks". With the concept of park [6] the attention and the conservation of the heritage are to be considered not only by some individual finds, but

in a more complex way. This complexity consists of all the territory structured not only by archeological finds, but also by the urban centers, by the farm fields, by the landscape, and by the environmental resources. This results in a triggering of the relationship between ancient context and contemporary living in the territory, between old and new, because the territory is both simultaneous and layering of materials, identities and cultures.
It should be noted, however, that an archeological park is feasible only if there is indeed an area bounded and limited, because if the goods are scattered and spread over the territory, as often happens, it is impossible to apply the basic principles of structuring. This is the case of the city of Marsala, which, even though it does not possess any relevant cultural goods like other Sicilian realities, has a very interesting and worthy of attention archaeological supply, to be finalized in a logic of strategic planning. It is possible on the one hand to make plans for an archaeological park around Capo Boeo, which is very wide, visible and recognizable, and for another park substantially already structured on the Mothia Island. On the other hand, there are many other sites scattered on the territory that do not have the characteristics to suggest the transformation in parks, and for which different types of interventions are needed to enhance the management and the itineraries within the inner city, an area connected to the main archeological references through virtual instruments. This role of main area can be assigned to the site of Capo Boeo, which, together with the Archeological Museum of Baglio Anselmi, covers an area of 28 hectares and preserves important evidence from various typological and cronological points of view, and that has given the possibility to read and understand the evolution of the primitive town of *Lilybaeum*. This town had a Phoenician asset, on which the new roman town was built. The site was bound in 1949 (Law 1089/1939), and has therefore not been involved in construction and urban expansion. However, only since 2003, some actions of requalification of archeological heritage have taken place. The aim of these actions is the restitution of the area to the city, through the creation of a park in which the user has the ability to make an experiential visit accompanied by multimedia tools which "give voice" to the archeological findings. Spaces for educational activities and the creation of a Narrative Museum are also being finalized. Elements that combine a visit to culture, with the pleasure of environmental beauty, listening to sounds, voices and stories about the ancient life. The next step, in progress with the process of strategic planning of Marsala, will be the integration of the archaeological park with the more articulated system of the territorial resources.
Working in a perspective of management and integration of the territorial resources, it is essential to reflect on the role of the different actors involved. From the normative point of view, the activities of cultural valorization can be managed directly or indirectly, involving also the private sector and social enterprises, implying a new concept of cultural good as surplus value for the community that owns it, because the cultural goods are a potential instrument of development for the economic industries and for the promotional activities of the territory [7]. The private actors are called upon to participate to the formulation and implementation of strategies to enhance cooperation with the public, or even independently through the signing of concession contracts. The presence of private sector is generally positive because it implies both the presence of actors with different professional background, or a wide specialization of the interventions, that can be more pointed and efficient, in accordance with the expectations of the consumers, respecting the local identity. The multidisciplinarity of the research group fosters also the structuring of planning and integrated valorization projects for the tourist, without failing in the scientific rigor and the completeness of information. In this new conception of the project for the valorization and the management of archaeological areas, the figure of the archeologist as "unique actor" decays, as well as that of the territorial planner, replaced by a team of skillful agents, who cooperate efficiently to realize an archaeological park not only as "theater of archaeological finds" but also like a place of learning, of leisure and experimentation of active participation. Therefore, it is very important to find a new structuring of human capital: individuals belonging to different disciplines must be composed and organized in different ways and at the same time a strategic, integrated structuring of a relational system.

3. The integration of archeological areas in the processes of strategic planning: the case of Marsala

The necessity to operate with and within new instruments and new actors in a strategic, integrated, multiscale, subsidiary and active way in decisions and actions to transform the local system, to identify common goals, are the main characteristics of the strategic planning which the Italian Government has defined as voluntary and collective action of mobilization of actors with different backgrounds, needs, thoughts and priorities. With the aim of sharing the identity and the future of the territory, stipulating a contract between public and private actors and local population, with the coordination and the control of their responsibilities, in 2010 the local municipality of Marsala has initiated the process for the definition of the Strategic Plan of the city. The Strategic Plan aims at the preservation and the fruition of the territory and its resources, the development of the economic and local system, and the growth of a cultural tourism, which has to respect the local values. In this way, the Plan is a flexible and operative instrument, which listens the local community and the subjects who, have been working in various capacities in the area. The Plan not only identifies the objectives of conservation and development of short, medium and long term, but also the strategies and actions to be implemented to achieve them. The necessity to structure a Strategic Plan in Marsala was born by the awareness that the territory presents a survey of different resources, which potentially give Marsala the possibility to be characteristic and differentiate itself from other Sicilian realities. First of all, Marsala presents a widespread urban system, hinged on the presence of the historical districts diffused on a

wide territory. The second important element is the relationship between the contemporary town and the historical-cultural-environmental heritage, enriched with connections between archaeological sites and big areas of naturalistic interest, and in particular, the protected areas of Stagnone and Sciare. The third important aspect of the local identity is linked to an economic system characterized by important elements of territorial belonging, with the presence of a productive texture linked to historical and social identities, like the production of the wine and the salt, products which have characterized and structured the landscape of Marsala, with the salt pans, the windmills and the system of the wine *bagli*.

These are all resources which do not have the force to compete and to be so attractive if considered individually, but only if put into an integrated system of archeological heritage. In fact, nowadays, also without a right valorization activity, some touristic circuits include the visits to Stagnone Islands, with Mothia, and to the Archaeological Museum of Capo Boeo. The objective declared by the local Administration in the Strategic Plan, is to develop this cultural and touristic offer, using the "catalyst" of the archaeology to bring out positive effects in the all local system, involving also the private enterprises to valorize and to renew the local productions of wine, considered as medium of historical and cultural identity, for the requalification and the fruition of the natural and environmental heritage, for the new design of the coast, with the urban waterfront and the development of the port in a touristic way, for the recovery of the historical centre as natural commercial centre, for the development of the town and of the districts in a polycentric way (in a perspective of containment of the soil consumption), for the mobility, and for the territorial accessibility. The improvement of the level of usability of the archaeological heritage, encouraging the integration with the other resources of the town becomes thus the first objective of the strategic line "The culture at the centre of the development policies" [8]. This objective is in close synergy with the recovery of the industrial archeological heritage, historical productive, through some forms of joined management, with the support of branding and territorial marketing policies, with the promotion of a cultural policy in favor of new generations, creating places and activities for the education, the knowledge and cultural growth.

4. Conclusion. The role of the archeological heritage: recipient or actor of strategies of valorization?

The Strategic Plan of Marsala permits to bring back the complexity of the local context - given by the variety and the articulation of the cultural heritage, the actors and the process of constitution of the local identity and the attribution of value to the resources of the territory - in a "meta-planning" approach structured for requirements, performances and strategies. In this way, paying attention to the needs of the local community and the stakeholders, the archeological resources have become the lever to manage a "cascading" process of valorization, which goes over the small area of the archeological park or of the system of the sites, to open itself to the widest area of the territory of Marsala, with the aim to research synergies and nets of relationships between subjects and resources. The testing of integration of the process of valorization of the archeological heritage started with the Strategic Plan, can lead to important results for the city. In the short term, there will be the development of the sites already usable nowadays and a higher awareness of the local community for the conservation of archaeological resources, with strategic projects of education for the use of these resources, not with single project, but using a coordinated program of actions. In the medium term, the archeological park of Capo Boeo will be realized, as an element of connection between archeological goods spread in the territory, and the cultural and environmental events that the city has to offer, structuring a permanent laboratory of research and testing for the sustainable development and for the "creation" of new cultural values and new landscapes. In the long term, there will be presented a "strong" candidacy for the recognition of the system "Mothia and Lilibeo and the Phoenician civilization in Italy" as Unesco world heritage site, with a plan which is able to connect the management of the site with the processes of development of the city.

References

[1] This text reports the experience that the Research Group "Governance, design and exploitation for the built environment" of the BEST Department - Building Environment Science and Technology, of Politecnico di Milano, coordinated by Fabrizio Schiaffonati and Elena Mussinelli, has been developing in Marsala, for the Strategic Plan called "Marsala 2020 - Città Territorio". The Plan was assigned in the 2010 from Comune di Marsala (Trapani, Sicily) to Centro Studi PIM of Milan (leader), Avventura Urbana Srl of Turin, Eures Group Srl of Marsala, and Itinera Lab Srl of Marsala. The Centro Studi PIM avails itself of scientific consultancy of the BEST Department of Politecnico di Milano.

The experience of Marsala is only the last in chronological order among the activities of strategic planning which the Research Group has developed, first in Novara (Piedmont) in 2007 and then in Mazara del Vallo (Trapani, Sicily) in 2010. These experiences are placed in the contribute that the Technology of Architecture gives to the strategic planning for the creation of system of the resources and of the planning expressed by the territory, and of location of strategic assets of development in the medium and long period.

For a close examination are suggested:

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Romagna (2010).
This line of research has found incubation in the experiments led in the territory of Mantua (Lombardy) with the Strategic Territorial Marketing Plans of Morainal Area and Oltrepò, and more recently in the Province of Mantua, with the constitution of Cultural Districts of Mantua and Sabbioneta ("Regge dei Gonzaga") and of 13 towns of Oltrepò ("DOMInUS"). The Research Group "Governance, design and exploitation for the built environment" is collaborating for the construction of these two Districts. The findings of this research are documented in:
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[2] Word Commission on Environment and Development, *Our Common Future*, 1987.

[3] Dioguardi, G., "Organizzazione, cultura, territorio", *Franco Angeli*, Milano (2009).
Gianfranco Dioguardi, a theorist of "impresa rete" – in his words also "macroimpresa" – underlines the importance of the strengthening of the social function, in fact, the innovation, meant as new combination of productive factors, induces the businessman who leads the operative net, to rediscover the "spirit of the enterprise" through forms of strong motivation which can be transmitted to all who take part in the transformation of the territory. Therefore, this is also in the direction of the culture of the social transformation of the enterprise the development to the third sector and to *non-profit* sector.
For a close examination are suggested: Donato, F., Badia, F., "La valorizzazione dei siti culturali e del paesaggio. Una prospettiva economico-aziendale", *Leo S. Olschki Editore*, Ferrara (2008).

[4] For a close examination are suggested:
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- Riva, R., "Il metaprogetto dell'ecomuseo", *Maggioli*, Santarcangelo di Romagna (2008).

[5] Decreto legislativo 22 gennaio 2004 n. 42 "Codice dei beni culturali e del paesaggio", s.m.i..
Accettura, B., "I beni culturali tra ordinamento europeo e ordinamenti nazionali", in: *Aedon*, n.2, *Il Mulino* (2003).

[6] In the international context the idea of archeological park traces back to the last century when, ended the big period of research and of rediscovery of the big Greek and Roman civilizations, the role of the archeology had been developing in relation with the society. The concept of archeological park started in the North Europe due to the strong relation with culture, territory and nature. Only during the first years of the XX century the concept was elaborated also in Italy. In Italy the idea of park as instrument of development and valorization of the archeological area was elaborated in the Sixties and Seventies, in particular after the creation of the "Ministero dei Beni Culturali" in 1975. The definition of the archeological park has been long and difficult, maybe because archeology was unable to be intended also as a science applicable to the management of the territory. It was therefore difficult to catch and define the relationship between urban planning of a territory and archeological planning. Nowadays, also from the legal point of view there are only some specific instructions about parks, not to mention the ambiguity between the laws regarding archeological assets and landscape, yet considered as separated elements and not as integrated realities. For a close examination are suggested:
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[7] For a close examination are suggested:
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[8] The Plan has picked out four strategic lines. Not only "The culture at the centre of the development policies", but also: "To foster the territorial quality", "To foster the rural economy" and "The sea as industry of the future".
The documents elaborated are published on the website: www.pianostrategicomarsala.net.

HEAT ISLANDS AND URBAN STRUCTURE

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Abstract

The phenomenon of Urban Heat Island is shown by an increase in temperature that mostly affects urban areas in comparison with the surrounding rural areas. This increase in temperature becomes problematic during the heat waves when it can give rise to problems of energy and health. The factors affecting this phenomenon are related to the morphology and location of the urban area, to the characteristics of building and roads materials, to the shape of urban structure. The paper investigates the phenomenon of UHI by analyzing in particular the influence of major urban planning features: the average height of buildings, the building density, the coverage ratio, the percentage of impermeable surface. The study was carried out starting from the analysis of a real case within the Province of Naples. The identification of areas liable to heat islands has been done by working out a thermal map of the Province of Naples through the creation of hyper-spectral satellite images using remote sensing techniques. This map has allowed to select some sample areas within which the main urban planning parameters have been detected through remote sensing techniques or spatial analysis. For each parameter, correlation curves "temperature - urban planning parameter" have been worked out. The main result is the development of an abacus that allows to estimate the expected temperature changes according to the decrease or increase of each urban parameter.

Keywords: Urban structure, energy consumption, climate change

1. Introduction

Urban Heat Island -UHI- is a thermal anomaly affecting large urban areas that show temperatures which are higher than surrounding rural areas. The intensity of this phenomenon can be quantified as the maximum difference between the average temperature of urban air and that of the surrounding rural environment. Compared to the latter, the temperature increase is more pronounced at night than by day; in daylight the temperature difference between urban and suburban areas can range from +1 ° C to +3 ° C, while at night it can reach values ranging from +7 to +12 ° C [1]. This phenomenon occurs especially in big cities where there is an extensive use of materials that retain heat. The widespread overbuilding, the prevalence of paved surfaces on green areas, the use of building materials with low ability to dissipate heat are among the main causes of UHI. To these causes other factors are added due to the location of the urban area (local morphology, microclimate features, presence of huge waterbodies) and to human activities (emissions from motor vehicles, industrial plants, heating and air conditioning systems for household use).

In summer, the presence of this phenomenon leads to numerous problems, ranging from the peak demands for energy consumption, to air-conditioning costs, pollution and greenhouse emissions, health problems. The phenomenon becomes dangerous during the increasingly frequent summer heat waves, which can cause power blackouts in metropolitan areas and a significant increase in mortality.

The scientific approach to the problem has so far focused mainly on how to detect the temperature within the heat islands and on the thermal properties of building materials. This paper investigates how urban structure can contribute to the occurrence of this phenomenon .

The incidence of urban shape in the determination of UHI is widely recognized in scientific field, though not much investigated in parametric form [2]. The proposed study examines specifically the relationship between some indicators of urban shape and the temperatures reached inside UHI and identifies the impact of selected urban structure indicators on the phenomenon. The field of application was the province of Naples.

The study was divided into four phases:

1 UHI identification
2 Identification of test areas subject to UHI phenomenon.
3 Recognition of the main indicators of the urban structure in the test areas.
4 Comparison among the test areas and correlation analysis for evaluating the incidence of each feature of the urban structure on the temperature variation.

First step developed has been Heat Islands identification. There are two types of UHI: *surface* and *atmosferic* UHI. Surface Urban Heat Island refers to the temperature of urban surfaces exposed to the sun that is hotter than air. In summertime urban surfaces temperature could reach 50°C during the day, the difference with air temperature is smaller during nighttime. Atmosferic UHI refers to warmer air in urban areas compared to cooler air in rural surroundings, this phenomenoun is weak throughout the day and becomes more pronounced during nighttime due to the slow release of heat from urban surfaces. To identify UHI scientists use direct and indirect methods.Direct methods such as fixed weather stations and mobile traverses are used to identify atmosfpheric UHI [1,2]. İn this paper, remote sensing, an indirect measurement technique, has been used to estimate surface UHI.

Remote sensing data has been used to identify green areas too. Trees and vegetation help reduce air temperatures trough the evapotranspiration process, in which plants release water to the surrounding air, dissipating ambient heat. In addition, the remaining rate of solar radiation not used for evapotranspiration and photosynthesis is reflected and so is neither absorbed nor emitted back later. This means that, when a vegetation surface is present, temperature values are lower. The vegetation is easily detectable by satellite observations because it produces a specific spectral resolution characterized by a specific pattern of the reflectance coefficient.

The temperature map has allowed the identification of test areas resulting warmer than surrounding environment. The selected areas have the same size (1 km^2) similar land use and building materials but different characteristics of urban geometry. The indicators used in each test area are the following:

- Non-permeable Surfaces Index: expressed by the ratio between paved open areas (i.e. streets, parking areas, courtyard) and the total amount of open areas;
- Percentage of Green Areas i.e. the area occupied by vegetation;

-Land cover ratio: expressed by the ratio between the built surface and the land area. The total built surface is the sum of the areas resulting from the horizontal plane projections of the buildings shapes;

-Geographical localization: location of each test area in relation to the surroundings, i.e. whether it is an inland or a coastal area;

- Building density: expressed by the ratio between the sum of the buildings volumes and the surface of the entire area;
- Mean altitude at sea level;

Mean height of buildings.

The comparison between the value of each indicator in any test area and the average temperature of each area has allowed the correlation analysis among urban structure and temperature increase.

2. The temperature and vegetation maps

The data used for this study were acquired by the air transported sensor MIVIS (Multispectral Infrared and Visible Imaging Spectrometer) made available by the Province of Naples with the scientific and technical cooperation of the Air Laboratory for Environmental Research, LARA, of the National Council for Research (CNR). MIVIS is a sensor that operates with high spectral and spatial resolution which registers the radiation issuing from the earth's surface. The high spectral resolution consists in the high number of acquisition channels: in fact, the radiation from the earth's surface is divided into 102 channels, each with a small range of wavelengths. The high spatial resolution of the images obtained by the MIVIS

sensor, however, offers a great detail in the number and geometrical characteristics of the elements that compose the images thanks to the 3x3m pixel size, which allows more precise and detailed analysis of phenomena. Data processing has been performed by the software ENVI 4.7 (Environment for Visualizing Image of the "Research System Inc"), which allows the visualization and analysis of data in different formats.

The realization of the temperature map has included the whole province of Naples, which consists of 92 municipalities. The area analyzed, given its size, was not detected in a single flight but was completed in a period from 28 / 06 / 2005 to 27 / 07 / 2005. This resulted in a marked difference in temperature between group of strips realized in different days, and that was taken into account in the selection of test areas. The entire detection consist of 116 strips needed to cover 1170 km2 in the province of Naples. The temperature map realized is a two-dimensional image that shows the temperature of the bodies derived by measuring the intensity of infrared radiation emitted by the concerned bodies. The temperature map has been realized analyzing the channel 93 of each strip as it provides temperature values, which in so low altitude flight (about 1500 meters) is very similar to the temperature measured at ground level [3]. Channel 93 of each strip includes the range of wavelengths ranging from 8.2 µm to 8.6 µm which is not detectable by the human eye and detects the temperature of the bodies Therefore in the range of channel 93 the detected electromagnetic energy is only the radiance of the bodies. In fact, the amount of energy emitted per unit of area and per unit of wavelength range is not affected by the reflected solar radiation. In addition the range 8.2 ÷ 8.6 µm of the channel 93 lies in the atmospheric window ranging from 8 µm to 14 microns where the interposition of the atmosphere between the satellite and the Earth's surface is almost meaningless. In this range the particles making up the atmosphere are crossed by the electromagnetic radiation and the one that reaches the sensor is exactly the radiance emitted by terrestrial bodies, without the interference of the atmosphere through the absorption or diffusion phenomena. A preliminary operation to the analysis of such a vast territory as the province of Naples was to make a single mosaic image from the many strips issued from MIVIS. The obtained mosaic image, with datum Gauss Boaga Roma40 (in use in the period of the survey realization), was converted to UTM WGS-84. The representation of the mosaic image in classes of temperature has assured an immediate reading of values, showing very high values, above 50 º C, which are evidence of thermal anomalies that are the basis for the development of the Urban Heat Island phenomenon. Thanks to the high geometric resolution of data it is possible to identify in the temperature map the single existing buildings that reach these anomalous peaks. The high geometric resolution, therefore, plays a key role in making a more detailed analysis allowing to derive the thermal properties of the different natural or anthropogenic elements present in the temperature map [4].

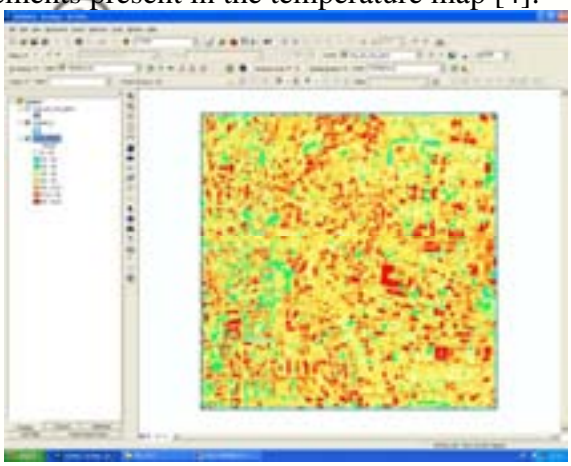

Figure 1 - The temperature map

The comparison between orthophoto and temperature map clearly shows the role of materials on temperature, in the same area we find surfaces exceeding 50° C and surfaces below 35° C. The black bituminous built-up roofs and the paved wide open spaces (parks, squares) reach the highest temperatures.

Remote sensing data has been used to realize the vegetation map too. Most vegetation indices are based on the fact that there are significant differences of reflectance in the electromagnetic spectrum and are based on the analysis of the relationship between defined wawelenghts, where there are different behaviours of reflection and absorption [5]. A widely used index is the NDVI (Normalized Difference Vegetation Index) which is based on the normalized difference between BV (brightness value) of pixels in the Near Infrared range (NIR) and those of the Red Infrared (RED):

NDVI = (NIR – RED) / (NIR + RED)

Typical values of NDVI -which is limited in the range (-1, 1)- are: 0.2 to 0.6 for vegetation; 0.1 ÷ 0.1 for soils and rocks; 0, 2 for water.

Even the vegetation map through NDVI has been produced from the data of MIVIS sensor. For each strip two acquisition channels were considered: Channel 13 for the red infrared with a range of wavelengths ranging from 0.673 µm to 0.693 µm and the channel 20 for the Near Infrared ranging from 0.813 µm to 0.833 µm. To obtain a thematic map showing the vegetation it was necessary to change the decimal values of NDVI in integer values, by performing a linear stretching consisting in converting a 32 bit picture in a 8bit one where the BV of pixels have values ranging from 0 to 255 (ie, there is a passage from 232 to 28 colour graduation). The map shows all the vegetation of the Naples province. The high geometric resolution characterized by a 9m2 pixel allows to make a detailed analysis identifying every single tree that has a meaningful influence on the temperature value as it interacts with the solar radiation. In fact, in green areas the recorded temperature is lower since urban vegetation has a substantial effect on reducing urban temperature, then, its increase has to be considered as one of the most effective measures against the UHI phenomenon.

Figure 2 - The localization of test areas

3. Urban structure in test areas

The values of the indicators describing urban structure have been derived from the official map of the Province of Naples. The table 1 shows the values calculated for all the investigated areas.

TEST AREA	Land cover ratio	Percentage of green areas	Non-permeable surfaces I.	Mean temperature [ºC]	Geographic Localization	Mean height of buildings [m]	Building density [m^3/m^2]	Mean altitude s.l. [m]
1	0,441	13,05	42,88	42,5	Inland plain	7,49	4,17	97,15
2	0,25	31,55	43,4	39	Inland plain	5,01	2,016	111,23
3	0,18	51,94	30,53	38,1	Inland plain	4,92	1,23	112,44
4	0,425	18,51	39	40,48	Inland plain	5,34	2,67	102,1
5	0,43	15	41,61	36	Coastal area	12,35	6,45	48,98
6	0,192	49,98	30,81	35,8	Coastal area	6,94	1,71	61,55
7	0,5	2,35	47,806	39,75	Coastal area	21,65	12,25	18,74
8	0,11	73,83	14,92	34,5	Coastal area	6,87	1,14	86,03

For each indicator the correlation with the mean temperature of the area has been studied. There is a direct correlation between land cover ratio and mean temperature: in flat inland areas, an increase of about 0.26 of the land cover ratio creates a temperature gradient of about 4.4 ° C. Indeed, from a coverage ratio equal to 0.18 and a temperature of 38.1 ° C, representing the area n. 3, we move to values of 0.44 and 42.5 ° C in the area n.1.
In coastal areas, with similar land cover ratio, temperature is lower, the decrease is between 3 ° and 6 ° C to confirm the beneficial effect of sea on temperature.
The percentage of green areas has a positive impact on decreasing temperature. In coastal areas the temperature moves from 39.75 ° C to 34.5 ° C at the respective green rates of 2.35% and 73.83%. The inverse correlation is not linear as the temperature is significantly affected by the exposure to the sea. In inland areas, however, the decreasing trend is almost linear since the reduction in temperature is only influenced by the vegetation surface. For an average temperature of 42.5 ° C there is a area covered by vegetation amounting to 13.05%, while at a temperature of 38.1 ° C there is 51.98% of vegetation surface. When the vegetation in the area increases by about 40% there is a temperature decreases of about 4 units.

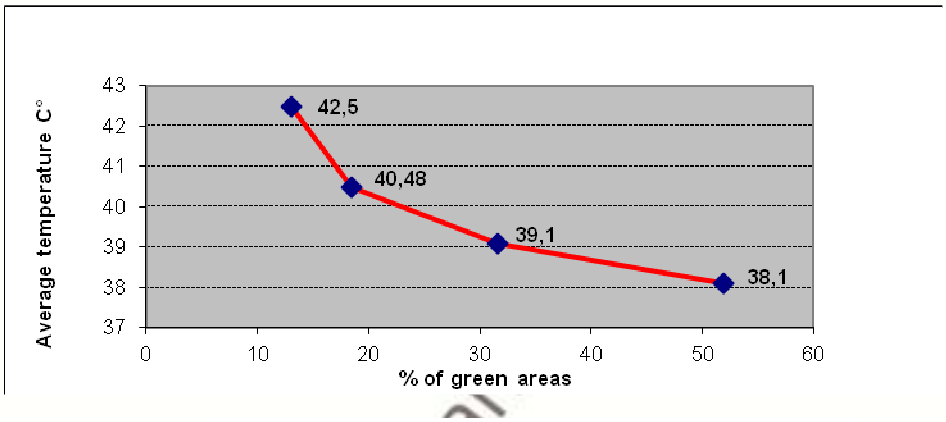

Figure 3 - Percentage of green areas - Temperature in inland plain areas

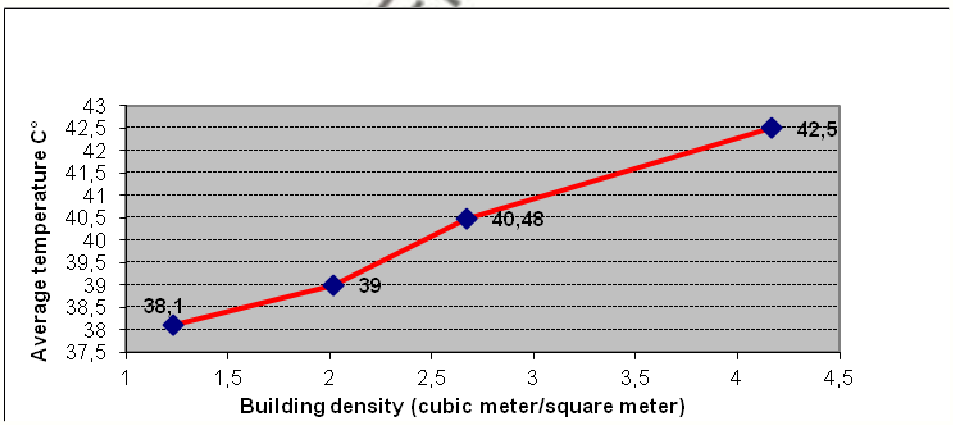

Figure 4 - Building density - temperature in inland plain areas

There is an increasing temperature trend according to the increase of the average height of the buildings. In fact, the more the buildings height is, the more it is difficult to dissipate heat in the atmosphere, since it remains trapped in building environments for a long time causing the "canyon effect". In inland plain areas, we move from a temperature of 38.1 ° C with a mean height of buildings of 4.92 m to a temperature of 42.5 ° C at a mean height of 7.49 m. In coastal areas temperature moves from 34.5 ° C to 39.75 ° C in correspondence of the mean height of building equal to 6.87 m and 21.65 m respectively. Also for this indicator the trend is not linear and making a comparison between inland and coastal areas, in the first case the temperature of 39 ° C is achieved at a 'height of 5.01 m, while in the second case that temperature is reached with a significantly elevated height of about 21m. This fact shows, once again, the dissipative action of the sea toward heat. The building density is a cross indicator that links building height to the

covered surface. Of course, like the two primary indicators it issues from, it shows a rising trend as the temperature increases: almost linear for the inland plain areas, broken for coastal areas.

4. Conclusion

The work proposed is still in progress, we are going to increase the number of test areas in order to have a sample survey more meaningful of different conditions (by geographical localization or building materials) present in an urban environment. What exposed until now has mainly a methodological value and is a first test of the procedure set up. The definition of the relations that shows the increase or decrease in temperature Δ T (u), related to a unit increase of the examined indicators Δ..^{u}, has been crucial for realizing an abacus that allows to estimate the temperature changes expected with the increase of each indicator connected with the increase of temperature inside an area of 1 km 2 according to the unit increase of the indices.

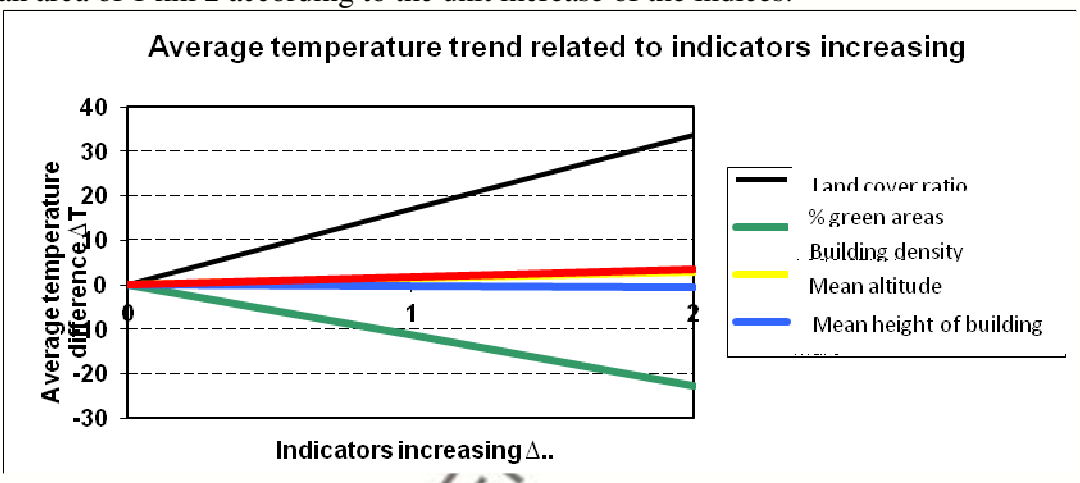

Figure 5 - Average temperature trend related to indicator increasing

With the same morphological conditions, i.e. with a inland plain area with heights equal to 100 meters above sea level and building materials, this kind of abacus (implemented with the data still in progress) may be useful to estimate the increases in temperature deduced from some parameters of urban and regional planning.

Immediate actions to reduce UHI are the cooling of roofs and street pavements using lighter colored materials and the increasing of green areas and green roofs.

Aknowledgements

Paragraph 1 is due to M. Soravia; paragraph 2 is due to F. P. Migliaccio; paragraph 3 and 4 are due to M. Stanganelli

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STRATEGIES FOR SUSTAINABLE DEVELOPMENT IN ROMANIAN COASTAL ZONE OF THE BLACK SEA IN USE OF RENEWABLE ENERGIES

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Abstract

The coastal environment is very dynamic, fragile, vulnerable and have limited capacity to support human pressure and the current global climate change (rising temperatures, rising sea levels, frequent extreme weather events) to determine risks for natural resources, fragile ecosystems and coastal safety population in these areas. Therefore, investments shall implemented solutions focused on green energy development based on solar radiation, wind, biofuels and on recycling, green real estate development and spatial planning. Investment truly sustainable, so called regenerative investments, must channel financial resources into projects that imitate the workings of nature in the closed-loop systems that recycle materials and energy. Using local materials and traditional construction can reduce costs, create local employment positions but can reduce energy requirements for production of building materials. It is known that in the Mediterranean two thousand years ago to achieve passive cooling of buildings and now these techniques are revitalized with new options available today.

Keywords: optimi traditional architecture, solar potential, operating in optimum parameters

1. Introduction

This material is aimed to determine the characteristics of environmental factor for an area in the Romanian Black Sea coast, in the deltaic coast and lagoon coast to expand solar energy use in homes in this area. Evaluation of sustainable development indicators is performed using pressure-situation-response analysis are components of the coastal environment in a sector. Coastal management activities and sustainable development requires the integration of sectoral programs for sustainable development of coastal settlements, adaptation of infrastructure, human resources, promoting clean technologies and sustainable practices, preparation and implementation of land use, development and implementation of quality criteria simultaneously environment.

Duration of sunshine in the territory of Romania has the same values as in Turkey, Bulgaria, Italy, Macedonia and northern Spain.

2. Description of the house from an arhitectural point of view

Chosen for study is a house typical of the Danube Delta and has a poor architecture in terms of materials, but is well adapted to local natural conditions. The architecture of the houses is that determin production of maximum effect with minimum material means [1].

Figure 1. House study – photo by Ionut Radulescu, Village Museum,Bucharest

The roof appears first, rises slightly, emerge as a backboneover tall grass and over bushes of flowers, which at their turn encircle the porch, hanging everything that grab[1].The roof is entirely of reeds which is burned by the sun and is in two waters. Is a narrow porch, with pillars thin, tall and carved. It is made of ground being paved with planks of wood and is higher than yard [1].

Housing unites under one roof, the house functioning and annex, only chicken coop and summer kitchen are not under the same roof. *The house is built of unburnt bricks and bricks* [5]. House has 10 rooms and is in the shape of L. Long side is space for housing and less space is used for different household activities (tool room, room for food, fish smoking room, stable and glacier). The other two sides of the house are enclosed with a fence built of stone not want to "hide" the house, but it invites you to discover.

Space for housing has two rooms for sleeping (one for guests and one for home owners), two tends to make the connection between porch and sleeping rooms and kitchen winter.

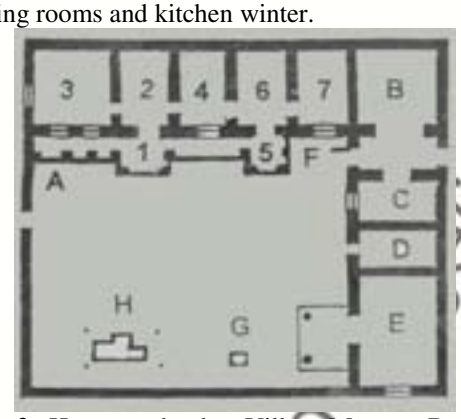

Figure 2. House study plan, Village Museum,Bucharest

A – house (1 – portch; 2 – enterence room (strive); 3 – room for guests; 4 – room for living; 5 – prispa; 6 – enterence room (strive); 7 – kitchen); B – tool store; C – food store; D – smoked fish store; E – barn; F – glacier; G – hen house; H – summer kitchen

Carpentry of traditiona dobrogen house is their outdoor ornaments. Consists from frieze and fretwork frontal, frascias at eaves painted in blue, shutters and doors painted in living colors [5].

a **b** **c**

Figure 3. Elements of exterior joinery, Village Museum,Bucharest
a – painted door , b – painted windou (photo by Ionut Radulescu),
c – porch overview (photo by Mihnea Ghindus)

3. Calculations for the functioning of the house

3.1. Environmental characteristics and calculation of potential solar

For chosen location, genetic factors of climate are characterized by the average of 2250 sunshine hours, average total cloudiness is 5.4 tenths, average annual number of days with clear sky varies from 70.1 days. Global solar radiation as the main genetic factor climate reaches the Danube Delta in Romania higher annual values, they increase from west (130 kcal/cm^2) east (over 135 kcal/cm^2 under the influence of the Black Sea. These values are influenced by total cloudiness and sunshine duration [3].

Air temperature is uniformly distributed on the surface of the delta, there is a gradual increase from west to east, while reducing the influence of land and increasing influence of the sea. Oscillation yearly averages between 11.0 ° C and 11.6 ° C. Values are average annual relative humidity equal to or greater than 75% because of the many sources of evaporative and evapotranspiration within the delta.
Precipitation is reduced in amount and decreases from west to east because of the active area specific delta and the Black Sea. In most of the delta amount of rainfall is between 350mm and 400 mm.
Wide opening to the east, the absence of orographic barriers and many bodies of water, as near the Black Sea are elements which determine the high frequency of winds, high speeds and low atmospheric calm. Prevailing winds are from the northern sector alternating with the southern most intense wind acceleration is recorded in winter and transitional seasons [2].
Taking all these local caracteristical of environmental factors, could determine the solar potential. Based on daily measurements of sunshine duration and solar radiation Rs [W / m] to evaluate the potential of solar Ps [W / m] of the site under study.

a **b**

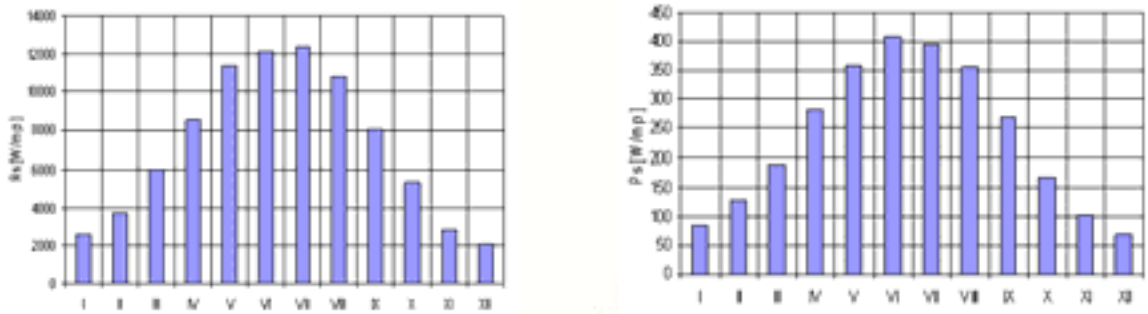

Figure 4. Solar radiation - **a** and potential of solar - b

From analysis we can see that the max values of sunshine duration and solar potential of (409 W / m) are obtained in the summer. Lows are recorded in winter and the transition seasons.

3.2. Calculation of energy

Calculation of energy was determined based on average annual values of potential solar for different categories of customers. For heating, domestic hot water and lighting was use the methodology for calculating the energy performance of buildings [4] and finally we obtained the following values [table 1].

Table 1. Calculation of energy

Month	Consumtion energy *Ec*			
	Light [kWh/luna]	**Power [kWh/luna]**	**Air conditioning [kWh/luna]**	**Heating [kWh/luna]**
I	9	324		108
II	9	324		108
III	9	324		108
IV	8	324		
V	8	324		
VI	8	324	150	
VII	8	324	150	
VIII	8	324	150	
IX	8	324		
X	8	324		
XI	9	324		108
XII	9	324		108

Formulas for calculating energy consumption for lighting, power and heating take into account the following factors: total surface area, the volume of occupied space free, the rate of ventilation of premises (number of air exchanges per hour) operating ratio, coefficient of compliance, the average thermal resistance building envelope corrected during the heating season, water consumption density, specific heat hot water consumption, installed power.
According to Suri et all panel mounted horizontally, the energy produced per kWp for Romania, has values on the coast of 1000kWh/kWp as have countries such as northern Turkey, Greece, Croatia, Italy, France and northern Spain.

3.3. Photovoltaic plant

After calculations, the following components of photovoltaic installation for places of study resulted [Table 2].

Table 2. Components of photovoltaic installation

Nr.crt.	Name of component	Description	Numbar
1	Photovoltaic panel	IPM 250W	20
2	Inverter	SIM 24/2000	2
3	Charge controller	SIM 24/40	2
4	Battery	12V/200h	8
5	Photovoltaic panel mounting system	Kit suport	20set
6	Box connections, fuses, connectors, other	String Box	1

Figure 5 presents photovoltaic palnt made of:

- 20 photovoltaic panels IPM 250W haveing the future caractheristics: module efficiency 14%; cell efficiency 15,8%; max power 250W; dimensions LxWxH 1650 x 990 x 35 mm;
- 2 invertere SIM 24/2000 haveing the future caractheristics: maximum continuous power: 2000W; peak power: 4000W; Dc input voltage range: 21.4V-33V; Ac output voltage range: 115V/230V +/- 3%; efficiency: > 85%; dimensions (LxWxH): 415 x 283 x 100 mm;
- 2 charge controllers with next caractheristics: voltage configurations: 12 and 24Vdc Auto-Detection; rated charging current: 40 Amp; rated load current: 15 Amp; dimension (DxWxH): 192 x 140 x 66 mm.
- 8 battery with next caractheristics: voltage 12V; up to an hour current 200A; dimensions LxWxH 330 x 215 x 170

Figure 5. Photovoltaic plant

4. Conclusion

In this article is presented with the operation of a photovoltaic plan on traditional houses. Based on calculated energy values was showned that such a home can ensure its energy needs for housing in a large proportion. The problem is in winter when energy demand is higher than the proposed energy. The solution to this problem is usage of a generator. Another solution is to use wind energy keeping in mind that in winter the wind is high potential values. In this way they are used several kinds of local renewable energy. Given that the Romanian Black Sea coast is characterized by high sunshine duration and high wind potential can extend the use of such energy throughout space. Traditional architecture with thatched roof is an architecture that can support solar panels because it is an area that allows fastening systems in the resistance of the roof structure.

Acknowledgements
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TRADITIONAL WOODEN BUILDINGS IN PORTUGAL THE *AVIEIRA* HOUSE

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Abstract

The presence of wood in structural applications in construction was constant in Portugal until the end of the XIXth and early XXth centuries. Wood was used since the first constructions when the available resources were scarce and it continues to be present in vernacular buildings and areas whose heritage value requires their preservation. The wood as a structural material is now uncommon in residential buildings in Portugal. It often appears as partial constructive element (particularly in roof structures and floors) and occasionally as integral constructive element. In the latter case, on the vast majority of situations, it appears as a culturally decontextualized constructive system since it lost any connection with traditional solutions using wood.

Keywords: Wooden Buildings, Traditional Construction, Stilt Houses, Avieira Culture

1. Introduction

Due to the lack of efficient means of transportation, the materials used in the walls of traditional houses, mostly heavy in our climate and cultural context, were closely associated with the local availability of raw materials and labor [1]. As a consequence, the materials used for the construction of the heavy and structural elements corresponded directly to the lithological characteristics of the soil and their distribution throughout the country was the one represented in the map (Figure 1).

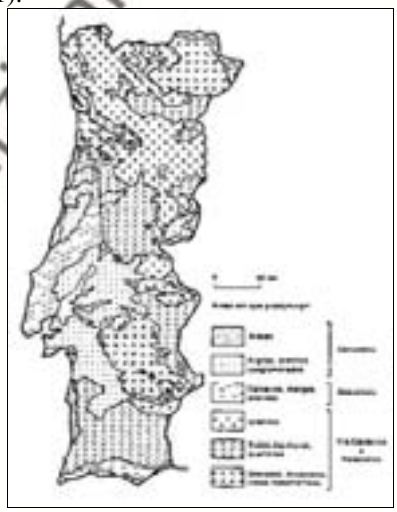


Figure 1. Lithologic diversity in continental Portugal [2]

The use of wood in the whole building was conditioned not only by the climatic characteristics and durability of the material on the outside, but mainly for the simplicity of obtaining the material, related to the existence of near pine forests. "In the northern part of Extremadura, along the low cost, the Leiria Pine Forest was a determinant element of the architecture of the region, leading the timber to occupy a predominant role and sometimes almost an exclusive one in construction" [3].

This fact was due not only to the availability of wood, but also to the non-availability of stone nearby. Even the clay needed for the manufacture of adobe blocks or rammed earth, is totally lacking in these sand soils.

While in cold countries with abundance of forests, namely the Nordic countries, the wood was and still is the whole structural and cladding component of buildings, in countries with fewer wood resources, like Portugal, it was used

predominantly in the structures and parquet floors, roof structures, windows and doors, where wood was irreplaceable due to its mechanical properties, combining low weight with a high resistance to bending stresses [1].
The wooden construction is also related to the quality of the land where the buildings are implanted. From the Portuguese cities of Espinho (20km south of Oporto) until S. Pedro de Moel (100km north of Lisbon), the coast is an extensive range of quaternary sands, as shown in Figure 1. In these coastal areas, as seen in the houses in Aveiro, "the lightness of the wood allows the raise of buildings in a sandy soil of low stability (...). The *Palheiros*, built at poles, bring to mind assumptions related and derived from pre-historic lake stilts" [4]. This solution also prevents the accumulation of sand carried by the wind. Moreover, "(...) when it becomes necessary, the house is raised rises using hydraulic systems, pulling up the stakes or adding stilts that cause the house to raise to bigger height" [4]. There is a wood scaled model used as a showcase of Avieira Culture dwelling (Figure 2) found in the village of Caneiras.

Figure 2. Scale model of an *Avieira* house, supported by a truck pulled trailer

The area of traditional wooden constructions of the *Palheiro* type extended along the north of the Douro coast, from Caminha to Póvoa de Varzim (Figure 3). The area of this type of construction had its southern limit in clusters in the coast of Pedrogão and Vieira de Leiria beaches, nowadays non-existent (Figure 4). From these fishing settlements south of Vouga a periodic migratory chain of the Mondego's people and of the fishers of Vieira de Leiria was created.

Figure 3. Aguçadoura, Póvoa de Varzim

Figure 4. *Palheiros* in Vieira de Leiria [2]

The latest, during fishing low season, work in the rice fields of the Sado River and in the fisheries and transport of the Tagus River [2]. Thus they have settled in this area bringing with them their traditional building types. Examples of these Avieiros houses are located in the basin of the Tagus River, particulary in the area of Santarém, which features clusters in the villages of Caneiras, Escaroupim, Palhota, Valada and Patacão, among others the only elements in these construction that are not made of wood are the chimney and the pillars, which raise the house from the soil, protecting from the humidity and the floods of the Tagus River. This situation is related to the ground type.

2. Avieira Architecture

The stilt constructions of the Tagus river began to appear in the landscape for periodic use – fishing season to the fishers of Vieira de Leiria. At first, the buildings were canvas tents and reed roofs supported on stakes. With time and the desire to remain along the river lead to the houses becoming permanent, which induced better quality. These were the origins of the first stilts constructions - typical of Vieira de Leiria beach - huts built with material available at the mound.

Nowadays there are still some examples of these constructions in the area of Santarém, despite some differences, particularly in their construction process. Originally the houses, being entirely of wood, were materialized by a horizontal grid over the stakes where the skeleton of the house laid, formed by horizontal and vertical logs. Today, this skeleton is built on stakes of concrete instead of wood. The roofs, in the past made of stern, are now composed of tile gutters and the false chimneys, before consisting of two up lifted tiles, were now replaced with conventional masonry chimneys.

Due to comfort and evolution, most of the houses in the rest areas (rooms), are internally coated by vertical varnished pine planking. The living areas "(...) are tidy, clean, lined with flashy papers and colorful fabrics" [5]. Other compartments such toilets, are generally outside, following the porch (if it exists) and the kitchens are completely separated from the housing area, as in the house visited in Caneiras, Santarém. It is situated across the road that provides access to various huts, for the sake of fire safety.

The settlement of Caneiras is organized along the Tagus river in two rows with access paths between them. Some units have a warehouse directly placed on the ground (Figure 5), while the housing is supported on pillars. The house represented here dates from 1980.

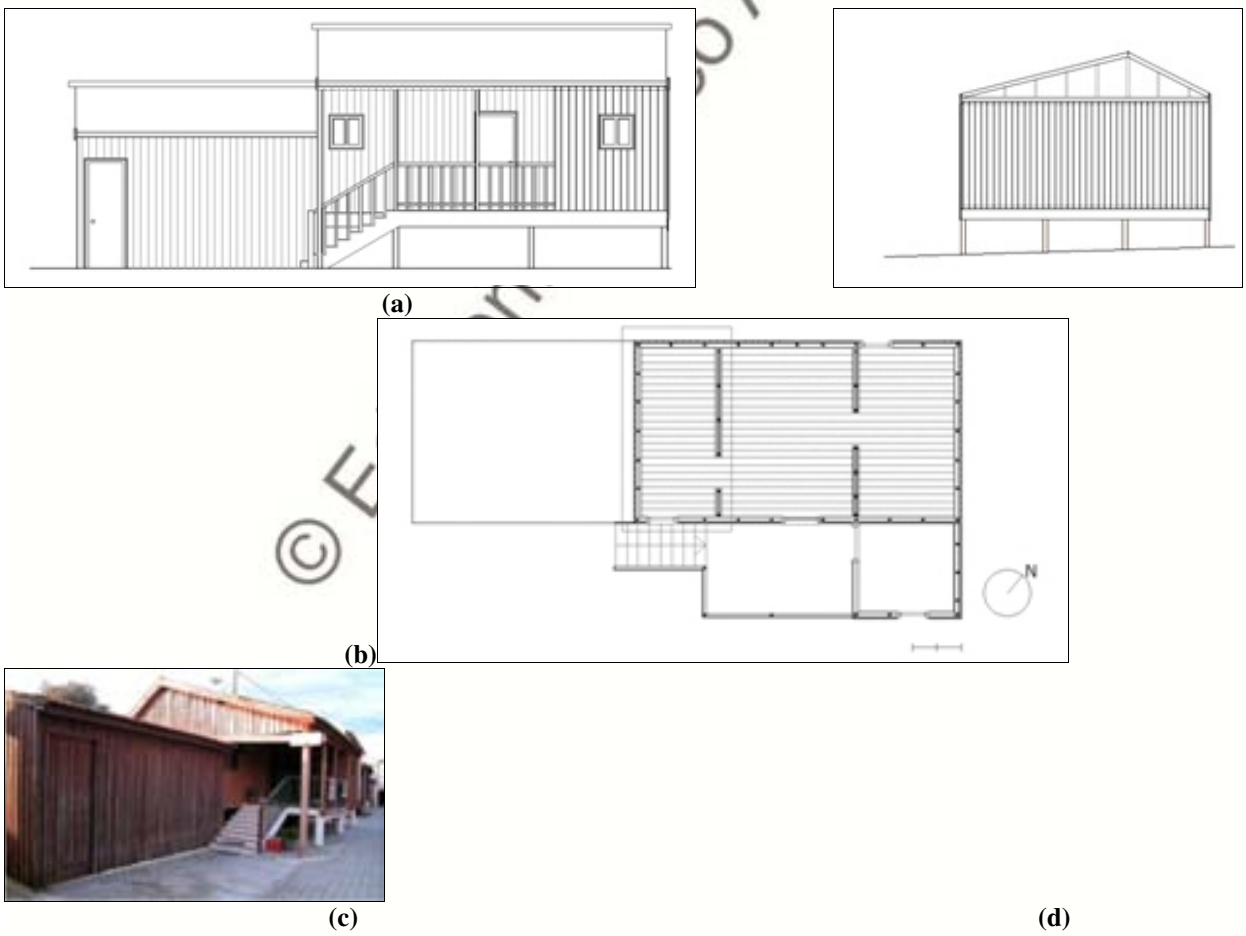
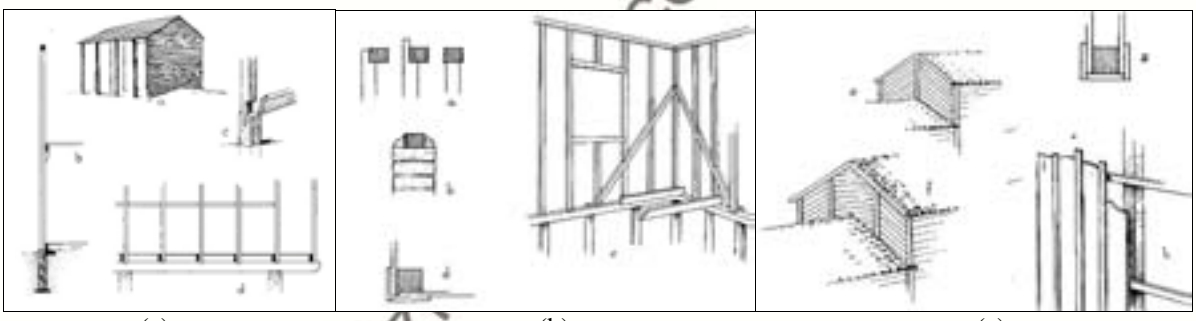


Figure 5. Elevation (a), structural section (b), plan (c) and outside view (d) of an Avieiros house located in Caneiras.

2.1. Wood as a structural material

The use of wood has several structural advantages: its immediate capacity to be put under load, good flexural behavior, which offers the facility to absorb defects in execution, low self-weight, in addition to the environmental

aspect. The embodied energy is very low and is a reusable material, recyclable and biodegradable when using local and little-transformed wood.
The structural use of wood has however some disadvantages, such as problems of durability, its inadequacy for tall buildings, the possibility of presenting some distortion over time, its fuel like nature and its need for maintenance. There are however treatments and even wood products that have mechanical properties and higher durability than natural wood, even though under the environmental point of view its utilization has to be weighted as a function of use and expected performance.
There are no alternative materials to wood (from the structural perspective) which may present a better compromise between the environmental, mechanical and functional performances, so its use will always be one to consider, especially in single-family housing or buildings of small height.
The walls in wooden ruler resting on a wooden structure are characteristic of some coastal areas of Portugal, representing an evolution of stern walls. However in these buildings, the coverage remained in stern or has evolved to tile roofs.
The facade solutions found in the traditional light weight building are light-weight, consist of a punctual support material with a structural function and a differentiated clenching material. Usually the wood structure is inside two clenching materials that form respectively the inner and outer face of the wall. In constructions studied, air cavity do not show any filling material. Currently the air cavity between two panels is almost always filled with insulation materials. In some buildings prior to the XIXth century, particularly in urban settings such as the Lisboa Pombalina or in Guimarães, the air cavity was filled with heavy materials such as clay or brick, in mixed system, as in half timbered and wattle and daub.
The primitive beach huts and *Palheiros* (Figure 6) more or less evolved , which could reach two or more floors were always in wood, from the poles in the foundation to the cover of floorboards, stern or reed, which only much later gave way to roof tile gutter. In the majority of cases the foundations were gradually replaced by more durable materials such as stone and concrete.

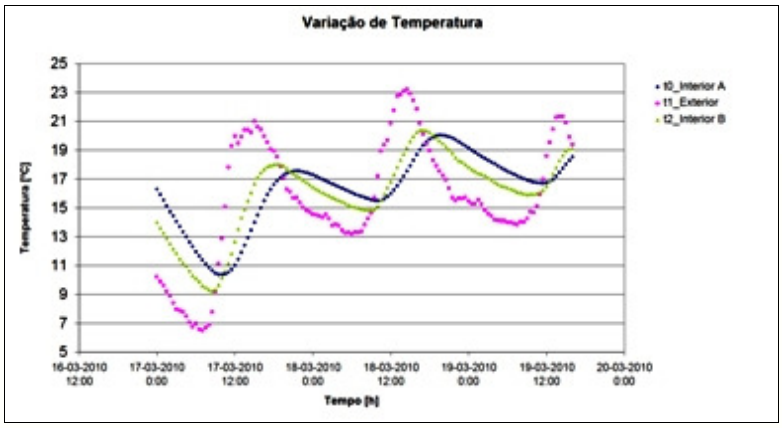


(a) (b) (c)

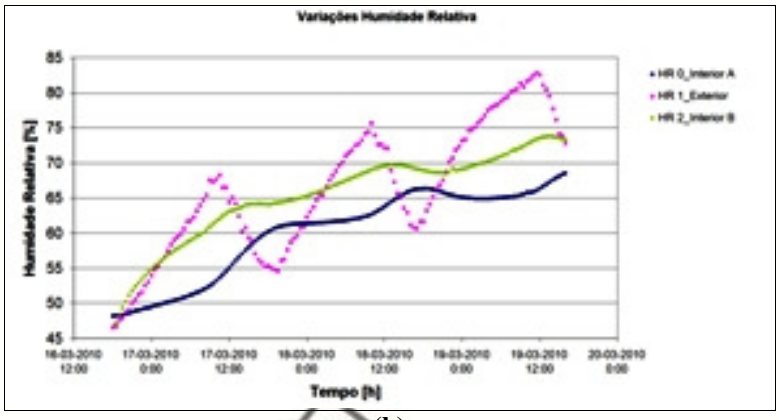
Figure 6. Construction details of Palheiros at Esmoriz beach, Aveiro (a) and Mira beach, Coimbra (b and c) [3]

2.2. Higrothermal performance of wooden houses

A problem related with buildings entirely built with light-weight materials, in the climate of Portugal is its low thermal inertia which results in excessive daytime thermal fluctuations of inside temperature. Hence they become more suitable for invariably cold or hot climates with little diurnal and annual temperature fluctuations and are therefore characteristic of Northern Europe countries, where the insulation capacity is more important than inertia. In tropical countries, the protection is mainly intended to shelter from rain and excessive sunlight which does not imply inertia or thermal insulation, but shading and ventilation strategies. In coastal areas of temperate countries, like Portugal, the lack of thermal mass of the building elements is made obvious by the presence of water which ensures a natural regulation of thermal fluctuations.
In the studied house the placement of a monitoring hygrothermal system was conducted, during three days of March (2010). From these measurements it can be concluded that, despite the outside temperature displaying a high thermal amplitude, between 5ºC and 7ºC, the interior temperature fluctuated significantly less, between 2ºC and 3.5ºC, with a maximum temperature of 19.5ºC (Figure 7). On what concerns the relative humidity of the housing the results were even more positive, since the oscillations were less than 10%, while outside the house the fluctuations were around 30 to 45% and the maximum relative humidity remained more than 10% lower than the exterior in the interior compartments.



(a)



(b)

Figure 7. Temperature (a) and relative humidity (b) in the house visited in Caneiras, Santarém

4. Conclusion

This paper aims to present and characterize the solutions that exist in the traditional wooden village of Caneiras, Santarém. Within this goal; plans, elevations, sections and exterior and internal photographs of the building are presented, as well as the results of hygrothermal monitorization carried out during the heating season. This study has the intention of contribute to the formalization of a methodology of intervention that does not confine itself to simple restoration, but that can also introduce an added value in terms of implementing new comfort standards in rehabilitation, as well as the application of some of the concepts in new construction valuing the wood as noble material.

Face hygrothermal measurements we concluded that in terms of humidity and temperature, the results were satisfactory, taking into account that the situation is not optimal.

Acknowledgements

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WHAT SLOTERDIJK'S *FOAM CITY* HAS TO DO WITH "OPEN SOURCE" URBANISM, AND FURTHER, WITH THE MEDITERRANEAN CITY?

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Abstract

Drawing from Peter Sloterdijk's concept of *Foam City*, the paper establish a link with the state-of-the art Open Source Urbanism by capitalizing on several famous utopian examples given in Sloterdijk's magnum opus *Spheres* and the references to the Greeks, a major Mediterranean civilization, the cradle of the classical philosophy and of well-known, highly livable, pleasant, prosperous cities.

Keywords: *Foam City*, Peter Sloterdijk, Open Source Urbanism, Urbanism

1. Introduction

One of the contemporary "performing philosophers", in a league of their own, somehow close from this performative point of view to Virilio and Zizek, Peter Sloterdijk is dealing in the 3rd volume of "Spheres" with a concept coined as *Foam City*.

2. A call to Solidarity

In the outset of the Foam City section, Sloterdik points out [1]:

> While agencies analyze in the real work to drive people to the pure isolation in their own homes, agencies of social synthesis commit themselves to the mission of producing common forms in which it would possible to group the insula in interactive units.

A position similar with these so-called "social synthesis agencies" is also the key in the context of achieving critical mass, in order to be able to do "Open Source" Urbanism, despite the fact that Geert Hofstede and Fons Trompenaars, for instance, did cultural research which shows very low solidarity levels in Romania.

But let's see which are the main characteristics of "Open Source" Urbanism…

Since for the first time in the history of humanity more of people live in cities than elsewhere it is vital to start thinking at ways to get more and more involved in their design, production and inhabitation.

As Matthew Fuller and Usman Haque put it in "Urban Versioning System 1.0" [2]:

> A system that encourages people themselves to create their own spaces and collaboratively build a social space – such a system could be more efficient, more imaginative and more conceptually "open". Yet even this is not sufficient: there is no point in having an "open" design process that results in a structurally "closed" entity. Architecture that is produced through an authentically open process is never finished: there is no distinction between design and inhabitation.

"Open Source" it's a movement which appeared in the '80s, and had as main goal the free distribution of software among those who were interested, who could also modify it freely or even sell it. Everything with no restrictions, be them commercial or even military.
On the other hand, "Open Source" Urbanism is much more recent than "Open Source" Software and tries to bring together urbanists, but not only. Other group oriented designers, planners, urban activists, etc.

The purpose is to facilitate the planning and building of the living environments directly by those involved, ensuring an increase of the quality of life and sustainability, by slashing the top-down approach and replacing it with a bottom-up perspective.

But in order to succeed in such an enterprise, one key factor is the participation, which is based on solidarity – an attribute very questionable in Romania, due to the legacy of the communism, who systematically attempted to destroy it along its rule, lasting almost half a century.

It's Sloterdijk who's giving also a possible "solution" to this apparently impossible problem of the lack of solidarity:

> But whatever the insularity of individual, who have their own way of moving home, it is always co-isolated islands and connected to the network, to be so associated with temporary or chronic Islands neighbors to form structures of medium and large - for a national convention, a Love Parade, a club, a lodge of Freemasons, the staff of a company, a meeting of shareholders, the public of a room together, a suburban neighborhood […]

And he's adding:

> This is why the term "communication" has a sound so urgent in all contemporary discourses: that word is a lifeline to all those who seek salvation in cohesion, or more precisely: in the exchange symbolic and transactional obligations - while once during the long century of Marxism was expected that the "work" in his division and its recombination.

3. Sloterdijk's Gallery of Utopians and the (Quasi-)Utopia of Open Source Urbanism of Mediterranean inspiration

In the second chapter of the second volume, "Globes", Sloterdijk make a comeback to the Greeks, while dealing with *εἶδος* (p. 191, in the French edition).

For Plato the term *εἶδος* has an important philosophical meaning, and starting with his writings this word gets a life of its own. Since for him *εἶδος* serves at designating the primal realities, peculiar to the idea of shape. Although he is using the term *ἔιδη* in order to designate same realities, and although there are small differences of meaning and use even in his own writings, the two terms seem interchangeable. At Platon the term *εἶδος* could be find already in the Socratic dialogues, where, both *εἶδος* as well as *ἔιδη* appear often [3].

In Sloterdijk's words:

> Any "view" is complete and true round by its own strength: this quality pregnant gives her blood to the Greek conception of the εἶδος. Which in this sense is an image, may at any time be the representative of the world.

Watching from his "cave", with the eyes of his deep and visionary mind, Plato arrives at the concept of the ideal city, as a construct not necessarily in shape, but rather in the way of ideas, ethics, social, political, why not – utopian, a superior by-product of the solidarity of the citizens.

The ideal city (*Καλλίπολις*, lit. "beautiful city") is a combination of imagination and experience, in which, with the help of the mind we attempt to rebuild the life of the citizens into a harmonious community. It is a virtual place which could correct or change adverse, unwanted conditions. It is, equally, an expression of the exasperation, but of hope, too [4].

For Plato, the ideal city is the one which is mirroring the *κόσμος*, on one side and the individual on the other. As he is describing it in *The Republic*, the ideal city, the *πόλις* is based on justice and human virtue. It is a form of social and political organization which let the citizens to maximize their potential, and to serve their fellow citizens and to live in harmony with the laws and the universal truths [5].

Figure 1. *"Ideal City"* by Bartolomeo di Giovanni Corradini, displayed at Walters Art gallery, Baltimore, Maryland USA

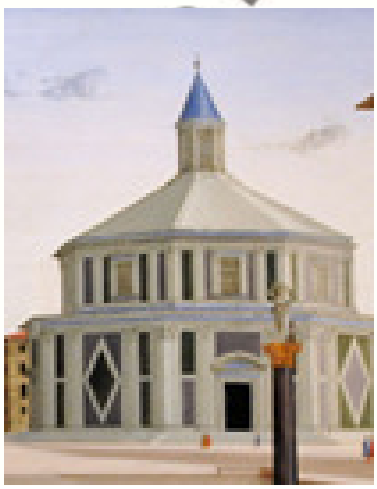
Plato set also a classification in 5 steps of the optimal form of government. The best form is according to him, the aristocratic model based on a king-philosopher. The second is timocracy, or the leadership exerted by an elite of guardians, of strong men. Oligarchy, the third form, was the leadership of "the few". The last two – democracy and tyranny – were forms of leadership of many.
According to Plato, the ideal city had to be an enlightened one, based on the highest universal principles. He insisted that only those citizens which abide to these ideals could protect, and if needed defend it in the name of the common good, and only these are fit to lead it.

In order to become a king-philosopher, or an ideal leader, an extremely rigorous study path was required. The ideal leader was someone with an inner call, a *δαίμων*. This *δαίμων*, which was expected to haunt the king-philosopher, was one of the differentiator of Plato's concept ideal city, as compared with similar concepts of other thinkers.

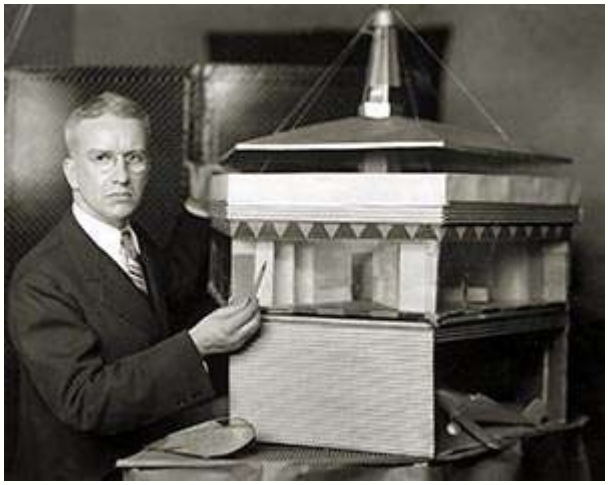
No doubt -- keeping all proportions -- a similar *δαίμων*, made me chose as research theme the 'Open Source' Urbanism.

A theme, which clearly has an utopian side, nevertheless, at least in that it tries to reverse the top-down approach of urban planning, making it bottom-up.

Referring to a detail of the above illustration and to a picture of R. Buckminster Fuller (in Chapter II/A/5 ("The machine for living or the self – mobilized space")) we note a striking similarity between the shape of two utopian buildings..



Detail from the above illustration



R. Buckminster Fuller in front of the second mode of the *Dymaxion House*, 1929

Richard Buckminster ("Bucky") Fuller was a visionary of survival on planet (/"Spaceship") Earth, who devoted his life to a cause. Although most of his utopian inventions were never applied, he kept exerting a significant influence on architects, however utopian he was, or just because of that.

After making a short history of the architecture and engineering related work of Buckminster Fuller, Sloterdijk concludes:

> According to Fuller, his alliance with mobility should allow the modern habitat lead to a healing break with traditional psychology of the "masses" urban. The Dymaxion house must become the media for circulating a home that has dropped the last relics of feudal Europe to the extent they relate to dogmatic foundations and faith in gravity walls.

Figure4. Sony's Foam City happening in Miami, USA (1)

Another famous utopian reviewed by Sloterdijk was Constant Anton Niewenhuys, the father of the *New Babylon* project.

Figure 5. Sony's Foam City happening in Miami, USA (2)

> [...] the Neo-Babylonian flow existentialists are living in a world of alienated labor in the future. Their relationship to reality is expressed exclusively by the construction of spaces, atmospheres and mobile

> environment. They prance in the hanging gardens of insanity - fighters, congenital, codelirious. This is why the ancient cadastres must give way to a new description "psycho-geographical" of space, a description that is more focused on the surfaces of the earth, land, national borders, but only expressive acts on people, their moods, their books, their facilities.

Last but not least, Sloterdijk includes reference to the International Situationist movement and Guy Debord (while connecting them to Constant) in his Foam City section of the third volume of Spheres:

> Because his (my note: Constant's) Utopia, following the social fantasies of the Situationist International, designed the new "company" as a form of coexistence of unemployed happy, the atmospheric environment of coexistence, which is perceived elsewhere that as a by-product, is for the first time in his city, released as the main product. (Guy Debord, with which Constant cooperation from the late 1950s, spoke in 1957 of "areas of affect" and "sensory reality" urban.)

4. Conclusion

To conclude, reviewing Sloterdijk's "Spheres", we get a handful of some potential hints regarding aspects pertaining to the solidarity – once an attribute of most of the Mediterranean cultures, and to another Mediteranean "specialty" – the utopian side involved in imagining and building amazing cities, the ambition of a new kind of Urbanism, called Open Source Urbanism.

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"ABITARE MEDITERRANEO" database: an OPEN SYSTEM

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Abstract

"Abitare Mediterraneo" database is related to innovative products and technologies, for sustainable buildings, aimed to save energy in Mediterranean areas. The project stems from the grouping leading companies and university research centres, coordinated by the Department of Technology for Architecture and Design and funded by Tuscany Region. The research structure a new multimedia library as design tool, through check and testing. The library has been structured as an open system that analyze the energy performance of technological solutions on market, under different configurations and operative condition use as innovative systems, energy performance and thermal-hygrometric assessment.
The research topic are:

- Identify the criteria for assessing the energy performance of products to have the database
- Define the criteria to archive and creating a database for the results of research / experimentation; identify a new use of building space; catalog the new legislation of interest.
- Analyze the energy performance of commercial systems, through different technical configurations and energy performance; to develop a data sheet for implementation of database.

Through the use of database, the partner companies will be able to propose products certified "Abitare Mediterraneo" and, at same time, the user will be able to evaluate the energy performance of products.

Keywords: Building Units, Energy saving, Innovation product, Information Communication Technology

1. Introduction

The database has been developed to spread sustainable construction in Italy, with the aim to achieve the 20/20/20 goals and extending energy regulation in buildings. The European Union defines these regulation through the Energy Performance Building 2002/91/CE and EU Directive 2010/31. These aim to diffuse local and national regulations to guarantee high the efficient buildings, using appropriate policies for local climate conditions [1].

The multimedia library defines:

- The legislation database, focused on the local, national and European legislation
- The design solution database for Mediterranean climate
- The focus on energy performance of design solutions

In Southern Europe, winter and summer conditions are both crucial to create appropriate solutions in energy efficient buildings. This specific climatic conditions, with the problems of indoor summer comfort and the consumption of primary resources, need a dedicate system of technical and typological solution that include not only the energy management but also the new and typical use of space. In Italy, the constant dependency on fossil fuels, oil and methane gas is still high in housing and office buildings sector, and now the summer consumption create a new request that become not sustainable for the country[2-3].

The Tuscan Region has been engaged since long time in environmental politics, regarding energy saving in buildings and renewable energy sources. European directive EPBD 2002/92 has been adopted under the Regional Legislative Decree 39/2005, which promoted energy efficiency on a territorial scale and on the building trade. The research "Abitare Mediterraneo" aims to develop a new model to build sustainable building that consider solution for indoor comfort in summer: the connection between the three parts of multimedia library create a network that can be use by designer, company, public administration, research institutions. The database focus to create new synergy between this actors in order to increase performance and compatibility of products inside the building process.

2. The research "Abitare Mediterraneo"

"Abitare Mediterraneo" aimed to develop synergy between industrial companies, builders and research centres, to increase competitiveness in building sector and meet European and National standard requirements.

The research develops advanced tools:

- a Database;
- a Test Cell;
- A new spin-off on sustainable architecture and innovative products.

The project aims to increase the energy saving in Mediterranean climate, focusing on summer comfort, developing and testing innovative solutions with national and EU companies.

3. Tool for Mediterranean building design

The multimedia library of "Abitare Mediterraneo", create a complete tool to help designers, companies and public administrations to design building in Mediterranean climate. The database structure develop a system to surfing inside a specific meta-design, technical and performance solutions of building and envelop in relationship with the energy legislation[4]. The structure of library create a open network where is possible compare different technical solution: the user can choose the detail of information, from meta-design solutions to technical details: defined by energetic and sustainable performance. This system aims to assist not only the designer's work, offering a comparison between technical solutions, but also companies that want develop their products with attention to energy saving in summer condition.

Figure 1. Abitare Mediterraneo home page: principal access of database

3.1. Legislation database

The first part of database defines the laws, concerning energy saving, sustainable building and LCA: in this part of database the user can find the energy legislation - European, national, and local - in order to saving energy in buildings. This database try to create a complete vision to new legislation, focus on the European directive and the Italian laws: particular attention is dedicate to the legislative decrees 192/2005 and 311/2006. These legislative decrees, in Italy, define the performance criteria for the energy consumptions in the building sector, introducing topics in order to decrees of energy consumption in summer months and in Mediterranean climate. The need to reduce summer energy consumptions of buildings gives an input to construction industries to accelerate the development of innovative product for the building sector.

3.2. Meta-design solution for Mediterranean climate

The catalog of metadesign solutions "Abitare mediterraneo" analyzes performance requirements of specifics building units for mediterranean climate: the catalog define the most important metadesign features for the building units and explain their function with case studies. This library want to become a reference point for designers that approaching not only at energetic projects but also at projects were, new pattern of space, contribute at indoor comfort. The database want create a map of the building system [5] were technical and typological solution are conneted by the requirements of space and performance of solution: inside every solution is possible identify the most important requirements and some metadesign indications, direct connected with the technical solution database, were it's possible found different solution for answer at requirements indicated.

Figure 2. Home page of solution catalog

3.3. Technical solution database

Inside the Database it's possible choose, within a large group of products for building, components and technological systems more efficient in energy saving: the user can develop metadesign solutions in terms of performance and in relation to environmental characteristics of Mediterranean areas.
The Open System Catalogue is create to help non-expert user that want find technological solution to define energy-efficient projects in the Mediterranean area. The interface with use of colour and simple label create a visual system, that helps users in the surfing: the subdivision of construction system become a synthetic scheme[8].

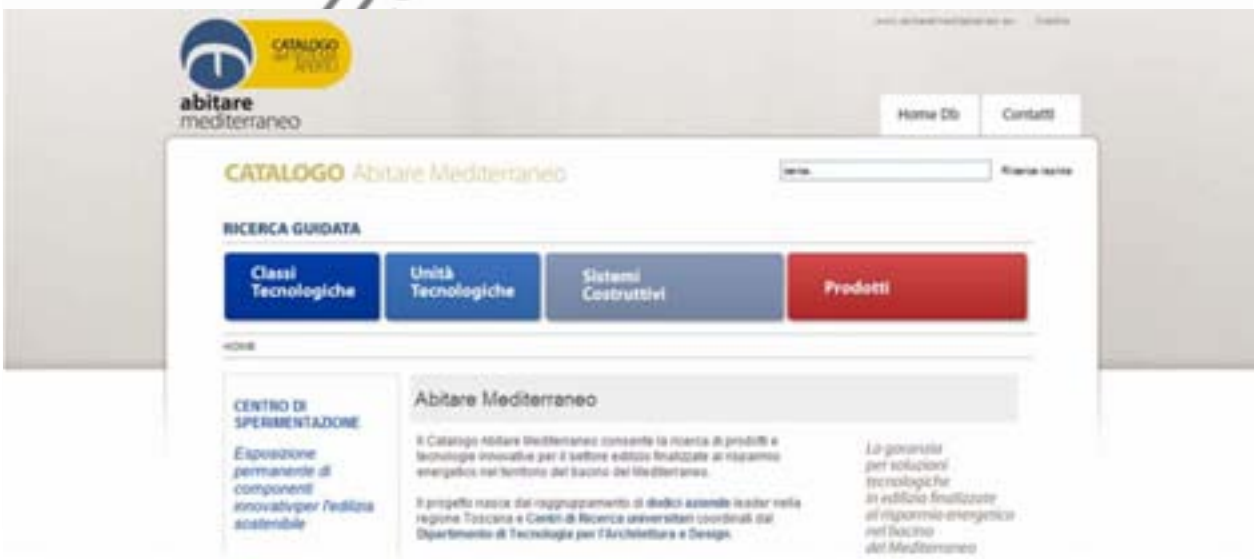

Figure 3. Home page of technical solution Database

The database contains a selected information about technology systems, aims to become a key reference for anyone who wants to find information about:

- Technical solution
- Building detail
- Termo-igrometric performance
- Acoustic performance
- LCA and environmental foot print
- Firm information

All technological systems will be analyzed in relation to the defined evaluation criteria by "Abitare Mediterraneo" about on their degree of sustainability. The designer will be able to choose a wide range of solutions that guarantee performance in relation to different aspects related to energy efficiency (measured in terms of transmittance and thermal inertia) [7], but also to economic sustainability: the datasheet represents a practical tool to realize a analysis cost-benefit of technical solution.

Figure 4. Datasheet new technical solution to Mediterranean design

4. Conclusion

The multimedia library wants to be a new practice tool for designers, useful not only for define technical and performance solution but also to like a complete decisional instrument to support the designer in all phases of projects. Developments are possible through future collaborations with software companies, with the realization of new datasheets dedicated to the computational tools that allow the designer to modify the technological features of the solutions presented. This allowing designers to evaluate the performance and analyze the cost-effectiveness.

Acknowledgements
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Topic: G. Mediterranean Landscape: Paths, Works and Water Management

Title: *Villages in the Interior of Portugal*

Key Words: desertification; depopulation; water crisis; economic decline

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Building a collective memory

Villages in the Interior of Portugal, The case of the Algarve

This article aims to look at the performance of contemporary production of space along with architecture's ambitions in the after crises Algarve.

Desertification is a complex problem with multiple dimensions, causes and effects, affecting large areas around the world. Desertification is widely viewed as a major environmental issue of global significance (Geist, 2005). This phenomenon is certainly a problem that crosses continents and can be detected in several zones across the globe (Lowdermilk, 1935), some of the most affected areas are in the USA (Brown, 1948), South Africa (Schwarz, 1919) and Australia (Walls, 1980).

Desertification is the degradation of land in arid, semi-arid and dry sub-humid areas. This phenomenon is primarily caused by human activities and climatic variations because dry land ecosystems are extremely vulnerable to over-exploitation, inappropriate land use and droughts. Desertification has severely affected the livelihoods of farmers around the globe, causing food insecurity in many areas. Satellites have the capability to detect desertification and have seen active land degradation trends in Europe (ESA, 2005).

Several studies on desertification are focused on the impacts of this ecological problem in the African Continent (Verstraete, 1986). The Mediterranean must be the region of the world most affected by human-induced degradation over thousands of years. The evidence of degradation is very clear, with only relict patches of the indigenous forest cover remaining and entire landscapes no longer able to sustain any cultivation (Geenson, Brandt, & Thornes, 2002). Accelerated soil erosion is as old as farming. Greek hillsides were originally forested and covered by a fertile soil mantle, which, however, was rather shallow and vulnerable to erosion.

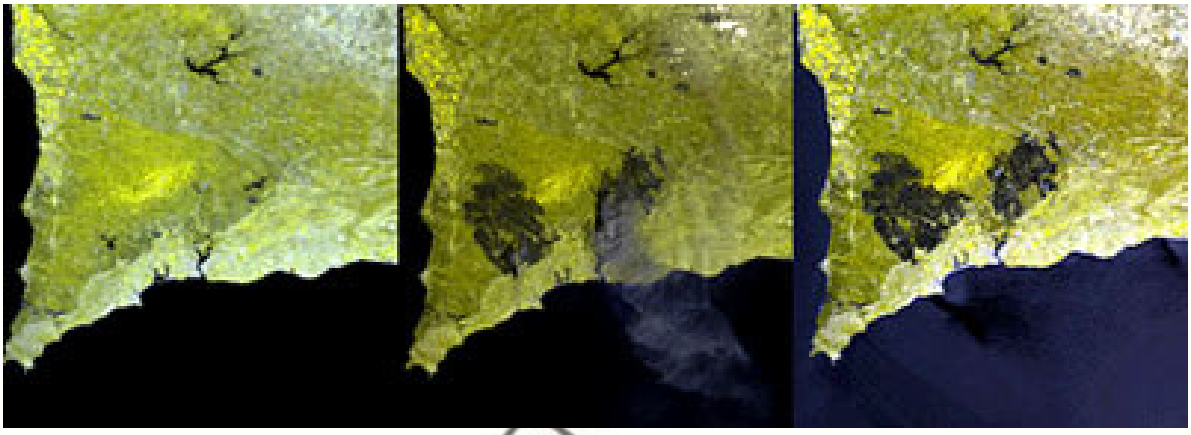
"Desertification is a common problem across Mediterranean nations, because of circumstances in common: similar historical backgrounds, climatic conditions, land use patterns, cultural characteristics and vegetation types." explained Dr. Mevlut Duzgun of the Turkish Ministry of Environment and Forestry, a DesertWatch partner user.

Portuguese hillsides were originally forested and covered by a fertile soil mantle, agricultural and agro-industrial practices shaped the landscape and destroyed the native forest. This process started long ago. Agricultural activity in Roman times was very intense and left its marks on the territory (Barker, 2002). Idanha-a-Velha, one of the parishes of Idanha-a-Nova borough (Central Portugal), in the Roman period had around 5 thousand inhabitants and all this area was intensively explored in terms of farming (Marques de Sá, 2007). The degradation of the land in Mediterranean countries is mainly human induced (Barker, 2002). Upland grazing and farming probably begun around the middle of the second millennium and begun the initial damage of forests.

Several thousands of years of exploitative agriculture have greatly contributed to a dramatic reduction of agricultural productivity in the Mediterranean region, something that Plato described,

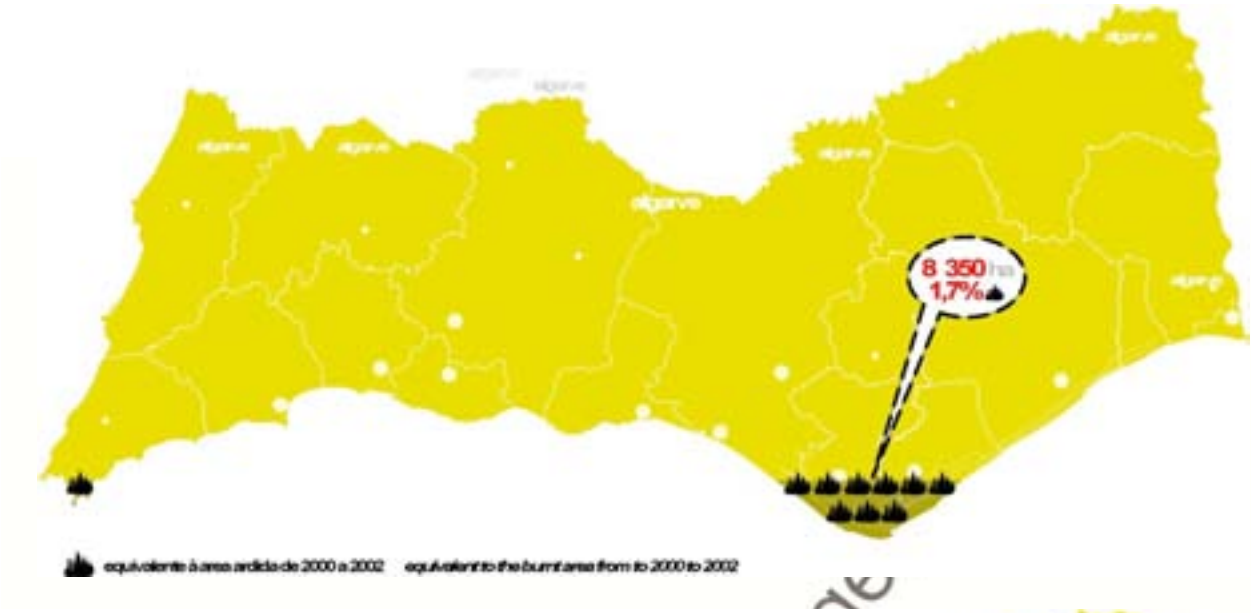
when speaking for Attica in the 4th century BC (Cristias III), making note of the occurrence of massive floods and landslides, the disappearance of forests and the denudation of cattle pasture. Presently, Portugal is the third most deserted country in Europe, just after Turkey and Italy, and followed by Greece (ESA, 2005).

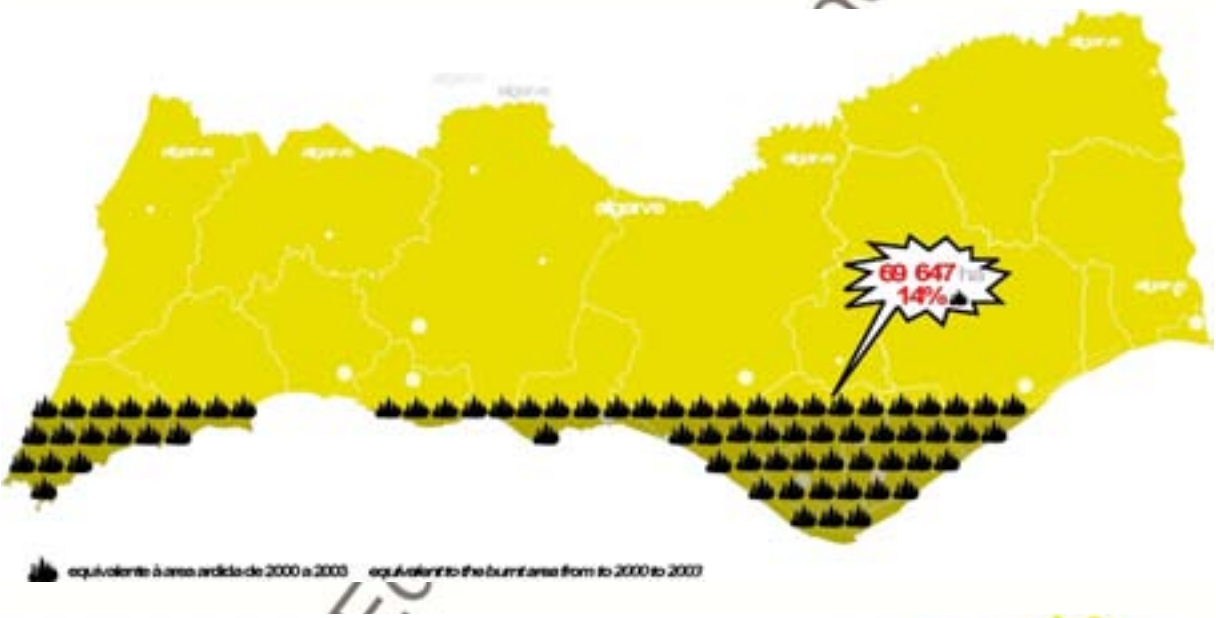
The Mediterranean is a densely populated dry land zone, and this factors make this region very vulnerable to desertification, although regular forest fires make this situation worse. Between 600 000 and 800 000 hectares of the Mediterranean, forest is burnt annually – leaving an area approaching the size of Corsica stripped of vegetation. The World Wildlife Fund estimates that 95% of these fires are caused by negligence or/and deliberate arson (ESA, 2004).

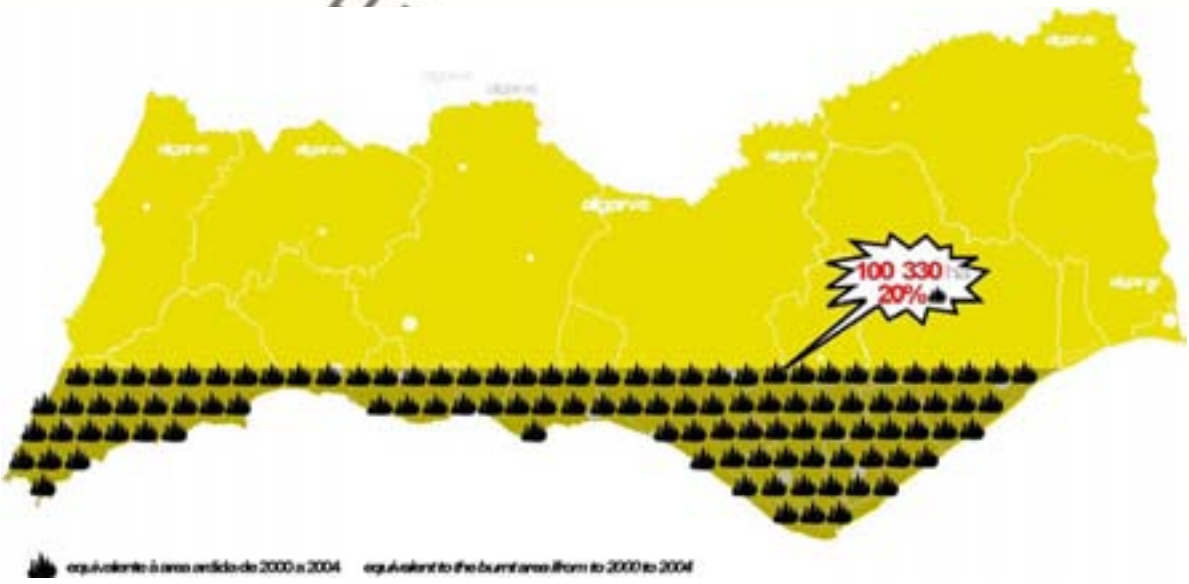


A trio of images of the south region of Portugal - Monchique, Algarve - acquired by Envisat's Medium Resolution Imaging Spectrometer (MERIS) during August 2003's forest fires. The first image was acquired at the 8th of August, before the fires started, the second was acquired at the 14th of August during the midst of the blazes, and the last was acquired at the 20th of August. Burnt areas appear as very dark patches. Image taken from www.esa.int (ESA, 2004).

The forest fires that occur every year in Portugal contribute strongly to the water crisis and land degradation. Considering that the visual perception of this reality is very important for the understanding of the real scale of the problem, I will now show some maps for the Algarve region showing the evolution of forest fires from 2000 to 2004.


algarve
8 350 ha
1,7%
equivalente à area ardida de 2000 a 2002
equivalent to the burnt area from to 2000 to 2002


algarve
69 647 ha
14%
equivalente à area ardida de 2000 a 2003
equivalent to the burnt area from to 2000 to 2003


algarve
100 330 ha
20%
equivalente à area ardida de 2000 a 2004
equivalent to the burnt area from to 2000 to 2004

Alongside with desertification two other problems characterize the Portuguese territories located in the interior of the country; the depopulation and economic decline. In my understanding, desertification has two different dimensions: the biophysical dimension characterized by the reduction of the biological potential and biodiversity and the human dimension characterized by the abandonment and progressive depopulation of certain regions. Both dimensions contribute to a slowdown in local economies and this contributes to a slowdown in the national economy.

In 1986, Portugal joined the EU at that time called EEC. The country lacked in mobility infrastructures, and it would take a long time to get from one of the main cities in the coastline to a village or smaller city in the interior. After 1986, with funding from the EU, several roads and highways were built. The improvement of mobility infrastructures in the country is quite recent. Only after the nineties, highways were concluded and this event reduced the distance between the interior and the coast (Augusto Mateus & Associados, 2004). Presently, the country has good mobility infrastructures but people already left. The bases of rural development are people. If a rural area has massive out-migration of young people or/and a large percentage of the rural community is above the age of 65, as is the case of Portugal (Instituto Nacional de Estatística), it is very difficult to initiate endogenous growth.

Rural areas account for more than 80% of the territory of the European Union and are home to some 25% of the population. Rural areas are often

URBAN FORM AND CITY ENVIRONMENT. A PROPOSED METHODOLOGY TO UNDERSTAND SUSTAINABILITY

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Abstract

The paper deals with the experience of a four-year research at the University of Naples "Federico II" jointly carried out with the National Research Council (IRAT-CNR) and with the support of a private company (EUASIA LTD) specializing in eco-cultural tourism. The study is focused on the environmental performances of the urban space of a number of small towns and villages of Southern Italy according to the assumption that in such places, elements of the ancient settlements are still recognizable.
The paper proposes a knowledge-oriented methodology aimed at enhancing the significance of the urban form in terms of relationships between natural and built environment, empirically demonstrating the existence of a (somehow implicit) ecological design approach of the primary urban patterns that characterizes urban signatures [Alberti, 2007] in terms of pattern itself, building shape, use of materials and construction technologies.
The research point out the value of the original construction process and it aims at highlighting the coherence between urban form and the natural environment, notably focused on the sustainable use of the local resources (vegetation, soil and water) that correspond to the ecological cycles and is adapted to human activities.
This important realtionship could help to build up both social and economic sustainability and to develop an innovative approach to urban planning and urban design. The new approach can be applied to historical urban contexts as well as to the planning of new settlements planning.

Keywords: urban form, ecological performance, local resource

1. Introduction

Open spaces play a significant role in attaining and improving sustainability. Many forms of ancient urban spaces provide fine examples of ecological design as built technologies were strongly influenced by the site and by the availability of natural resources. In particular, open space mediates the relationship between the natural and built environment and it encourages housing design to blend with the local context.
Harmonization of nature and architecture in many historic towns shows this positive integration and represents an important topic in urban management. Even medieval cities that can appear very different from each other have many common characteristics strictly related to the environmental context. [Piccinato, 1978].
Ancient towns, especially, exhibit many practical construction features that provide key benefits to the built-up area in terms of improving microclimate, managing rainfall and controlling environmental risk. At regional scale the rural landscape narrates the best balanced relationship between natural and built environment, so it produces a particular kind of rural habitat called "agroecosystem" [Sereni, 1961].
The inner sustainability of such historical asset can be impacted by the new construction because of the lack of knowledge of the former design approach between the built space and the natural environment so that even works aimed at rehabilitating or maintaining could upset local ecological balance and the site identity. Thus, even when historic urban space is subjected to modernization for updating urban services - such as allowing accessibility by car, improving infrastructure, developing commerce, etc. – it is important to compare the new performances to the original state of the site and be sensitive to local, specific carrying capacity [LeGates, Stout, 2011].
The study proposes a knowledge-oriented methodology for assessing the environmental values of the urban form, enhancing its environmental performances and improving construction processes and technologies for the urban rehabilitation and maintenance. The capacity of adapting the urban morphology to the natural context is assumed as a kind of inner sustainability of the ancient cities that gives form to the city space, consistent with the human needs and to the natural constraints. In a very qualitative way we postulate here a sort of ecological succession of the human being (acting as a biocenosis) that colonizes the natural site according to the ecological behavior of the species, able to survive thanks to the capacity of building its own habitat. By this way we assume that the material consistency of the city (including gardens, routes, squares, ecc.) represents the main structure of the human habitat,

evolved in time from the first settlements until the contemporary cities. Organic cities, most than the planned ones, points out this former ecological attitude of responding to the human's need of survival throughout the sustainable modification of the natural environment. According to this, the study also assumes that the urban morphology plays a crucial role in assuring a kind of ecological balance, so a deepening of the urban form and of its material consistency that can lead towards a specific best practice to design sustainable contemporary urban spaces.
Starting from these assumptions, the research has found in the small towns and villages of Southern Italy a meaningful example of those artificial landscapes that were well described at the end of 70s by Eugenio Turri to quote *"… such few landscapes, as the Italian one, as so deeply featured by the human work. Not a wild nature rather a domesticated space, representative of the stratification of the building process that comes out from a series of artificial spaces that link together generations – communicating the inner site code - and effective representation of the life and the culture of the local community"* [Turri, 1979].
According to these remarks, the study tries to carry out a scan methodology for describing the constructive code that shapes such "organic cities" [Kostof 1991] in order to point out the former rules and the logical connections with the natural environment. The purpose of the study is to assess a methodology for describing urban space in detail, in a way of emphasizing the coherence between the urban pattern, urban signatures and some key constructive technologies. Finally, the research states the importance of the knowledge-oriented design approach to found more clear and operative criteria for improving the ecological performances of the cities spaces and the human quality of life within it [Dierna et al. 2005].

2. Methodological specifications

The study stresses the importance of visual perception as a very distinctive architectural tool to harness the direct experience of the site and its features to harmonise the built and the natural environment. Moreover, the research postulates the need of investigating the form itself (its geometry, its rhythm, its material consistency) and compares the patterns selected with the information related to the ecology of the site and to its history [Jabareen 2006]. By this the main patterns adopted for the studies concern specific configuration issues such as the form of the urban border, the ratio of the urban blocks and the pattern of the urban area. The study recognizes some urban characteristics , here called *signature*, [Alberti 2007] for each of the case studies a set of built elements that act as a sort of construction "invariants" [De Fusco, 1973] that characterize the site and the city identity [Lynch, 1960].

Such "signatures" refer to:

- urban pattern (consistency of the urban border, ratio of the different land uses inside the urban border and ratio of the urban block)
- urban sub-systems (the ratio between street width and building height, the geometric ratio of building façades and the ratio of the different land cover inside the urban border)
- construction systems (roof typology, surface treatment – paving and façades)
- construction technologies (façades ' plastering, streets' paving, roof cover)

Starting from this point, the study tries to analyse the ratio of the geometrical relationship and the construction technologies that make up such urban elements. At different scales, the research focuses on the relationship between the urban form and the natural opportunities and constraints that define locally the specificity of that site.
The proposed methodology presents three recognition levels (fig.1):

Context Scan. This phase is aimed at pointing out the relationship between the form of the urban settlement and its natural context at a broad scale. Starting from the analysis of the characteristics of the urban space, the study aims at collecting information about the natural environment with a view of determining how this should influence local urban forms and patterns. We focused on the likely main pattern of the built up area: the characteristic of the urban border between urban space and countryside; the impact of the former infrastructure on the surrounding countryside; the relationship between sealed surfaces and the evopotranspiring ones; the potential connectivity of the urban open spaces.
Urban settlement is deemed as a system through a holistic approach aimed at considering the relationship between the human product (the city itself) and the natural environment.
Some tools have been used for analyzing the urban pattern at this wider scale:

- site topography,
- land cover,
- land use,
- hydrology (potential storm drains, streams, canals, etc.)
- geological setting.

Each layer is placed on the city plan and has been compared with city's sections.

Urban Scan, this level is mostly oriented at collecting information at city scale (fig.2). The purpose is to assess the inner coherence of the relationship of the urban components deemed as discrete set of parts, and comparing that information with the characteristics of the local environment. According to this, the analysis is focuses on the configuration of the built up area and especially the form and the aggregation/ combined effects of the urban blocks. Specifically the study points out:

- the disposition of buildings volumes
- the typological of the urban blocks
- the roof typology
- the façade design (such as geometrical patterns, the ratio of full/ empty surfaces)
- the treatment of vertical surfaces
- the street paving.

These kinds of data are compared with:

- exposure to prevalent wind;
- sunlight exposure;
- storm water collecting;
- land cover

Construction scan, the third level of recognition is focused on the construction features of the built up area. The aim is to assess the relationship between the construction technologies and the availability of local resources. The purpose of this step is to investigate the site specifically, highlighting any links of existing technological systems with the availability of materials and resources.
The main tool for this recognition is the Life Cycle Analysis (LCA) of those construction elements chosen as local landmarks, key signatures of site identity. The proposed methodology starts by assuming the life cycle of such urban elements as in four main phases (pre-production, production, life service, cast off) according to the building process. The pre-production phase corresponds to material supplying, production relates to the yard design, life use concerns building maintenance and refurbishment and the cast off deals with the potential re-use or recycle of the construction components. The choice of LCA as a key tool for scanning the construction level is determinate by the availability of construction resources within the urban context and by understanding how the local community has used such resources in a sustainable way. Through the constructive scan it is possible to appreciate the grounds of the technological design approach, always appropriate in terms of economy of works, material transport, resources consumption. Indeed, the former construction process was featured by strategies of local production thus the implicit adoption of a Life Cycle Design approach was aimed at preserving the local capital of natural resources, adapting the human needs to the natural cycles and to the availability of non renewable resources. By this, the qualitative LCA of some construction elements show us such former sustainable design in terms of resource use, building yard organization, transport organization, recycling and reuse of construction materials, extension of life service of the construction elements and of technological solutions.
This phase closes the cycle of the knowledge process by acquiring and merging such information again to the specific of the natural context: the stone materials that originates from the geological setting of the site, the vegetation coverage that provides timber and other kind of construction materials, and the site hydrology which determines water availability as well as possibly gravel.

2.2. Case study: the Village of Sieti

Sieti village is part of Giffoni Sei Casali a small Municipality within the Regional Park of Monti Picentini. Due to its position in the middle of the hills, Sieti represents a meaningful example of how past practices in rainfall management adapts the built environment to natural constraints for sustaining new, artificial habitats.
Moreover the regional park acts positively in the choice of Sieti as a case study because it emphasizes the need to create an urban code for managing city space in a sustainable way. At present, Sieti's development is oriented towards eco-cultural tourism due to the value of its building heritage and the quality of its urban spaces. Furthermore, the future role of Sieti Village within the actual regional park, is planned as a hospitality centre, and therefore updating and maintenance of building stock is essential as well as the improvement of tourism facilities. According to this objective, a more specific knowledge of traditional construction method – and its ecological roots – is a basic requirement for safeguarding local identity and historical values.
Regarding the application of the methodology, the case study shows the following results:

The **Context scan** shows significant differences between the Northern and Southern boundaries: building frontages are conformed to the need to protect the built up area from the coldest and prevalent winds coming from North, while the Southern fronts present open façades with a very different geometrical pattern. The Northern frontage is enclosed and having a walled appearance, as responding to the request of protecting the village from sliding risk and prevalent winds: no streets or squares break the compactness of the building sequence. The urban pattern corresponds coherently to the geological setting and topography of the site located on a natural saddle in harmony and scale with the mountain slopes surrounding the built up area. Besides, the urban pattern effectively supports effectively the local hydrology as streets and passages are adapted to the runoff lines. This creates an integrated system for discharging stormwater out of the built up area quickly and to stream below. The vegetation coverage, (comprising gardens and allotments distributed inside the urban blocks) provides a quota of permeable soil for mitigating heat island phenomena, adapting urban microclimate and reducing storm drainage. From the study a recognition of a number of environmental performances have been carried out as result of the interaction between human needs and the natural environment. The main performances are the protection from prevalent winds, the protection against and prevention of land sliding, the prevention of soil erosion, the respect of the water natural cycle, the implementation of ventilation and sanitary regulation in the built up area (fig.3)

The **Urban Scan** of Sieti provides a set of data concerning the environmental performances previously highlighted and some added performances regarding the quality of the built environment. Even at urban scale, indeed, the differences between the Northern and Southern frontages are immediately apparent: urban blocks presents enforced corner northward, oriented to the mountain slope for breaking slides and to reduce volume and velocity of runoff. Urban frontages act as fortification in which building surfaces protect street environment. The compactness of the Northern frontage has also been enhanced by the grey color of the façades, perfectly integrated into the landscape. Vertical dimension is prevalent and the view of urban space corresponds to a deep and linear perspective that enhances internal frontages, surfaces, colours and texture. The whole urban space evokes the perception of inclusiveness and protection, as well as the adaptation of traditional community lifestyles which was focused on agriculture. Analysis of the street sections show that street width vary from 2 – 3 m, while building height vary in a range of 9-12 m according to different uses of the building, structured on four levels: storeroom at the ground-floor, residential use at first and second floor level and garrets at the top. The dwelling hierarchy is clearly represented by the geometric ratio between open and closed surfaces on the building facade and by the shape of the windows. Building structure has been designed for optimizing energy efficiency, especially concerning the regulation of the internal temperature of the residential floors: storerooms at the ground floor and garrets on the top isolate the other floors by reducing dampness and rain seepage, and they mitigate outside temperature in both winter and summer. Different windows' typologies and geometric pattern of North and South facing façades show the capacity to optimize sun light and insolation and the need to protect exposed frontages from the coldest winds. The relationship between form and function is well represented by the basement windows featured by narrow and sloping cuts that allow inside ventilation of the ground floor where food are stored (fig.4). Similarly the roofs' typology, two pitched roofs made by bent and flat tiles, offers order and consistency in design. The ratio of street width and building height allows a traditional means to discharge storm water quickly away: the gentle slope of the roof conveys rainwater in the middle of the street from where (thanks to the double direction gradient of the ballast) storm water may reach the cropland first and then flows into the stream below. The traditional roof typology does not include any roof gutter and pluvial because of the absence of a draining net, and also because street paving was semi permeable, made by large pebbles and stones coming from the dredging of the stream: thus the action of pebbles and stone reduces runoff and its erosive capacity. Further means to decrease the erosive capacity of run-off concern the configuration of the building corners reinforced by short buttress that are able to resist runoff erosion thanks to its plastered and rounded form. By this analysis some environmental performances emerge: the energy efficiency of the built up area; the mitigation of the urban microclimate; the maintenance of the natural water cycle and the maintenance of the stream.

Deepening **the Constructive Scan,** the analysis of the cross sections typologies provides an outline of the urban elements that cooperate to identify the key elements of the Sieti street space, made up of: paving, portals, stairs, windows, building surfaces, roof slope. Special significance is given to the use of plastering on vertical surfaces: the unusual grey color of the building frontage reflects the local method of plastering without any stucco or paint, leaving the surfaces transpiring and facilitating the integration of the built up area into the natural landscape, blending visually with the native limestone rocks. Six cm plaster coating is laid on Sieti buildings acting as a thick skin on the outside wall, protecting from the aggression of physical agents and adapting the thickness of the plaster to the degree of the surface degradation by erosive process, influenced by the different levels of exposure of the façades of the buildings. The plastering technique reveals the availability of know-how among the work force and the viability of maintenance works in terms of costs, time and labour. The importance of plaster is also enhanced by its use for façade decoration, for remarking building floors, for framing windows and balconies and for treating

plaster as a substitute for more expensive materials such as marble or decorative stone. Therefore, the use of plaster layers for building angled buttresses or make building corners round can be considered as a mean to reduce environmental risk in the built space as these elements are catalysts for breaking storm water flows, decreasing run-off erosion and steering water towards the natural drainage of the stream below. The analysis the plaster LCA was specially focused on the pre-production and life service phases. Generally plaster pre-production is based on the huge availability of water, gravel and inert materials (lime and sand, at least). Starting from this notion, the analysis of Sieti plaster reveals the considerable human capacity of using local resources in a sustainable way, choosing firstly renewable resources (plentiful water) quarrying from the river (lime quarrying), secondary cast off material such as waste arising from local lime quarries. Both materials cause the grey colouring of plaster. Regarding the life service, the thickness of plaster layers shows a good knowledge of the plaster life span and the natural cycle process. In fact the degradation effect on building surface is almost equivalent to the cycle of periodic stream cleaning: thus the plaster thickness is designed for lasting about a decade.

4. Conclusion

First applications of the approach we are proposing gave good results that can be repeated in different study areas. Of course the procedure must be tested on other case studies to be refined and to obtain a transferable methodology.
The next objective is to finalize the work we have made on these topics. So we would define a grid where we can put the elements and the relationships that we obtained from case studies according to their characteristics of sustainability. The elements are parts and building components that we identified for ecological performances. The relationships are the interactions that these elements have among them and the natural elements through which the ecological performance occurs.
Another important objective is the extension of our interpreting model to urban and regional scales by considering on settlements and their relationship with the territorial context. Historical settlements can be analyzed as ecological sub-systems as part of a larger regional system where may relationship and synergie occur.
The importance of urban scale is a key issue concerning the relationship between the building design of urban areas and any synergies with the local natural environment. Whereas small traditional urban settlements tend to be closer to and reflect their natural surroundings, larger urban settlements tend to lose such synergies with the natural environment as thier built form and typologies tend to dominate, rather then blend, with the local eco-system. A problem arises when such large-scale urbanization and their designs are applied to small settlements, as in the suburbanization or extension of small towns and villages. Here the importance of ecological factors in the design of small settlements as highlighted in this paper, become ignored to the detriment of sustainability and sense of the place building.

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HISTORIC HERITAGE: A MODEL OF SUSTAINABLE DEVELOPMENT

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Abstract

For over 10 years in Europe, in catching possible opportunities given by the development of new logics and technologies, the EU official documents have focused on socio-cultural issues, as well as environmental ones, which are considered necessary for the integration and promotion of sustainable development. The historic-architectural and cultural heritage has been given new connotations and the historic cities and urban areas have begun to be seen from a new perspective.
The lesson given by historical heritage, not so much for its artistic values that we are always ready to appreciate, but for the solution adopted to meet the community's needs, consists in combining both social and economic requirements, in accordance with the logic of sustainability.
The historical cities express a "system" produced by the evolution of lifestyles and communities' ways of organizing in view of well-defined needs. That's the reason why historical heritage offers an example of its logic configured through the principles of eco-compatibility and eco-efficiency. Sustainability, which relies on an optimal use of resources in an ecological and comprehensive logic, is based on economic convenience not limited to the financial perspective.
Indeed the real problem is often not linked to the considered components, but to the logic adopted by the subjects the project is referred to.
The recent attention paid to energy performance raises an important question when historical fabrics and buildings are concerned. How can we combine policies of conservation and enhancement of this heritage with the desire to encourage sustainable development?

Keywords: historic centre, identity, sustainability, energy performance

1. Introduction

Technology innovation has supported the process of globalization. This process has characterized the last few decades and induced great economic, cultural and social changes.
For over 10 years in Europe, in catching possible opportunities given by the development of new logics and technologies, the EU official documents have focused on socio-cultural issues, as well as environmental ones, which are considered necessary for the integration and promotion of sustainable development. The attention has been paid to the crucial role that identities and diversities can play to contrast unavoidable and unconscious phenomena of homologation. The historic-architectural and cultural heritage has been given new connotations and the historic cities and urban areas have begun to be seen from a new perspective.
The historic heritage is an expression of identity, a result indeed of what man in time has helped to shape more or less consciously. Exactly as an outcome of the interaction among different components and factors, as well as expression of everybody's memory of the town, of its specificities and identities, historic heritage assumes a shape of an enormous reservoir of cultural, social and economic resources, very often not completely known, which should be considered in relation to the different situations. The unicity or presence of widespread characters, interrelated or not, can be a distinctive resource, able to exalt and enhance the identity of places and to exploit their potentialities.
The identification of specific elements may allow the detection of identity and performance characteristics of the heritage, in relation to individual elements and to the system of relations in general, and helps increase their identities, their recognition and usability, enhancing their peculiarities in the interests of competitiveness[1].
In particular, the historic towns can be considered an expression of the materialization of a "system" produced by the evolution of life styles and ways of community's organization in response to specific needs. That is the reason why historical heritage offers an example of his logic configured through the principles of eco-compatibility and eco-efficiency. Sustainability, which relies on an optimal use of resources in an ecological and comprehensive logic, is based on economic convenience not limited to the financial perspective. The real problem is not indeed often linked to the components considered, but to the logic adopted by the subjects the project is referred to.

2. The legislative and regulatory framework

In the context of initiatives to combat climate change, the recent attention paid to energy performance raises an important question when historic fabric and historic buildings are concerned.
The European Directive 2002/91/EC, in bringing attention to the residential and tertiary sector-since more than 40% of final energy consumption is believed to be absorbed by its real estate, has provided a method for calculating the integrated energy performance of buildings by setting the parameters to be met by new and existing building (if interventions of re-qualification are to be realized), leaving to individual states the freedom to comment on officially protected building heritage and all historic heritage in general, being by its nature highly sensitive, which could be damaged by the application of Directive[2] and risk of altering its authenticity as well as tangible and intangible qualities that are witness of our history.
Actually the quite substantial Italian legislative framework, on national and regional levels, has only partially faced this issue. Only a few regions such as Umbria, Toscana and Friuli Venezia Giulia, on considering the issue of energy performance in historic areas, referred to the importance of looking at the relationship building/ environment, both natural and constructed, as well as the aspects related to their interactions.
An important contribution comes undoubtedly from the study carried out by a large group of scientists and engineers, on behalf of the Ministry for the Architectural, Artistic and Ethno-anthropological heritage, which worked on the drafting of "Guidelines for the efficient use of energy in the cultural heritage ". These provide useful guidance for assessing and improving energy performance of the historical heritage, in compliance with the regulations in the field of conservation. Their goal is twofold: to provide designers a tool to assess the energy performance of historic buildings in the current regulatory organization and a system to plan the energy redevelopment according to the needs and characteristics of cultural heritage; to give guidelines to the administrations responsible for safeguarding the cultural heritage, for the formulation of the final decision on energy efficiency and conservation conditions guaranteed by the intervention.

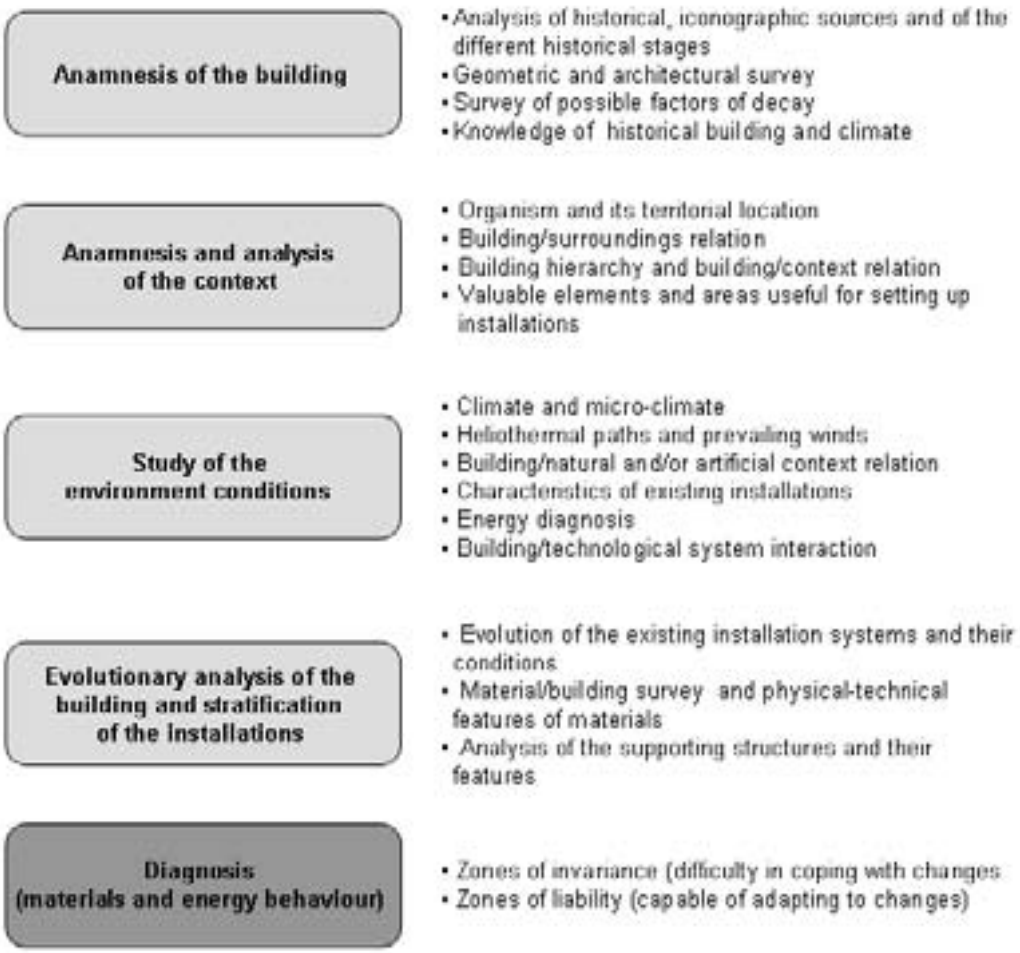

Figure 1. Path of knowledge

The Guidelines state that not only it must be taken into account the energy performance index for the supply of primary energy per area unit or size of the property considered, but it should be identified also the level of integration of landscape and technology interventions at different scales: micro (detail of the construction and installation system), meso (in relation to components such as urban streets, squares, green elements ,...); macro (in relation to the local and regional context). The same integration of technological elements must be considered with reference to two types of levels: partial, if it is just to introduce some elements, total, if what is placed becomes an active component of the part. As it is stressed, in fact, it is important that strategies are defined in relation to the building structure, as well as to the possible energy production.
Beyond the purely technical details, it is significant to highlight the importance of the context, as it emerges from the "path of knowledge" defined with the target to provide the designer with the approach to be taken to make appropriate proposals for improving energy efficiency, based on a correct diagnosis and assessment of the buildings ability to cope with changes.

3. Some considerations

In the light of these brief considerations, it is interesting to focus on historical contexts. One problem that frequently arises is how to combine policies for the preservation and enhancement of cultural heritage with the desire to increase the identity and to promote sustainable development. What factors and components are to be considered? It should be said that there are different considerations to do previously:

a) no doubt to keep in mind that in Italy about one third of the existing buildings dates before 1945 and historical buildings belong to this group;

Table 1. Residential buildings by their building period (Census ISTAT 2001)

Geographical areas	Before 1919	1920 - 1945	1946 - 1961	1962 - 1971	1972 - 1981	1982 - 1991	After 1992
North-West	668.591	331.048	349.918	428.140	364.697	204.132	176.849
Nord-East	387.792	233.289	342.555	423.372	389.208	208.518	176.862
Centre	414.518	215.119	281.146	323.944	325.477	186.717	115.219
South	488.160	370.740	404.306	474.329	533.448	421.580	188.812
Isles	191.198	253.619	281.904	318.172	370.376	269.555	133.285
TOTAL	**2.150.259**	**1.383.815**	**1.659.829**	**1.967.957**	**1.983.206**	**1.290.502**	**791.027**

b) the historical heritage almost always consists of load-bearing walls that have a thermal transmittance being less than 20% compared to that of buildings made of reinforced concrete, and in any case proportional to the thermal inertia

Table 2. Residential buildings by the material used for the load-bearing structure (ISTAT Census 2001)

Geographical areas	Load-bearing walls	Reinforced concrete	Other
North-West	1.417.906	709.227	376.242
Nord-East	1.449.171	375.370	337.055
Centre	1.238.340	380.638	243.162
South	1.738.244	773.971	363.160
Isles	1.060.321	528.999	228.789
TOTAL	**6.903.982**	**2.768.205**	**1.554.408**

c) If, on average, 68% of energy consumption in homes is for heating (indeed, there are fluctuations from 40% to 80%), it is also true that those data vary greatly in relation to geographical position. It is enough to think how in the case of Southern Italy and Isles, or the Mediterranean habitat, the data ends up by taking a very modest value.

d) The adoption of types and construction techniques based on bioclimatic principles in building has always been known, especially in the context of the Mediterranean.

Indeed, the major views expressed by the Directives in this area and the suggested assessments for existing buildings always refer to estimates and not precise measurements, neglecting that in the past the energy problem has always been taken into account and therefore the historical buildings, above all, constitute an important lesson on optimizing the global performances.

Making a reductive assessment of single components, based on hypothetical standard values, can lead to questionable results both in evaluating the values and in defining specific interventions, or energy costs and intervention ones. In addition, it should be considered the effect of interactions and that the individual components for optimal performance almost never coincide with the global energy balance.
Beyond the damage that interventions calibrated to generic estimates can determine, or how it is crucial to have an adequate basic knowledge on the behaviours of building systems on which we intervene, the risk we very often run is that we carry out interventions, even radical, that will end up by greatly increasing the ecologic mark.
The question, above all for the historical heritage, is more interesting if faced at urban or territorial scale, since the fabric and space organization require considerations that affect constructions. What is being investigated on the "heat isles" is a clear example of the above-said assumption, even from the energy point of view, and in the same way a bad sign is the lack of "eco-sustainable" culture in the processes of intervention and requalification of cities and regions. 70% of Europeans live in cities and more than 80% of GDP is produced there. Thus it is beyond doubt that we need to look holistically at the problem.
We all know that throughout history man has always tried to integrate what he was realizing into the environment. That's why he paid particular attention to the choice of place and to the way of combining aspects of climate and exposure of constructions for a more intelligent use of materials, vegetation, climatic factors, etc.. In most cases, historic cities and buildings are already the result of the search for good energy performance. The choice of exposure, treatment of surfaces, windows, fabric articulation - for example to encourage the creation of barriers to prevailing winds or forms of more ventilation- are all devices already introduced in the historic settlements. Perhaps, the changes introduced over the time have not taken them into account. The replacement of traditional paving surfaces with asphalt, the new building in back-yards and gardens and their paving at different times are but a few of the many elements to be reconsidered. On the other hand this is also the direction that the indications given in the Guidelines of the Ministry follow.
If it is true that residential activity is currently the largest energy consumer and therefore the optimization of energy performance of residential buildings is very important, there is no doubt that it will be possible to respond adequately to all instances only if, at the same time, the community awareness is awakened, on the one hand, and the reconsideration of the ways of life and urban structures organization is carried out, on the other. From this point of view, the role that the lawmaker can play in designing incentives and direct behaviours is crucial. It is important that the awareness-raising activities are pursued constantly. Behaviours not in line with the logic of energy conservation can lead to invalidate the benefits produced by the interventions or those introduced in the design. Recently in Italy different rates of energy costs for users have been introduced according to time slots, and these may be an important message to convey behaviours in line with the principles of sustainability. A significant outcome may indeed be to encourage, as well as the reduction of peak loads and the development of a quite constant demand, a careful and responsible behaviour in the use of energy resources. And this also is a way to draw attention to these issues and to make people better appreciate what nature bestows us and which our ancestors have almost always already treasured.

4. Conclusion

The preservation and enhancement of the historic centres depend on many factors and the risk is great that the same processes triggered by the use of this heritage of resources can turn into serious threats. The survival of the genius loci and its ability to withstand external pressures with a strong impact is, on the other hand, also linked to several current conditions, as well as to the will of rooting shown by communities, and it is important that the restoration and redevelopment interventions take into account buildings and contexts, in an integrated way, from the technological, economic, social and cultural point of view.
For the effective development of the territory today more and more we cannot disregard from an efficient social organization and from adequate levels of individual and collective wellbeing. These lasts finish to increase the capacity of the places to attract investments, helping in this way to stimulate territorial competitiveness. It is clear that if we must not underestimate the important role that today the social, cultural and economic contexts play in relation to the technological development, however, we must carefully reconsider the real needs and demands generated.
Only if we have a comprehensive and integrated approach - meaning that we are able to see historic centres not only like an heritage offered in use (residential, tourist, economic, ...), but as a rich component of values and issues to be read in relation to the social, economic and territorial contexts - we can make this heritage of resources a pivot of the development.

[1] Petroncelli E. (2010), Competitività territoriale e identità, in Atti della XIII Conferenza della Società Italiana degli Urbanisti "Città e crisi globale: clima, sviluppo e convivenza", Planum - The European Journal of Planning on-line, Rome, 25-27, pp. 52-55.

[2] Directive 2002/91/CE, Art. 4, par. 3, states "Gli Stati Membri possono decidere di non istituire o di non applicare i requisiti di cui al paragrafo 1 per le seguenti categorie di fabbricati:
- edifici o monumenti ufficialmente protetti come patrimonio designato o in virtù del loro speciale valore architettonico o storico, nei casi in cui il rispetto delle prescrizioni implicherebbe un'alterazione inaccettabile del loro carattere o aspetto, …".
Italy, in force of the Legislative Decree no. 192, 19 August 2005, regarding the areas of intervention has excluded from its application the properties referred to in the second part Art. 136, par. 1, b) e c) letters of the Legislative Decree n. 42, 22 August 2004 (Codice dei beni culturali): "…. b) le ville, i giardini e i parchi, non tutelati dalle disposizioni della Parte seconda del presente codice, che si distinguono per la loro non comune bellezza;
c) i complessi di cose immobili che compongono un caratteristico aspetto avente valore estetico e tradizionale inclusi i centri ed i nuclei storici;…". In the same ways the Legislative Decree 311, 29 December 2006, in the art. 1 states: "e) al comma 3, lettera a), dopo le parole: "recante il codice dei beni culturali e del paesaggio" sono aggiunte, in fine, le seguenti: "nei casi in cui il rispetto delle prescrizioni implicherebbe una alterazione inaccettabile del loro carattere o aspetto con particolare riferimento ai caratteri storico e artistici".

THE WALL, AN ELEMENT OF IDENTITY AND A STRUCTURING COMPONENT OF THE MEDITERRANEAN ARCHITECTURE.

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Abstract

The aim of this research is to investigate the role of the wall in the mediterranean architecture. In this geographical and cultural area, the wall gains qualities which go beyond the strictly structural and constructive function, becoming a structuring and qualifying element for settlements and living spaces and also the expression of local identity. The research, by "interpreting" the wall as a conceptual category, wants to give an answer to the deep need of improvement of the urban habitat architectural quality within a more proper relationship between identity characters and contemporary project.
If we observe villages and rural settlements in the Mediterranean basin, we will inevitably identify some primitive elements which characterize, build, structure and distinguish public from private spaces. Courtyard, wall, basic elements (the cell) and road are "particles". When they combine organically, they model settlement patterns and determine spatial perception, both partial and global. Through its mass and continuity, the wall contains all these basic elements of the Mediterranean architecture and it does not have merely a building function. It is structuring rather than only structural, it defines architectural space, it is a border and a continuum in stereotomy. As a conceptual category, it acquires complex meanings and conveys ideas like a precise living culture, to stay and relate to other people. Actually, the wall is the concrete expression of introversion, it is a border, an enclosure, it defines and creates spatial hierarchies, it protects and gives an order, it is a presence/absence, permeability, gravity, light and dark. Thus exploration, that is the theoretical and practical study of its meanings as a conceptual category, as well as the study of spatial phenomena and spatial organization, is aimed at finding a new interpretation and giving a new impulse to wall construction in these places. In the course of the last century, the cultural impoverishment has threatened these areas and it has undermined the basis of their identity. This is leading to the loss of their original peculiarities.

Keywords: Mediterranean Architecture; Wall; Traditional Architecture.

1. Introduction

The research lay its basis on the observation of the changes that the landscape of the settlement – especially the Mediterranean space - has gone through and is still going through since the second half of the twentieth century.
In less than a century the wrench between contemporary project and historical building result, deriving from centuries of adaptation to a place, of passing on the knowledge, of codification of the identity characteristics of a community, has led to a transfiguration of the villages and small urban centers' network in the Mediterranean area. This sudden process, when compared to the slow secular assimilation originating from the meeting of different cultures in the past, has injected new alien models in a consolidated context, without giving the time to develop a "social consciousness" able to filter and codify the big quantity of oncoming "terms" and to translate them into neologisms consistent with the local language. This series of transformations has had its effects on the core elements of the cultural and architectural substrate of the Mediterranean, from the urban structure to the development of typologies, to the materials and the techniques.
The estranged elements' identity is able to emphasize the importance of the constants in the local architectural cultures which, having a timeless and universal value for the community, must be preserved and deeply understood in order to set up a continuity between the past and the contemporary project. These constants can be classified observing the small villages and the small rural centers of the Mediterranean basin, where courtyard, wall, elementary cell and street are the "particles" that organically combined codify the fabric of the settlement and determine the spatial perception, both partial and total, of the built-up area.

1.1 Goals and structure of the research

The aim is to understand the culture of the wall in Sardinia so that– by means of a "project of knowledge" in the local area and more generally in the Mediterranean area and using consistent systems of project – the elements on which to reflect can be identified to restore a contact between contemporary project and historical context respecting the concept of "wall".

Investigating the criteria, the procedures and the systems with which the physical element of the wall – and the concept of limit and fence –comes before the contemporary architecture again as a "place" that can be architecturally discerned from the building organization.
The following dissertation utilizes two main pictures of close examination as a point of departure:

- Theoretical-conceptual picture, in which the wall is analyzed as a "*basic concept in architecture: from structural to structuring element*" according to two branches of research: the first at a macroscopic level, through an analytic study at a urban scale of the wall element that allows to understand the aggregation and sequence logics of the system of walls and cells that generate and shape the block, rule the relationships among the built-up areas and define the space of living circumscribing public and private, internal and external; the second investigate the "wall" as a structuring element of the architecture through the exploration, the theoretical and practical study of the meanings as a conceptual category;
- Cognitive-technical picture, in which the "*technological aspects and the techniques of building typical of the wall culture*" are investigated with a look to the Mediterranean building cultures and above all, to the development of the current techniques, through which the contemporary project can "materialize" the above mentioned characteristics.

The aim is to find a contemporary shape for the wall building not annulling the values of traditional construction and renewing the relationship between formal structure and tectonic structure of the wall system, according to the principle "*tradition means challenging the innovation*" asserted by Siza [1].

2. The wall beyond the material

Remembering Braudel [2], the Mediterranean is "a *thousand things in one*" but its identity is only one, its building culture is wall architecture, apart from the material used, be it stone, adobe or finished with white lime plaster. Therefore, it is charged of important meanings of the place and the identity that prescind from the building aspect, becoming an even more structuring element instead of just a structural one.
With regard to the structure of language W. von Humboldt specifies that "*the speech is not the result of a simple sum of the words that determine it: on the contrary, the words are determined by the whole speech*". In the same way the wall, while contributing to form an ensemble, gains from this its deepest meaning. The exploration of this group and its meanings puts itself forward as a supporting tool in the research of contemporary shapes and structures in wall and stereotomic architecture. The fence probably is the bridge between the role of the wall and the Mediterranean architecture. The wall is just a part of it, a segment establishing a connection between included and excluded spaces through the action of enclosing. If the Architecture as a basic act is to build fences, meaning with this the separation of an internal from an external, the result is that "architecture" basically means "to build walls".This point is important not only because it gives the wall the status of fundamental element in the architecture, but the wall becomes a structuring principle in the Mediterranean architecture at various levels.
The relation of homology generated at the various scales of the built-up, makes the wall a participant of the definition and the formation of the characteristics of settlement, block, street and their inter-relations, becoming one of the symptomatic factors of the local living and building culture. The wall as a conceptual category creates numerous subgroups that in our dissertation can only be briefly list: limit, generator of spaces, wall and neutral space, stereotomic continuum, the wall and its absence, including its intrinsic material qualities such as the archetype couples of light and shadow, heaviness and lightness, permeability , texture and tactility.

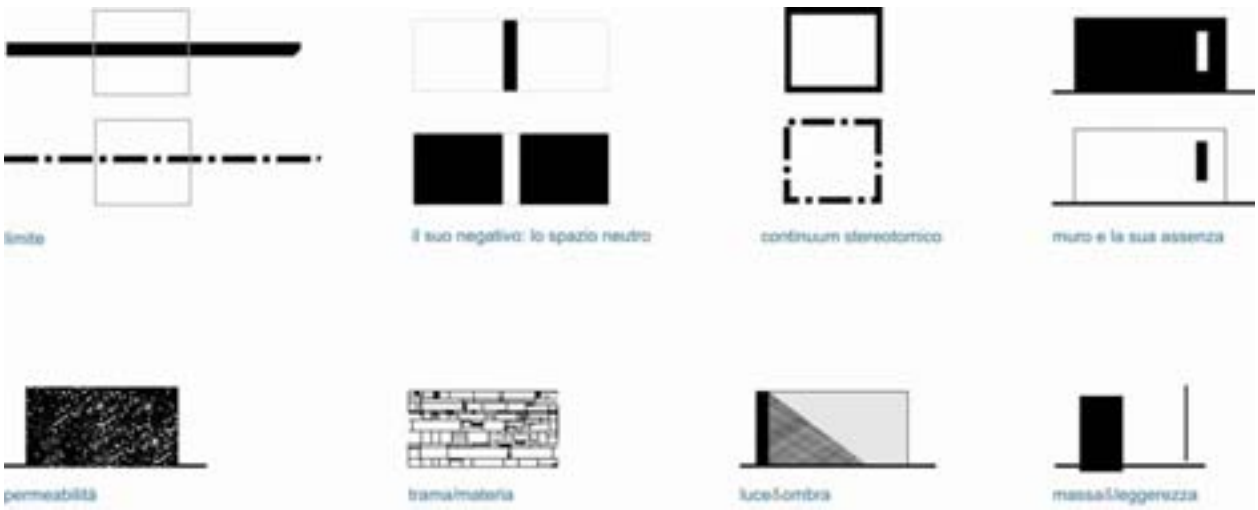

Figure 1. The wall as a conceptual category. The elements analized in the research.

The wall is a core item of the regional and Mediterranean architecture, but it also has various functions: to close, to support, to light, to air and to inspire admiration, that is why the culture of the wall is to be studied in its fundamental characteristics such as: raising, creating its own hierarchy, closing and opening. The architecture of these centers is the architecture of the "opaque" wall that does not give the light and the sight any chance to permeate, but only gives them the possibility to penetrate in a discontinuous, selective, guided from its own mass, way. Its materialization internally occurs through its own shadow, and externally through the light. The wall is thickness and continuity, as a stereotomic concept is spatial continuum, interrupted only by the few openings (doors, windows or portals if we refer to specific areas of Sardinia) that can be considered as a subtraction of the material of which the wall is composed.

In its being a building element produced by the superimposition and the sequence of single units – being adobe bricks or erratic stones – the wall itself is an "assemblage" of parts. The matching of elements creates thickness, their absence creates empty spaces through which the light can run producing textures and contrasts. These intrinsic characteristics are strictly related to the development of the "material" cultures that mainly lead to the use of what the territory offers.

These places have also in common the quality of the light which is the basis of a specific conception of space: the "Mediterranean space" seems almost filled by the sunshine, the objects have precise forms and noticeable characters. The aspect of the internal space defined by the wall, both in the courtyard and in the wall box, takes form thanks to the light/shadow effect: *Gravity builds the Space, Light build the Time* [3].

1.2 Contemporaneity between theory and technique

We have to bear in mind and keep our attention on the ways the wall materially takes form, because one of the causes of minor centers' transfiguration is given by the separation between building technique and needs and not Frampton defines as "earthworks", with the appearance and the misunderstanding of the bearing skeleton made of reinforced concrete, whose discontinuity – taking the place of the continuity of the wall box – takes any other meaning (including the structural and the building) out of the wall. The chance to create big openings, wide transparent surfaces to go as far as it's possible from the local materials (considered as obsolete), has stimulated a

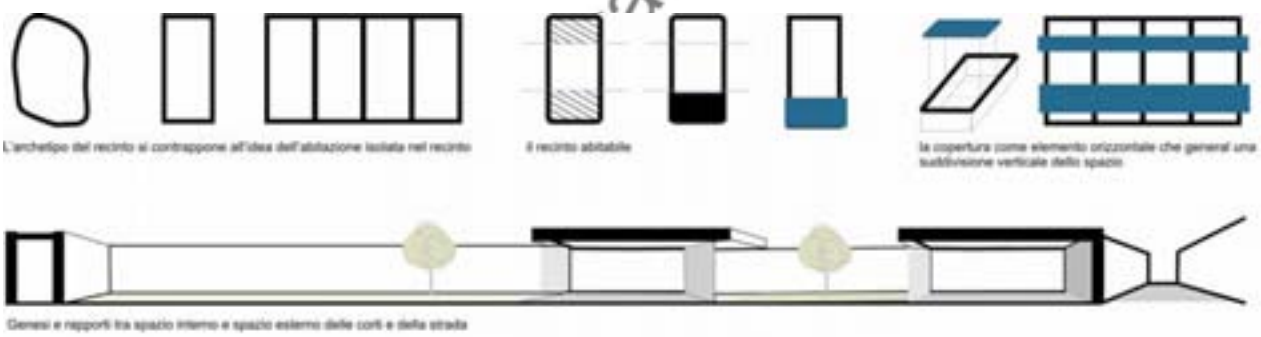

Figure 2. Courtyard Houses in Matosinhos. Schemes of relationship with the archetype of the fence and the succession of inner / outer / intermediate space .

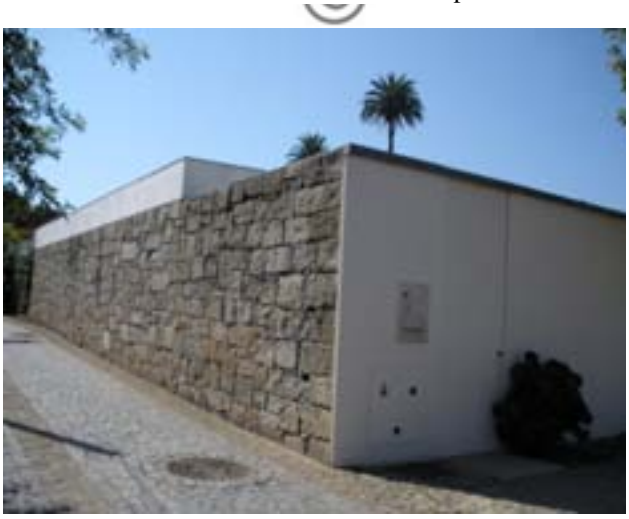

Figure 3-4. Courtyard Houses in Matosinhos and one of the streets of the old town of Matosinhos, near Souto de Moura project (pictures by Barbara Pau).

breaking between local living culture and local building culture, dematerializing the wall element.
The research of a new contemporary interpretation of the wall can be divided into two additional parts: a tighter relation with the tradition, affected by a really strong cultural background where the utilization of the local material becomes the "regulator element" of the project; a re-innovation of the tradition aimed to the experimentation on the wall mass, directed to those intrinsic characteristics of the material and of the building technique.
If we refer, for example, to those areas where the traditional stone architecture is the main object, conceiving this material as a material of the tradition does not exclude a contemporary reading of the wall and above all of the building technique, just as an innovative use searching for particular effects does not exclude an origin connected to the tradition.
Observing and analyzing the projects we can see all the various shades linked to the terms tradition and innovation.
If with its physical essence the wall is a volumetric boundary of the architecture, with its bidimensional identity reminds the world of "surfaces". We just need to have a look at the projects of many architects of the Mediterranean countries to understand how the "technical and material culture" could have affected their choices. From Portugal to Spain, from France to Italy, the picture of "building in the built-up" is articulated and represented in various ways. Two projects are to be considered as models in our dissertation: the patio houses by Souto de Moura in Matosinhos and the partial reconstruction of the Muralla Nazarì by Torrecillas in Granada.
In the well-known intervention in Matosinhos, Souto de Moura re-builds a living fabric at the borders of the old town center, basing its project upon the Mediterranean patio house, the archetype of the habitable enclosure, where fence and house merge as for an aggregation of the parts. The project genesis is mainly concentrated on the private and introvert character of the house: once the enclosure is built (i.e. once the domestic space is defined and protected), the horizontal floors define the rhythm of the vertical partition between internal/external space. The enclosure, even if made of concrete, shows its double face, internally plastered in white, outside with granite blocks scabbled with a pseudo-isodomo settlement on sub-horizontal rows, using a method similar to the traditional building technique: " *I placed considerable importance on adaptation to the site, and over the years, I developed a type of single-storey house that was well adapted to the land and its limits – wich in Portugal are always marked with walls -. I regarded those walls as part of the building and a feature that was not to be shunned or shut out*" [4].
The contemporaneity of the wall and its double composition is highlighted in an elegant way by the anchor solution. The wall made of granite reminds the archaism of the local technical culture and it is an explicit reference, not a nostalgic emulation. The double battlement it is not only a reference to the local identity, but together with the orientation satisfies the requirements of climatic comfort, fundamental for Mediterranean climates.
If the traditional character of the architecture is emphasized by the sense of place and the skilled use of local materials, the innovation is translated, not only into the original formal aspect, but into the building system itself that becomes "a skin". In the small intervention of reconstruction of the Muralla Nazarì in Granada, Torecillas, working on contrasts, highlights the values hidden beyond the physicality of the wall. Transforming the wall - which has lost its main function – from impassable limit to a permeable membrane. The wall becomes "space", through its thickness separates an internal from an external but it can also be an accessible space. The thickness that identifies mass and weight, it's a light and hollow covering. The permeability we have referred to in the previous paragraph, is here shown at various levels: at a urban scale as a passage way, at the object scale as the perception of the surroundings.

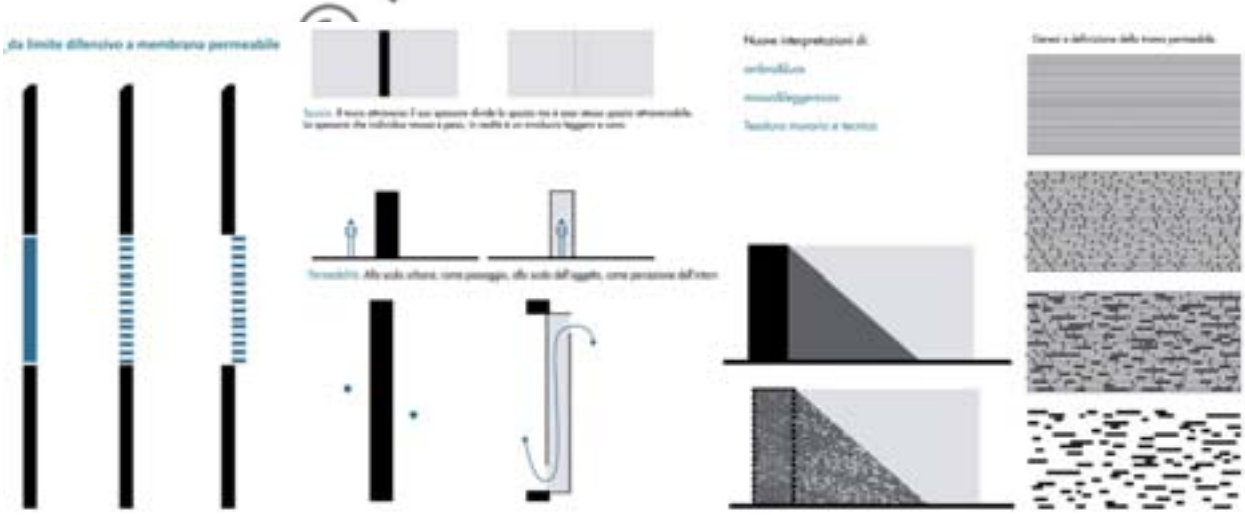

Figure 5. Muralla Nazarì. Schemes on the concepts wall's, from boundary to membrane permeable and the archietipe pairs of light and shadow, mass and weight.

Figure 6-7. Muralla Nazarì. The outside view of the wall and its relationship with the historic Muralla.
The interior view of the wall, a way between shadow and light (pictures by Barbara Pau).

The wall texture becomes an opportunity to experiment the archetype couples of light & shadow, mass & lightness. In this case, the materialization of the conceptual meanings are allowed by the building technique and the contemporary technologies: 30 mm granite sharp edge cut slabs, assembled one on the other in an apparently casual way, creating a permeable texture whose carrying capacity is entrusted to their superimposition and to the use of highly-resistant sticky cement.
In these examples the theoretical and the technical scale are connected, we have contemporary materials/new technologies and traditional materials (timeless) that relate to the idea of heaviness of the wall and its dematerialization.

3. Conclusion
These are some inputs of the research that wants to highlight the existence at the same time of at least two strategic attention levels for the contemporary project in minor contexts in the Mediterranean area.
On one hand the identity strength of the internal environmental image of the built-up Mediterranean area deriving from the ability of the wall element to give an unitary aspect to the urban environment, organizing the space according to consolidated logics.
On the other hand, at the site scale (that we can consider as more directly related to the project concept), the specific potentialities of the material, with which these systems and fabrics are built, to always give *n* possible interpretations. The infinite variables of project research on each of the analyzed groups and their combination, are able to offer a variety that makes the contemporary project always up-to-date and experimental.
All these aspects can be investigated to contribute to a better quality of the ex-novo and the renewal projects, starting from the idea of the importance of some core characters of the architecture that can give the project an additional value, both at the urban placement scale and at the architectural detail scale, let's think about the potentialities brought by the ability of shaping the volumes through light, permeability and textures.

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CONTEMPORARY EVOLUTION OF THE LOCAL BUILT-UP AREAS IN THE MEDITERRANEAN

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Abstract

The urban centers of rural nature in the Mediterranean area are classified as open systems whose urban structures suit the various ways of usage set in the course of time by the community.
These conceptions are based on the idea of "living" as an action building man's and space's identity.
The contemporary project dealing with the issues of building in a built-up area or defining urban boundaries , is called to confront with the urban system indicated as an ensemble of elements whose relationships are articulated by complex systems of intermediate spaces, microareas and spatial connectors often spontaneously born and whose urban and social role is really strong.
The habitat finds its strength in the qualities of density, in the relations of proximity, in the connection of the spaces, in not being monumental, in the intermediate spaces system.
At a domestic scale, the goal is to investigate the nature of the boundaries between public and private, observe how experience finds its balance in semi-private areas suitable for being outside with the purpose to define planning approaches capable of giving architectural answers sensitive to the threshold theme, able to articulate those areas that determine the relationship between cell construction and street, spaces often intangible but revealed by exploitation traces.

Keywords: living, proximity, intermediate spaces.

1. Introduction

The urban centers of rural nature in the Mediterranean area are classified as open systems whose urban structures suit the various ways of usage set in the course of time by the community. The spaces have an intrinsic flexibility of usage; nowadays , the spatial areas know ways of usage and conceptions different from those which have generated them. Different ways of appropriation can be recognized in some spaces steady in the structure , therefore the contemporaneity of Sardinia's minor centers – and of the Mediterranean area in general – enjoys the consolidated settlements. Despite the deeply changed nature of the society, the community is still fed by the relationships created by the spatial configurations of these urban systems. The configurations producing proximity conditions, build the "neighborhood" dimension that creates social relations, sometimes not explicit nor perceivable, crucial in constructing its own identity.
These conceptions are based on the idea of "living" as an action building man's and space's identity. The action of living, meaning something that affects and changes a place, has translated the local social structure into touchable forms. The deeply consistence, the perfect correspondence between culture of living and urban forms accepting and encouraging it, are nowadays recognized.
The semiotic analysis of the "real" becomes a project tool also in the contemporaneity, since it makes possible to rediscover the numerous qualities that the occupied spaces have and generate, the various ways of usage and appropriation stratified so far, the articulation of the spaces connecting the elements that settle the habitat and upon which the construction of a settlement is based.

Sharing some daily and domestic practices with the public. (Figure 1)

2. The relational value habitat consolidated.

The contemporary project dealing with the issues of building in a built-up area or defining urban boundaries , is called to confront with the urban system indicated as an ensemble of elements whose relationships are articulated by complex systems of intermediate spaces, microareas and spatial connectors often spontaneously born and whose urban and social role is really strong. These intermediate areas mitigate the relation between house and alley, courtyard , neighbour. They are well-balanced spaces whose proportion give them that domestic look determining the easiness of usage and appropriation. They can often be recognized as minor spaces , unoccupied areas left after construction or backs, but thanks to their informal character they are more spontaneously conceived and used. It's in these spaces - whose boundaries are imperceptible, whose extension is suggested only by the action space defined by usage, where the private property fades into the public of the street and whose sharing is perfectly managed and well-balanced – that the spare time is spent, here is where the time is spent to escape the boredom of the private in order to enjoy the liveliness that can be offered by the public and by meeting the community.

The attention to tiny spaces, to semi-public areas between house and street, to the street as a way which integrates the built shapes to the socio-cultural fabric, arises from the realization that the daily living enjoys these intermediate spaces because it is believed that this is where proximity and socio-urban relations can spontaneously born.

Nowadays, "the place of living" reflects a constant tension between private and public, individual and collective. On one hand, the private is preserved, isolating it from all that can be seen (protecting it from prying eyes and sharp hearing), on the other hand, the deep desire of sharing some daily and domestic practices with the public – the community – is felt, to be aware of its presence, to be a part of it, to know the dynamics and affect them.

The semiotic analysis of places and spaces concerning the local living area, highlight the physical and spatial consequences of these individual and collective tensions, discover its translation in intermediate spaces, domestic interstices creating a delicate and well-measured balance between inside and outside, public and semi-public. Therefore, the urban front is permeable, accepting interactions between house and street, allowing the penetration of connection spaces and the infiltration in the most inner parts of the fabric.

The "urban front" is permeable (Figure 2)

3. The contemporary project

The contemporary project of the habitat, or parts of it, it is now called to deal with the issue of the new ways of living between individual and collective, to study and interpret in another way the spatial configurations ruling those delicate relations of being in the space between objects (houses) and alley. Living the intermediate spaces, standing between public and private, is a clear cultural matter, it is a strong quality of the culture of living, typical of the local dimension so deep-rooted in the Mediterranean contexts. The "new" becomes part of the urban system, weaves relations among the various items, it creates comparisons and liaisons. The project interpret in another way the morphology and the characteristics of the settlement consolidated in that place in order to conceive sustainable changes of the contexts. It is in this sense that the intervention goes beyond the object to affect the scale of the items' system where the elements create the fabric of the habitat.

Contemporaneity is fully involved in the crisis of the relation between space and society, therefore, we are the audience of the changes of the territory and of the urban contexts that do not create any landscape since they are manifestly inconsistent against local memory and culture of living. We can observe ensembles of houses not creating any fabric, having no relations with the surrounding area, asserting their presence without taking into account the complexity that the action of living causes. Living is a domestic and daily action, it enjoys the dimension of relations that the settlement sets up. The house is the most important element, but the urban system cannot simply be considered as the sum of the objects-houses. The project of the habitat refers to complex systems managed by internal sub-systems and structures of relations articulating the elements of which it is composed. The project generates some difficulties when – beyond the scale of the single object – it expands to the system, defining and articulating the parts in a modulated and shaped whole aimed to creating favorable spaces and situations. In this sense the urban strength of the "close – knit block" is re-discovered; here the empty spaces are emphasized because they are measured and proportioned by the surrounding buildings that defines them. On the other hand, the weakness of many urbanistic choices is pointed out. These choices have produced the urban punctuation principle, giving the house the central position in the lot. The house is detached from the street and the neighbour, the urban front becomes flimsy, the characteristics of urbanity become weaker. The standardized models upon which this normative and building attitude is based, often leave out the complexity of the local culture of living and do not operate together with them , altering the requests of the inhabitants. Housing models, morphological and identity characteristics of a specific place are called into question.

Spatial configurations and structures of intermediate spaces, connecting the various parts, are omitted, the house is isolated from the surroundings, its surplus spaces and the garden areas seem to be enough to suggest that "so long yearned" wellness of living. The urban center's boundaries are frayed, their building monotony, given by the

repetition of a prototype makes them estranged, they have not been generated by a process of establishment in the context, they have been leaned.

The efforts that this research carries on is to found the habitat conception upon the dimension of the relations of everyday life, without giving up to a strong individual connotation of "living". The strength of the settlement of rural nature is recognizable for the wise ability - acquired in the course of time and from the experience given by the permanence in the same place – of building that delicate balance between public and private, inside and outside, sharing and closing.
The complexity of the contemporary society certainly causes a change in functions, uses, space dimensions. The habitat acquires many qualities such as the functional mixité and the relation between house and working area. The lesson given by the Mediterranean contexts points out the urban strength of a settlement, where functions and various natures of the spaces permeate one in another and make a comparison. More and more often we enjoy the chance to work near our own house. Contemporaneity shortens distances and times helping a discontinuity between central headquarters and single point of production. The residential fabric can therefore include the creation of spaces and working units assex or not to the house. The complexity and the presence at the same time of many functional layers, enriches the residential fabric, making it full of activities, life and presences. The discontinuities that can often be seen between public and private space do not simplify the presence at the same time of ways of living and employ the space.

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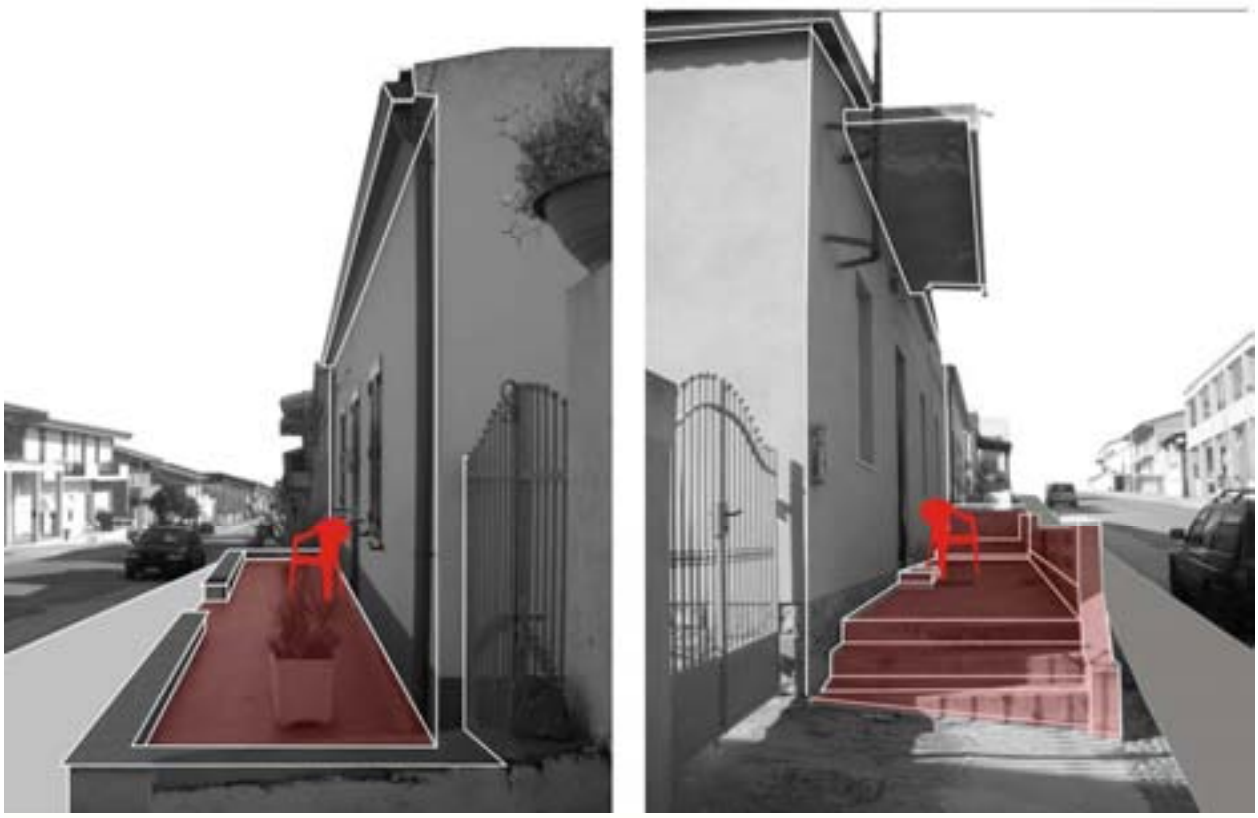

Intermediate spaces (Figure 3).

4. Conclusion

These remarks lead to the idea of a habitat which is specific of a particular place, with the contemporary man as its center and aimed to structuring systems of space able to create complex urban and social relations, in order to help the expression of its own social and cultural individuality.
Realizing of being part of a community, being part of an "us", strengthens the identification process carried on by a person. The habitat finds its strength in the qualities of density, in the relations of proximity, in the connection of the spaces, in not being monumental, in the intermediate spaces system.
The project of sewing, made in the internal part or at the boundaries of the consolidated urban fabric, becomes interesting and complex. Here the urban texture is readable and the settlement is deeply characterized by the density. It is extremely interesting the morphologic recomposition of the fabric, to interpret in another way the urban structures adding new building items. The creation of new spaces and dimensions adding complexity to the whole situation, gives new life to parts of the system, taking into account the requests of the contemporaneity. New houses are built in the consolidated urban system, interpreting the nature of the surrounding spaces, defining their own balances with the houses nearby, with the empty courtyard and with the street.
The consolidated contexts offer the richness of their own memory, their urban structures talks about a way of living, the habit of stand, the easiness of building neighborhood relations keeping their private in a microcosm often impenetrable. Ways of living that we can still enjoy nowadays, with some changes. The memory of the place, the signs and the stratifications produced by the appropriation make that territory recognizable and are the basis for rooting.

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SUPPORT TOOLS FOR BUILDING THERMAL REHABILITATION

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Abstract

Countries development led to an increase use of energy resources that are essential to social and economic welfare of populations but damage the environment. This raise in energy use originated the increase of greenhouse gases emissions and the consequent climatic changes we all assist.
Since only recently sustainability and energy efficiency issues have gained special relevance, especially in the Portuguese context, there is a great potential for the development of methodologies and strategies to improve the energy efficiency of buildings and to diagnose and repair thermal pathologies.
The Mediterranean area, in which Portugal is included, is a privileged area when compared with other parts of Europe because of its mild climate. However, buildings show very high heating needs and unnecessary cooling needs but also high improvement potential. It is possible to drastically reduce the heating needs by acting on the envelop and promoting efficient HVAC systems and reducing or even eliminating cooling needs as well as DHW needs by promoting efficient shading, thermal mass and the use of solar collectors.
This work intends to characterize the thermal performance of Portuguese residential buildings identifying their main thermal pathologies resulting from a bad design of the envelope and proposing the most appropriate improvement measures to reduce or even eliminate these pathologies.
To achieve these goals, a thermal diagnostics software tool is being developed taking into account the analysis of the envelope, the HVAC systems and existing pathologies. This tool will help designers to define their rehabilitation strategies towards improved buildings energy performance in a cost/benefit perspective.

Keywords: Thermal diagnosis, buildings pathologies, thermal rehabilitation of residential buildings, rehabilitation support tools

1. Introduction

Energy production and consumption are the basis for the growth of civilization. Global industrial revolution witnessed extensive use of energy and gradually the pattern of energy consumption started shifting toward massive dependence on electricity. For several decades, we all remained unconcerned about the fact that any form of energy is an exhaustible resource and unless these resources are used with required amount of care for avoidance of wasteful consumption, the future generations could even be deprived of the essential supplies for meeting their requirements and needs. It was only in the last few decades that this concern has started getting wider recognition. The fear of rapid depletion of exhaustible energy resources have been compounded with the concerns for global warming and other climate change related issues. It is a fact that larger amount of energy production, in most cases, is associated with larger amount of CO2 emissions [1].
Therefore, all aspects of energy consumption are being dissected with a view to finding out the possible areas of reductions, conservation and saving, so that without affecting the quality and level of services, the amount of consumption of electricity needed could be significantly reduced. All countries in the last years have started looking at the need for efficient consumption of energy. Whether some of them have gone ahead with the implementation of understanding reached in the Kyoto Protocol or not, they have started taking actions which would lead to a more efficient pattern of consumption.
Thus, the imperative to improve energy efficiency is stronger than ever. Energy efficiency must be one of the strategies employed to address the challenges of energy security, climate change and economic development. On this road to a sustainable energy future, actions in the building sector can play a key role. Energy performance of buildings is one of the keys to achieve the EU Climate & Energy objectives, namely the reduction of a 20% of the Greenhouse gases emissions by 2020 and a 20% energy savings by 2020. They account for 40 % of Europe's energy use and a third of its greenhouse gas [2]. Therefore, improving the energy performance of buildings is a cost-effective way of fighting against climate change and improving energy security, while also creating job opportunities, particularly in the building sector.
So, it is evident that energy efficiency in buildings has tremendous potential all over the world, but the greatest potential to save energy is offered by existing buildings. They are responsible for over 40% of the world's total primary energy consumption, and account for 24% of world CO2 emissions [3].
According to Census 2011, in Portugal there are more than 3.5 million buildings, representing approximately 30% of final energy consumption (18% in residential buildings and 12% in service buildings) [4]. The overall analysis of the distribution of energy consumption in the domestic sector in terms of final energy also shows that 68% are

consumed in food preparation and heating of domestic hot water (DHW), 17% on lighting and appliances and 15% in heating and cooling [5].
This shows the significant weight of DHW heating in the overall energy consumption. At this point of view it is possible to conclude that Portugal, as well as other countries in the Mediterranean region, has enormous potential for energy savings in buildings since they have a privileged sun exposure that allows them to take great advantage of passive solar techniques as well as of solar collectors for heating DHW.
However, despite the enormous potential for thermal rehabilitation that Portugal has, its housing stock, although it is relatively recent, is in very bad conditions of conservation due to lack of adequate legislation, the inexperience of those involved in the rehabilitation sector and also the lack of appropriate tools to support decision makers providing them with the best solutions, both technically and economically, to improve the energy performance of a building [6] [7].
So first, this work aims to characterize the thermal pathologies most common in Portugal, which will allow to define the most appropriate measures for improvement and how to apply them correctly.
Secondly, it is also a purpose to develop an innovative tool to assist users in choosing the most appropriate improvement measures to reduce or eliminate the thermal pathologies found as well as improving the energy performance of the building as a whole in a cost/benefit perspective.

2. Methology of the Study

To develop the software tool, an initial analysis was undertaken to assess the state of the art regarding the characterization of the existing housing stock and that consisted of a collection that included the exhaustive literature review of the different types of residential buildings as well as the solutions used to characterize and standardize the existing residential buildings [8]. For this paper they were reviewed 600 buildings, selected from those whose energy certificates were required to a company of designers that is supporting this project, distributed by construction period as shown in Figure 1.

Figure 1. Percentage of case studies for construction period

Based on the information gathered within the literature review, it was decided to divide the thermal pathologies encountered in four major groups: pathologies in facade elements, in roofs, in floors and in glazing. Each of these groups then originated subgroups with the most frequent pathologies. Each of the pathologies observed "in-situ" was recorded as well as the improvement measures proposed to eliminate it [9].
During the study, it was performed a detailed cost-effective analysis of the proposed rehabilitation solutions based on inflation and interest rates. The cost of each solution includes the costs of materials, labour and application, provided by manufacturers. The study also included the assessment of the asset value achieved in the building with the rehabilitation process, along with a detailed cost analysis of each task towards the objective.

3. Results

3.1. Characterization of thermal pathologies

When analyzing the possibility of including energy efficiency measures in a building it is important not only to consider the degree of deterioration due to various factors, such as the natural aging of materials or lack of maintenance, but also that the current characteristics of buildings can lead to a reduction in its thermal performance and high energy consumption, whether in the cold or warm season [10].
Among the most common anomalies of the buildings, should be mentioned the lack or inadequate thermal insulation of the building envelope, the presence of thermal bridges, degradation of the covering or occurrence of humidity (affecting the energy performance and durability), low thermal performance of glazing (high heat loss coefficient

and excessive air leaks), lack of adequate shading (leading to overheating or increased cooling loads) and non-controlled ventilation (responsible for greater energy needs in winter) or insufficient ventilation (leading to high relative humidity levels, condensation problems and low indoor air quality in winter and overheating in summer). [11] [12].
Of the 600 case studies, the pathologies observed had the distribution shown in the following figures 2 and 3.

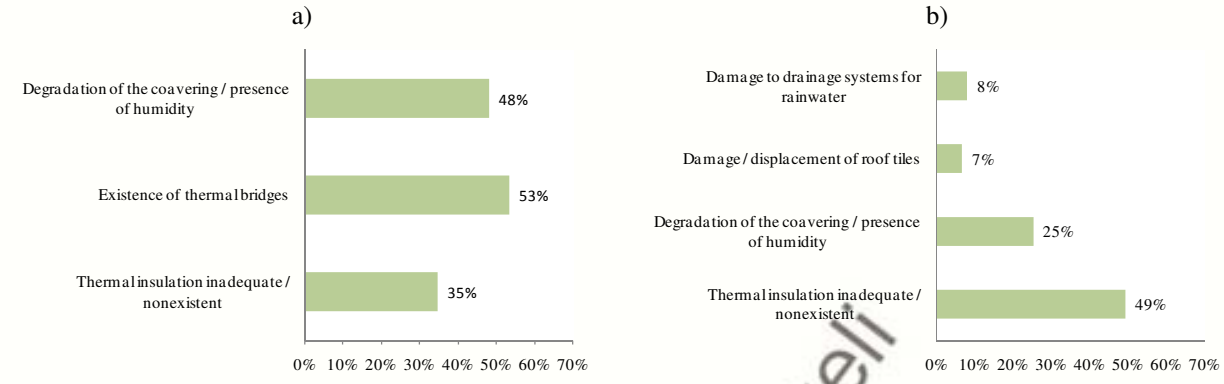

Figure 2. Percentage of pathologies evaluated in: a) façade elements, b) roofs

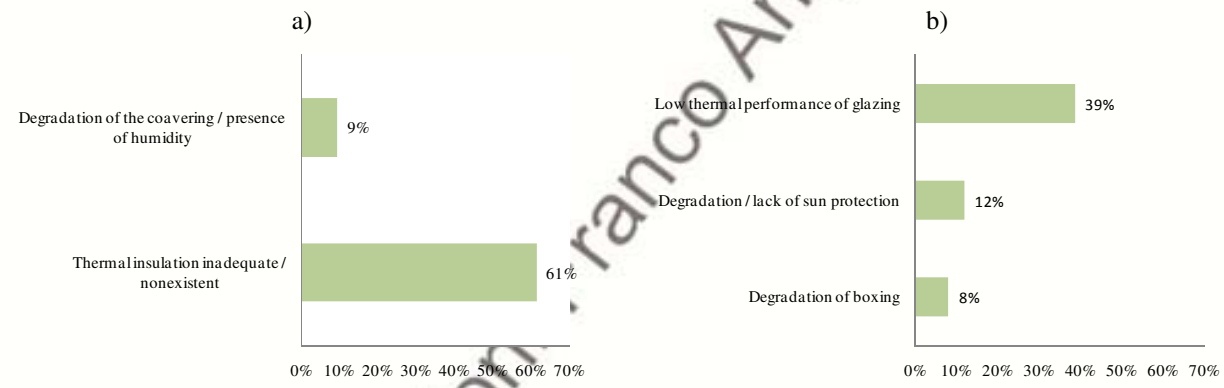

Figure 3. Percentage of pathologies evaluated in:a) floors; b) glazing

Although the sample included relatively new buildings in their distribution (with 37% of the buildings built after 2006 - date of entry into force of the renewed thermal regulation, and 76% of the buildings built after 1990 - date of entry into force of the first thermal regulation), it is verified that the Portuguese housing stock shows large gaps in its thermal quality. Indeed, as can be seen in the previous figures, a large part of the buildings studied exhibit degradation in its coverings with the presence of humidity in the walls (48%), roofs (25%) and floors (9%). This is due mainly to lack of insulation in these elements (35% in walls, 49% in roofs and 61% in floors) and the existence of thermal bridges in walls (53%). In the case of glazing it was possible to see that the pathologies found are mainly due to the use of single glazing with low thermal performance (39%) instead of double or triple glazing with better performances.

3.2. Improvement measures proposed

Each one of the pathologies observed in the 600 analysed cases was recorded as well as the improvement measures proposed to eliminate it, considering the following order of priority of intervention:

1. Correction of construction pathologies;
2. Reduction of energy needs through intervention on buildings envelope;
3. Use of renewable energy;
4. Use of more efficient systems.

Figure 4 shows the distribution of the proposed improvement measures for the cases under analysis. As it is possible to see, in most cases the proposed improvements encompassed the placement of insulation in the envelope elements, especially on the roofs (71% of cases). These measures allowed not only to improve and eliminate the most common pathologies (presence of humidity and degradation of the coverings), but also to reduce the heat losses through the opaque envelope. It was also given particular attention to the equipment for heating DHW (62% of cases) given its importance in energy consumption in households having to bet on the placement of more efficient equipments.

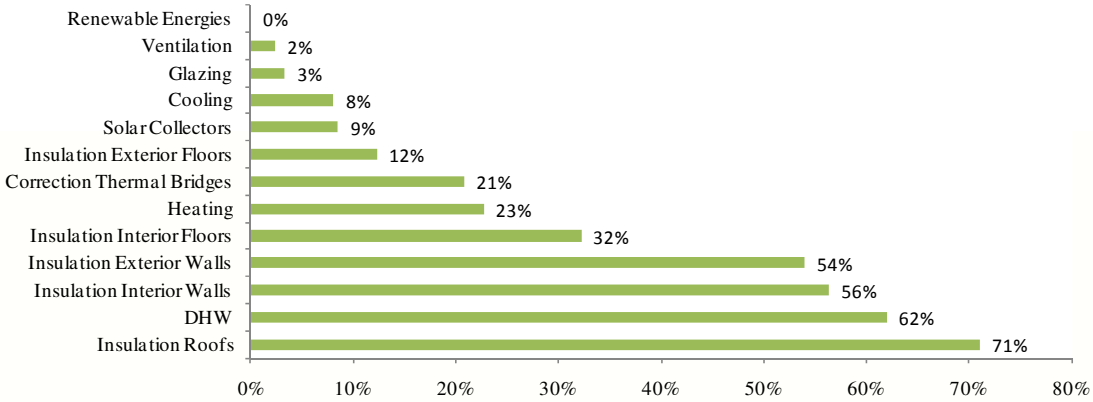

Figure 4. Distribution of the proposed improvement measures

3.3. Thermal diagnostics software tool

The difficulty shown by stakeholders in the process of energy certification of existing residential buildings in analyzing the most appropriate improvement measures to thermally rehabilitate buildings and reduce or even eliminate their thermal pathologies, allowed the development of an innovative software tool that makes this process easier. Figure 5 shows the flowchart of the software tool under development.

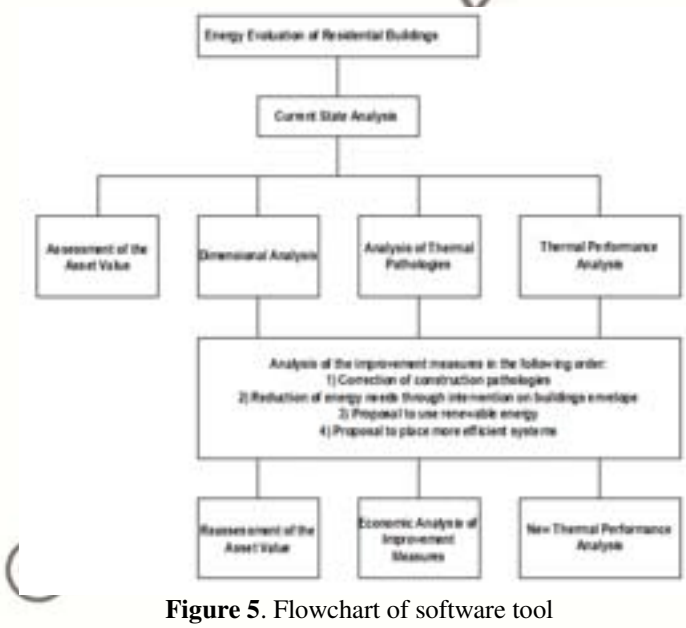

Figure 5. Flowchart of software tool

The software will analyze the current state of a building based on a dimensional assessment and characterization of all elements of the envelope (walls, roofs, floors, windows ...) and the characterization of the pathologies found. This initial analysis will also include the study of the building energy performance as well as the determination of the asset value of the property before any measures are implemented. The user should select, among several options, the pathologies observed in the building and then, depending on that selection, the tool will propose the most appropriate measures to improve its thermal performance, in both technical and economic perspective. The building energy performance and the asset value of the property will then be re-evaluated with the improvement measures implemented. The economic analysis will be based on the costs of the improvement measure (which includes the cost of materials and labour) and will evaluate not only the decrease in energy costs but also the increase of the asset value, taking into account current interest rates. Figure 6 shows examples of some interfaces of the software tool under development.

Figure 6. Examples of software interface

4. Conclusions

By the analysis of the graphs shown, it is possible to conclude that, in existing buildings, thermal bridges in façade elements are very frequent and responsible for humidity and moisture problems and degradation of the coverings. Insufficient insulation of roofs and floors are also common situations detected responsible for the very poor thermal performance of existing buildings along with the poor quality of glazing that, in most of the situations, are single glazing.

It is noted that in the studied sample, most of the observed fractions belong to relatively recent buildings (39% between 1991 and 2006 and 37% after 2006).

The data shows that the entry into force of the new thermal regulation, Decree-Law 80/2006, dated from 2006, has not yet been fully assimilated by some of the players, especially those responsible for the construction sector. Too often it appears that buildings built after 2006, but before the entry into force of the Decree-Law 78/2006 (Building Energy Certification System), do not meet the minimum requirements imposed by the thermal regulation, thus not complying with the requirements of the projects.

In addition, it appears that designers have some difficulties in analyzing the most appropriate measures to improve the energy performance of a building largely due to the lack of experience, technical studies and regulations in this area.

For these reasons, the tool that is being developed is particularly important in the Portuguese context. It is intended that the use of it would not only facilitate the work of designers but also raise the technical quality and efficiency of energy rehabilitation performed allowing to population greater comfort in their homes and significantly reducing unnecessary energy expenditure.

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TOWARDS MANAGEMENT AND PRESERVATION OF EGYPTIAN CULTURAL LANDSCAPE SITES - CASE STUDY: SIWA OASIS

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Abstract

The problem can be summarized in the lack of information, including the sequence steps for management and preservation of the cultural heritage landscape sites in Egypt. Also, the lack of coordination between the government, the associations which are looking after with culture landscape, GIS designers, archaeologists and the public for management the cultural landscapes sites and their preservation.

So, the paper has tried to put some of central research questions:

Is it possible to reach a common framework means the management and preservation of cultural heritage landscape sites in Egypt, in order to make a valorization for such these sites?

Could the application of this common framework on "Siwa Oasis" help to develop and upgrade this framework?

The paper aims to find the possibility of reaching a common framework for the formulation of management and preservation of cultural heritage landscape sites in Egypt in order to make a valorization for such these sites.

After that, the paper made an application on a cultural heritage site "Siwa Oasis", which aims to reach an urban upgrading, humanity upgrading and adaptation of the heritage places for the selected case study.

Keywords: Management, Preservation, Cultural Landscapes, Siwa Oasis

1. Introduction

The term 'cultural landscape' is examined from the perspective of its generally accepted use in various parts of the world. Contrasts exist due to the different cultural histories, academic affiliations and to the practitioners of the concept. Presently the term appears to have greater currency and relevance to landscape planning in Europe [1].

Cultural landscapes include homesteads and farmlands, as well as remnant native vegetation, Aboriginal sites and places, wetlands, early settlements, disused cemeteries, defunct industrial complexes and so on. These cultural landscapes preserve cultural values and ecological diversity, while offering economic gain through continued agriculture and tourism and considerable scenic and amenity value to local areas and daily life.

The concept of Cultural Heritage Landscapes is perhaps the most profound in the field of heritage preservation. It has long been intuitively understood that certain places have a special, distinguishable character based on the unique integration of such aspects as topography, fauna, settlement patterns, human industry and architecture. Indeed it is the seeking out of these places that 'drives' much of modern tourism. Cultural geographers have been considering and analyzing 'cultural landscapes' since the term was 'coined' by Carl O. Sauer (the father of cultural geography) in 1926 to describe any place modified by humankind, however subtly [2].

The oases in Egypt comprise the many depressions in the desert regions of Egypt. The desert regions include the Western desert and the Eastern desert, where the climatic conditions are very harsh throughout the year. The only places of relief in the deserts are these oases regions. Though these places are densely populated, it represents only a hundredth of the total population of Egypt. It is the Bedouin tribes in chief, who inhabit these oases regions. Agriculture is the chief means of occupation. These oases represent a type of cultural landscapes in Egypt.

1.1. Research problem & Motivations

Despite attempts to attention in the recent period of the mentioned cultural heritage sites in Egypt, but the outcome of the efforts can be considered as negligible which means that there is a problem or something goes wrong, and the thesis assumes that the imbalance cause is due to the absence of a system for management and preservation of these sites. So, the research problems can be summarized in the following points:

- **The absence of clear vision for management and preservation of Egyptian cultural heritage landscape sites.**
- The negative effect on the cultural and natural features due to management absence.
- The lack of information, including the sequence steps for management and preservation of the cultural heritage landscape sites in Egypt.

- Lack of coordination between the governmental bodies, other organs which are concerned with the culture heritage landscape sites in Egypt, researchers, and the public for management the cultural heritage landscape sites and their preservation.

1.2. Research questions

After reviewing of research problem and motivations, the paper tries to put some of main research questions:

- Who are responsible organs for management and conservation plans for cultural heritage landscape sites in Egypt?
- Is it possible to reach a common framework means the management and preservation of cultural heritage landscape sites in Egypt, in order to make a valorization for such these sites?
- Could the application of this common framework on "Siwa Oasis" help to develop and upgrade this framework?

1.3. Aims and objectives

By answering the research questions, the aims of this paper could be concentrated into the following points:

- The possibility of reaching a common framework for the formulation of management and preservation of cultural heritage landscape sites in Egypt in order to make a valorization for such these sites.
- The possibility of application this framework on "Siwa Oasis" in the Egyptian western desert, which is rich in tourism, agriculture, handcrafts, natural features and historical treasures.

2. Cultural Landscapes: General Concept and Egyptian Context

The World Conservation Union depicts the relationship between culture and landscape in Figure 1. [3].

According to the Operational Guidelines for the Implementation of the World Heritage Convention, cultural landscapes are cultural properties that represent the "combined works of nature and man" designated in Article I of the Convention [4].

"They are illustrative of the evolution of human society and settlement over time, under the influence of physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal."

Figure 1. The relationship between culture and landscape

In fact, there are a great variety of Landscapes that are representative of the different regions of Egypt. Combined works of nature and humankind, they express a long and intimate relationship between residents and the Egyptian natural environment. Egyptians Cultural landscapes could be classified into many types, for example but not limited to; built heritage, river banks, oases ecosystem, spectacular mountains, and also coastal, religious and industrialized cultural landscapes. The important qestion now is: who Protects the Egyptian Cultural Heritage and Cultural Landscapes?

The Supreme Council of Antiquities, (SCA), is the government body responsible for the restoration and preservation of the cultural heritage and cultural landscapes in Egypt. However, there are other administrative organs and other bodies concerned with cultural heritage and cultural landscapes in Egypt and they are working to assist the Supreme Council of Antiquities, each one in its fields, as shown in figure 2.

Figure 2. Administrative organs concerned with Egyptian cultural heritage landscapes

3. Siwa Oasis as a Case Study

With the presence of this diversity of cultural heritage landscape sites in Egypt, however, the Ecosystem sites don't get the same interest as is the case with the Pharaonic sites and particularly in regions which are outside the Nile valley. One of these sites is in the Egyptian western desert "Siwa Oasis" which is rich in tourism, agriculture, handcrafts, natural features and historical treasures.

The oases in Egypt comprise the many depressions in the desert regions of Egypt. The desert regions include the Western desert and the Eastern desert, where the climatic conditions are very harsh throughout the year. The only places of relief in the deserts are these oases regions.

Though these places are densely populated, it represents only a hundredth of the total population of Egypt. It is the Bedouin tribes in chief, who inhabit these oases regions. Agriculture is the chief means of occupation. These oases represent a type of cultural landscapes in Egypt.

The Siwa area lies in the western desert of Egypt, on the edge of the Great Sand Sea, as shown in figure 3. It is located in a natural depression, 82 kilometers long and 18 meters below sea level. The oasis comprises a series of palm and olive groves fed by a network of natural springs. In ancient times it was famous as the seat of the oracle of Amon. In the sixth century BC the Persian ruler Cambyses sent an army of 50,000 men to conquer the site, but they were never heard of again. Alexander the Great visited the oracle in 331 BC to ask if he was the immortal son of Zeus.

Figure 3. Geographic of Siwa Oasis

3.1. The Features of Cultural Landscapes in Siwa Oasis

Thousands of years of isolation in a vast and unforgiving desert have allowed the Siwian community to develop unique cultural traditions, building techniques, styles of embroidery and systems of agricultural production that are remarkable for their beauty and harmony with the natural environment.

In 2002, the Egyptian Government declared 7,800 square km in and around the Siwa Oasis a protected area, in recognition of Siwa's cultural, biological and environmental value. The new status prohibits all activities that damage or deplete the natural environment, including indigenous flora and fauna, and has bolstered the movement to preserve Siwa's invaluable resources.

3.1.1. Natural Features

Thousands of years ago, rocky plateaus cradled and protected this lush depression. Over the course of time, sandblasting desert winds have carved reliefs from the plateaus, resulting in a unique terrain. Ranging in size from boulders to mountains, these sedimentary sculptures punctuate a dramatic landscape – a landscape where the Great Sand Sea converges with fresh water springs, glistening salt lakes, lush vegetation and significant biodiversity [1]. Figure 4. Shows the natural features of Siwa Oasis.

Salt lakes | Fresh water springs | Sand dunes | Plants (date palms)

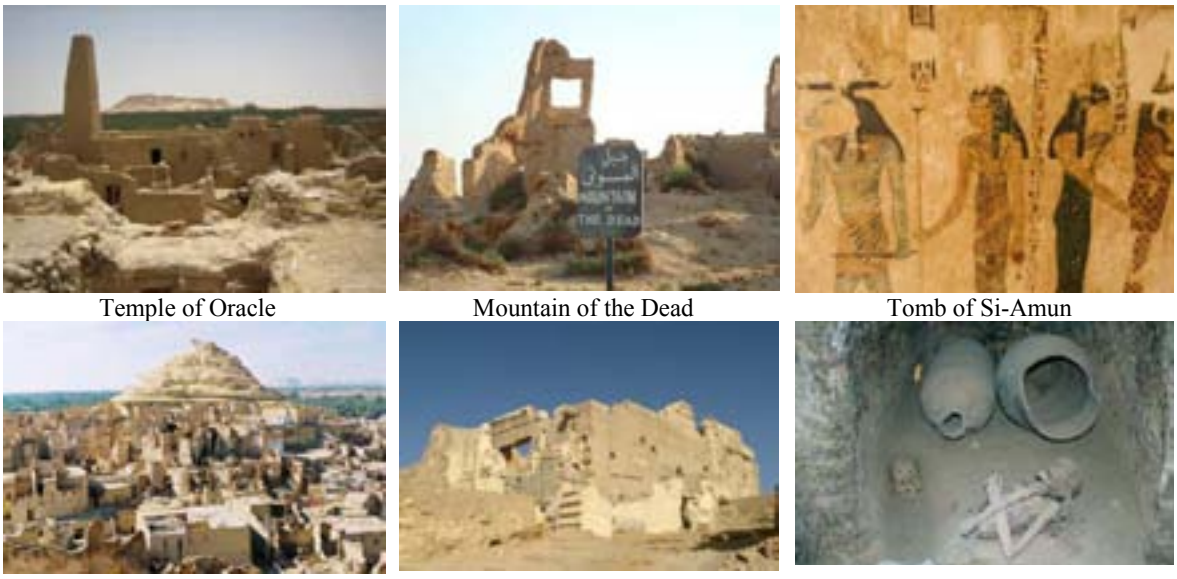
Figure 4. Natural Features of Siwa Oasis[2]

[1] Found in: http://www siwa.com (14th April 2011)

[2] **Source:** http://www.somewheredifferent.com/all-inclusive-holidays-to-egypt/all-inclusive-holidays-to-egypt-marsa-matruh.html

3.1.2. Historical Treasures

There are several old buildings scattered around in Siwa. The temple ruins, remains of the old Roman town and deserted houses tell us of the long and colourful history of the area. The mountains surrounding the Shali hide a vast amount of history. Mountain of the Dead is situated to the north of the city. The people fled to that mountain during the WWII air raids and found ancient tombs. Figure 5. shows the historical treasures existing in Siwa Oasis.



Temple of Oracle | Mountain of the Dead | Tomb of Si-Amun

Old Shali | Tomb of Alexander the Great | Tomb of Niperpathot

Figure 5. Historical Treasures of Siwa Oasis[3]

3.1.3. Siwian Culture

The Siwa Oasis enjoys a unique cultural heritage and a society rich in native custom and tradition. Descendents of the Berbers, or Imazighen, North Africa's original inhabitants, Siwians share more with cultures to its west than with Egypt. Siwa is the easternmost reach of Berber culture, and the oasis features rites, traditions, dress, tools, and a language distinct from the other oases of Egypt's Western Desert. Most important characteristic of Siwian culture are;

- **The Siwian House**

Made of Kershef stone, Al Beit Al Siwi is the only museum in Siwa. Organized by the local community to share their culture, this eco-museum was built as a traditional Kershef stone house -as shown in figure 6-, and displays the cooking utensils, richly ornamented garments, jewelry, musical instruments, baskets and pottery of Siwa.

Figure 6. A Traditional Kershef stone - Siwian House[4]

- **Arts and Crafts**

Siwian culture boasts a variety of traditional arts and crafts, such as silver jewelry, colorful woven baskets and embroidered and beaded garments and accessories. Figure 7 shows the several types of the Siwian crafts; textile, silver jewelry, traditional doors, traditional windows, and salt walls.

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[3] **Source:** http://travel.wikia.com/wiki/File:Siwa_Aghurmi_temple_de_l%27oracle_d%27Amon.jpg

[4] **Source:** http://www.fecielo.com/egypt

Figure 7. Several Types of the Siwian Crafts[5]

- **Women in Siwa**

Siwa is considered an extremely conservative society, even by Egyptian standards. Traditionally, both married and unmarried women alike do not leave the home unaccompanied, though stronger restrictions are placed on the movement of married women. If and when they travel outside their home, they cover themselves from head to toe. Accordingly, all travelers to Siwa, but especially females, should respect the local customs by dressing modestly. Revealing clothing is considered disrespectful and may solicit unwanted gazes from Siwian men. That said, Siwians are enormously hospitable, as long as their cultural differences are appreciated. Figure 8 shows the daily life of the Women in Siwa.

Figure 8. Daily Life of Women in Siwa[6]

3.2. Problems and Threats of Siwa Oasis

It can identify the most important causes of the problems plaguing the urban at Siwa Oasis is the environmental obstacles. The most important environmental problems and the impediments to tourism development have been illustrated in the following:

- **The Environmental Problems**

The Siwa Oasis suffers many environmental problems such as; water logging; soil Salinization; increase in the surface area of the saltwater lakes, Marshes and the rise of soil water levels by 4.5 cm/year. The results of these problems are deterioration in land productivity and which in turn results in lowering Agriculture income [5].

- The Problem of Water & Soil Salinization
- Desertification
- The Balance of Ecosystem
- Pollution

- **Impediments to Tourism Development**

Siwa Oasis is characterized by substantial tourism potential, which makes it a distinct tourist destination in the desert of North Africa in terms of historical buildings; eco-tourism and medical tourism, but there are some obstacles which impede the development of tourism in the oasis [6].

- Cultural and Social Impediments
- Geographical Impediments
- Urban Impediments
- Regulatory Impediments
- Environmental Impediments

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[5] **Source:** Environmental Quality International (EQI), "Siwa Oasis Report", 2009

[6] **Source:** http://www.siwa.com/AboutSiwa.html

3.3. SWOT Analysis of the Case Study

In order to visualize both; the internal and external factors that affect the area of study "Siwa Oasis" and its features, SWOT analysis was constructed. It is based on three main factors; Environment, Urban & Heritage and Tourism profile; table 1. Each of them is trying to draw a clear image about the current situation and the future development opportunities.

Table 1. SWOT Analysis, Siwa Oasis[7]

Point of Analysis	Strengths	Weaknesses	Opportunities	Threats
Environment	• Several magnificent salt lakes. • Fresh water springs. • Sand boards and toboggans of huge dunes. • Plants; date palm and olive, etc. • Distinct and wide-ranging collection of animal species, including at least two amphibians, mammals, reptiles, insects, soil fauna and birds. • Organic Agriculture	• Groundwater sources provide far more water than the inhabitants need. • Soil Salinization. • Desertification due to the large consumption of underground water. • The Balance of Ecosystem due to the negative change to the environment and natural heritage. • Pollution.	• Relationship between historic settlement and its surroundings natural and manmade setting. • Participation and involvement of the Siwa people in the environmental and developing programs. • Unique terrain punctuates a dramatic landscape where the Great Sand Sea converges with fresh water springs, salt lakes, lush vegetation and significant biodiversity.	• The human activities like "burning and the waste products flow from the olive factories" inhibit the vegetation diversity, performance of the plants, height, sociability life forms and phonological states. • Overgrazing was the most activities affect on vegetation diversity and floristic composition. • High temperatures during the day in summer.
Urban & Heritage	• Temple of Oracle. • Old Shali; magnificent relic at the center of Siwa's largest town. • Tomb of Alexander the great & other historical tombs. • Siwian house established of traditional building materials. • Traditional Models of windows and doors. • Variety of traditional arts and crafts.	• The urban indiscriminate sprawl of modern buildings. • The local buildings were suffering from severe settling damage due to the moist soils. • Some of the new buildings are being built in modern construction like concrete, bunt bricks; it does not fit the unique urban pattern.	• The presence of programs for developing Siwa oasis. • By putting a "Building Guideline", a good landscape image could be achieved. • Using local and traditional building materials has been appeared in hotels in the oasis and integrated patterns have been used in the layout.	• Difficulty of land reclamation due to increased consumption of groundwater. • Soil Salinization causes the difficulty of land reclamation. • The geographical isolation of the region; far away from the Nile valley. • Limited services and lack of infrastructure.
Tourism	• Historical places. • Medical tourism. • Eco-tourism. • Tourism services (Hotels, Restaurants, commercial shops, etc.)	• Cultural and Social Impediments. • Geographical Impediments. • Urban Impediments. • Regulatory Impediments. • Environmental Impediments.	• Preservation of the environment and sustainability • Emphasis to show the richness of local culture • Preservation of the architectural and urban patterns and to promote traditional building • Encourage safari	• Lack of popular participation in development. • Spatial remoteness to the oasis from the centers of urbanization in the Nile Valley. • Tourism development may adversely affect the environment.

[7] **Source:** Author

4. Proposed Vision of the Development Plan

It is clear that Siwa Oasis is rich with vital cultural heritage landscape, that is why it requires preservation which reflects a image of the urban desert communities and oases ecosystem, including the remnants of features witness to its style. Therefore, the research aims to preserve the site with stock rare and valuable physical characteristics, and to raise residents through a comprehensive system for aspects of physical, economic, social and others.

- **Urban upgrading**
  - Study the buildings case, the preservation of historic buildings, archaeological sites, and the style of Siwian buildings through comprehensive urban development for the oases ecosystem, restoration of ramshackle buildings which cause danger to passers-by and residents.
  - Study, develop and upgrade of infrastructure (paving the ways - sanitation - water - fire fighting - electricity - telephones)
  - Study of existing services in the region, and study the actual needs of health services, security, and others.

- **Humanitarian improving**
  - Developing the life way for residents in the site commensurate with modern requirements without prejudice to the social and doctrinal aspects.
  - Developing the professionalism performance of rare professionals distinguished, such as the Siwian crafts; textile, silver jewelry, traditional doors, traditional windows, and salt walls and the establishment of workshops supported by the State through the available development programs.
  - Organization of marketing and development of local products in the site.

- **Rehabilitation of heritage buildings**
  - Rehabilitation the historical buildings - after restoration - and make them fit for use, such as restoration of buildings in old Shali to use it again as hotels with the same style of the oasis and make it a vital tourist attraction not just a monument or historical buildings. It is also possible to host the popular arts to highlight the inherent aspects of popular life.

4.1. Key areas of work

The research tries to put a plan to apply the common framework on the selected case study; this plan consists of three main axes as followed;

- **Political and administrative axis**

By management configuring has the strings of financial requirements and the various legal aspects, and discusses the possibilities of funding. As well as efforts to sensitize the public media to provide positive participation, and to overcome obstacles of the responsibilities complexity between the various bodies that have relevance.

- **Technical axis:**

By technical working group configuring to carry out all technical studies and consultancies for various engineering and urban disciplines and supported by the specialties of social, economic, archaeological and others. For the preparation of surveys, preliminary studies, and then propose solutions and different alternatives to coordinate which will be identical with the economic situation and the requirements of local people.

- **Executive axis:**

By configuring the executive management to discuss the requirements provided by the technical team and to put it under implementation, to study the procedures of contracting with contractors involved in the project, and to follow-up and supervision of all the work carried in coordination with the other axes.

4.2. Roles and functions of each team

The following is a review of the most important functions and roles of each team to get to the development management of the cultural heritage landscape sites; figure 9. illustrates the proposed organizational structure of the project.

4.2.1. Management Team

- **Popular participation:**

Popular participation is the base that affects the management and cooperates in the development, adoption and implementation of the decisions that respond to actual needs of residents, and this will not come without full living of the site and knowledge of its potential for betterment.

Which requires the participation of residents in the process of comprehensive development planning, implementation, follow-up and evaluation? The main objectives of this participation in:

- Citizens to realize the potential available for development.
- Response plans and programs with the actual needs of the community.
- Directing human efforts and capabilities available to meet development needs.

- **Proposed policies for supporting and funding**

Improvement and upgrading processes require to the existence of sufficient capital to cover the different needs, so it is necessary to find appropriate sources of funding to meet the requirements, as well as the processes must be planned according to the funding of certain policies by either the lender or the borrower. In this regard, it is proposed the followings [7]:

- Development authority grants to investors some of the historical buildings (with a fee rent for a period agreed upon), and in return the value of benefit in addition to a percentage of return on investment.

Figure 9. Proposed organizational structure of the project[8]

- The authority -alone or in cooperation with the private sector- develops and improves the buildings referred to and provided with facilities and services through short-term loans at low interest rates that are provided with implementing the necessary funding in installments according to work progress.
- Be leased these buildings after development with requirements and specifications for use so that matching the historic features of the site.
- By the output rent; it could be made the improvement of the other sites, and so on.
- Sponsoring financing.

- **Marketing polices**

It is expected to increase demand for buildings by increasing the rates of improvement and upgrading, the availability of investors and establishment of proposed tourism and service activities. While offered buildings have been remained, this will lead to higher prices at high rates. To remedy this problem it must be to the proposed development authority the right to run what is available of the buildings in the region on the following scenarios:

- The authority shall develop policies to ensure effective control of prices and prevent speculation based on economic, administrative and legislative rules.
- Issuing the necessary laws to encourage investment through the report of tax breaks or facilities.

4.2.2. Technical Team

- **Information Compilation and presentation**

Management development processes at all levels based on data, information and precise indicators in order to reach sound decisions balance between the potential and resources & the demands and needs.

The technical team compiled all available data for the area from different sources, then compile the data are not available through the survey and the views of the residents. So as to allow the technical team data base for the site in all its forms .An analysis of these data can reach sound decisions for the development process.

- **Documentation Strategy**

The first preservation levels are associated with knowledge and this knowledge entails documentation as a fundamental aspect for preserving cultural heritage. Architectural and urban records, the recording process, and information management in the field of conservation are continuously developing and must be considered in a broader context and as a fundamental part of a large body of knowledge and disciplines converging to safeguard heritage [8].

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[8] **Source:** Author.

- **Preparation of surveys and preliminary studies**

To achieve the objective of this process, it should be in parallel with all technical disciplines in the technical team, in order to reach a logical set of alternatives for a solution can be trade-offs among them later.

4.2.3. Executive Team

- **Contract procedures with contractors**

This process is done by presented bids from various contractors, in various disciplines to carry out the works.

- **Restoration for historic buildings**

It is the act or process of accurately depicting the form, features, and character of a property as it appeared at the particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. The limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within the restoration project.

- **Follow-up and supervision**

Executive Team is committed to follow up and supervise of all the work carried out; in terms of restoration, maintenance, rehabilitation, renewal and etc., all of that in coordination and periodic follow-up with the other two teams.

4.3. Parameters of Evaluation

4.3.1. The Roles of Stakeholders and Beneficiaries

Stakeholders and beneficiaries of the proposed vision for management and preservation of cultural heritage landscape in Siwa Oasis can be divided in two sectors; public and private. Table 2. shows the roles of each sector.

Table 2. The Roles of Stakeholders and Beneficiaries[9]

Stakeholders and Beneficiaries		Roles
Ministry of Environment - Environmental Affairs Agency	Public Sector	Historic study and urban survey for the Oasis. Documentation of Heritage Landscape. Valorization of the existing ecological systems of this unique locality. Designating conservation areas to maintain and enhance their character and integrity. Designing controls and guidelines for the buildings. Provision of urban extension areas fit with the needs and culture of the citizens. To preserve the urban pattern, relationship between buildings and open spaces, form, appearance. To preserve relationship between historic settlement and its surroundings natural and manmade setting. To support development activities; social and economic. To activate Eco-Tourism. Fund for Local Initiatives.
Ministry of Agriculture and Land Reclamation		
Ministry of Public Works and Water Resources		
Ministry of Tourism		
Ministry of Investment		
Ministry of Housing, Utilities and Urban Development		
The governorate of Matruh		
Entrepreneurs (Businessmen) and Investors	Private Sector	Participation and involvement of the Siwa people (residents of all age group is of first and foremost importance). Preservation of historic buildings. Living in harmony with nature and focusing on recycling and reuse. Siwa's Artisanship Development Initiative. Participatory Events.
Siwian People		
Young People (workforce)		

4.3.2. Indicators of Success

According to the proposed vision for management and preservation of cultural heritage landscape in Siwa oasis, the indicator of success can be measured as following;

- Guidelines of the government's plans for the development of desert communities
- Activation Eco-Tourism

[9] **Source:** Author.

- The urgent need to provide job opportunities to young people.
- Improve the quality of life of residents in Siwa Oasis.
- Take advantage of the amount of olive and dates (light industries).
- Take advantage of underground water and to resolve the problem of water balance at the oasis [9].

4.3.3. SWOT Analysis of the Proposed Vision

To view the factors that affect the proposed management framework of cultural heritage landscape sites in Egypt, the SWOT analysis has been constructed.

Table 3. SWOT Analysis of the Proposed Plan[10]

Strengths	• To reach a common framework for the formulation of management and preservation of cultural heritage landscape sites in Egypt. • Valorization of the existing ecological systems in Egypt. • To find solutions for the current problems of the cultural heritage landscape sites in Egypt. • To take benefit from the natural features and the historical treasures at Siwa oasis. • To activate both local and international tourism to the cultural landscape heritage sites. • To preserve the variety of handcrafts in the traditional communities.
Weaknesses	• Need for huge investments for the implementation process. • Difficulty to convince young people (Manpower) to go to the western desert. • Management processes such has been viewed take a large time scale; that may affect on the expected results.
Opportunities	• Beginning of interest in cultural heritage landscape sites in the Middle East. • Determine the roles of each axis in order not to conflict between the administrative organs. • To support development activities; social and economic. • To activate Eco-Tourism in the Egyptian oases. • To preserve relationship between historic settlement and its surroundings natural and manmade setting.
Threats	• Spatial dimension may have a negative impact on tourism development • Instability in the financial statements for the duration of the project is long term. • Difficulty to convince public to participate in preservation of cultural heritage sites. • Need huge investments to complete the project.

The SWOT analysis provides information that is useful in bringing into play the resources and capabilities of competitive environment. The previous table 3. shows the SWOT analysis of the proposed Plan.

5. Conclusion

In this research, the wide range of knowledge attached to the concept of preservation of cultural heritage landscape sites; definitions, approaches, concepts, and case study has been introduced, analyzed, and categorized to be integrated within the profile of the Oases Ecosystem as a Cultural Heritage Landscape in Egypt. the aim of the research was to manage and preserve the cultural heritage landscape sites in Egypt. For the aim to be attained a number of objectives were claimed to be accomplished, providing the ground on which the proposed plan could be worked out. In this section, the results and the contributions of the research are introduced on the perspective of the accomplished objectives.

- The objective of investigating the complexity of management of Egyptian cultural heritage landscape sites in relation to their preservation was accomplished by tracing a wide range of related definitions, proposals, concepts and viewpoints out of a wide spectrum of references. Moreover, the research has documented the wide use of the terms in the management those sites, highlighting the problems of preservation to their social, cultural, and urban context.
- The objective of realizing the management of Egyptian cultural heritage landscape sites; according to the functions of management, was achieved by analyzing the cultural heritage landscape sites in terms of urban, social and visual studies, investigating the opportunities they offer and the challenges they pose.
- The objective of achieving the possibility of management and preservation of Siwa Oasis was accomplished by applying the proposal of the research to an existing oases ecosystem as cultural heritage landscape site in Egypt; by the three main axes of work; the political and administrative axis, the technical axis, and the executive axis.

[10] **Source:** Author

As stated in previously, the management of cultural heritage landscape sites in Egypt is almost exclusively on the Supreme Council of Antiquities; showing also the other professional bodies and organs which concerned with the Egyptian cultural heritage sites. As the research managed to define a profile of management and preservation of these sites by giving architects, planners and users the chance to enable wide ranges of opportunities through the proposed authority for development, a number of recommendations and advisable actions are proposed as follows;

- The first advisable action is to develop the frame work of preservation and management of Egyptian cultural heritage landscape sites. As the proposed frame work can be considered an initial step, more advancements, improvements and progressions are recommended to be done by academic researchers; making the frame work easier to understand and smoother to use, and moving towards the aim of this thesis.
- As for the administrative organs look after the Egyptian cultural heritage landscape are recommended to explore the alternatives of attaining aims and accomplishing objectives on the perspectives of the three main proposed axes of work; the political and administrative axis, the technical axis, and the executive axis.
- At last, the proposed organizational structure for the management is recommended to be consulted and revised by the government and professional institutions, to be translated into decisions, actions, laws and legislations; taking into account the local economic, technological, social and political profiles for each site.

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IMPROVING BUILDINGS REFURBISHMENT THROUGH OPERATIVE CONDITIONS EVALUATION

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Abstract

As EU existing buildings stock account for 40% of the total energy consumption, it is important to take measures to reduce these needs and, consequently, reduce the EU external energy dependency as well as reducing the greenhouse gas emissions, in accordance with what is prescribed in the EU Directive 2002/91/EU on Energy Efficiency in Buildings (EPBD) and reinforced with the "EPBD-recast". The implementation of energy efficiency measures in the existing building stock is necessary to meet the 2020 targets. Thus, energy refurbishment of existing buildings is essential to achieve these goals. However, during the buildings refurbishment, energy issues should not be the only concerns since the indoor air quality is also as important. When planning a building refurbishment it is then necessary to take into account the energy efficiency exigencies and also the indoor air quality. To do so, the main problems of the existing buildings should be identified, in order to do the right choices regarding the refurbishment project. This work presents a study carried out in a large office building to identify the main pathologies, related to the energy efficiency and also to the indoor air quality. The study encompasses an "in-situ" evaluation of the operating conditions, indoor air quality and air change rate. The main objective of this study was to support the development of a refurbishment project of the building that can optimize the energy efficiency, but also the relevant parameters to the Indoor Air Quality. The results showed that the building has a poor envelope thermal resistance, inadequate shading systems and also several problems regarding high concentration of some pollutants like CO_2 or VOC.

Keywords: buildings' refurbishment, indoor air quality, operating conditions

1. Introduction

Nowadays the improvement of the energy performance of the building stock is, without question, one of the biggest challenges that the construction sector has to face, as the European building stock is responsible for 33% of raw materials consumption, 33% of final energy consumption and 50% of electricity use [1, 2, 3]. From the energy performance perspective, the main building requirements are to increase the insulation thickness, reduce thermal bridges and reduce the air changes. The latter parameter has to be thought carefully, since the reduction of air changes can decrease the intake of fresh outside air and consequently increase the build-up of internally generated pollutants. However, only in the last decade indoor air quality (IAQ) has become an important occupational health and safety concern with public and governmental awareness.

The harmonization of the buildings energy performance requirements with the indoor air quality (IAQ) should be done in every building project, both for new and existing buildings.

Portugal implemented in 2006, the National Building Energy and Indoor Air Quality Certification System, corresponding to the transposition of the Energy Performance of Building Directive, EPBD [4], which imposes minimum energy efficiency for all buildings and periodic IAQ audits for office buildings.

As 90% of the population spends about 90% of their time in enclosed spaces exposed to consistently higher concentrations of air pollutants than outdoors, which led to the increase of the allergies and asthma incidence rate, thus a good indoor air quality has a vital impact in human health.

Asthma affects of about 150 million people worldwide and approximately 1 million in Portugal (10% of the population) and its incidence continues increasing, both in young as in elderly people [5].

Suspended particles are seen by many as one of the most critical air pollutants and some estimates suggest that particles are responsible for up to 10,000 premature deaths in the United Kingdom each year [6]. The IAQ is then an important factor in men well-being, health and productivity. Thus, when planning a building refurbishment, energy efficiency issues should be merged with the indoor air quality exigencies.

This paper present a study carried out in a large office building to identify the main pathologies, related to the energy efficiency and also to the indoor environmental quality. The study encompasses an "in-situ" evaluation of the operating conditions, indoor air quality, and air change rate. The main objective of this study was to support the development of a refurbishment project for the building that can optimize the energy efficiency but also the relevant parameters to the IAQ.

2. Methodology

This paper presents the assessment of the Indoor Air Quality and the Energy Performance of an office building located in the centre of Oporto, Portugal. The measurement campaign was divided in two major areas:

- IAQ conditions – measurement of the concentration of suspended particles (PM10), carbon dioxide (CO_2),

carbon monoxide (CO), ozone (O_3), formaldehyde (HCHO) and total volatile organic compounds (VOC).
- Characterization of the operating conditions of the buildings – Building air tightness (air change rate), occupation patterns, equipment and appliances existing in the rooms and their use pattern.

2.1 Building Characteristics

The building under analysis is located in an urban area, the city centre of Oporto in the North-West of Portugal. The building, represented in Figure 1, has 5 floors. The ground floor is partially underground. The building was built in the 1970's and suffered some changes in the 1990's. This building was chosen as it is representative of most of the Portuguese office buildings and was built before the implementation of the first Portuguese Thermal Regulation.

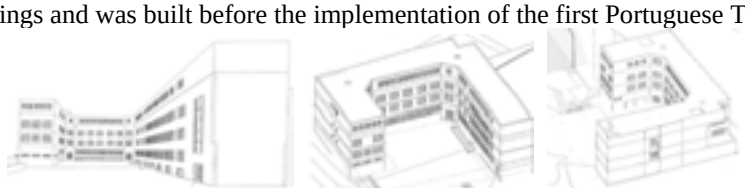

Figure 1. Views of the building (general perspective, SW and SE perspective)

The walls are concrete masonry units (CMU) with 27 cm thickness with plaster finishing and the roof is a concrete slab. All the windows are single glazed with metallic frame. The ground floor windows do not have any shading devices and the first floor windows have inside venetian blinds. The windows in the second and third floor have roller shutters and the windows in the fourth floor have curtains.

The building is naturally ventilated and has a diesel boiler associated with water radiators in the offices. Some rooms have additionally electrical oil radiators. There is no centralized cooling system and most part of the offices did not have any active cooling system, some had fans and others had split systems for cooling that were only turned on when the occupants were in the room.

2.2 Measurement procedures

The measurement campaign was performed during the summer months of June and July.

To measure "in situ" parameters associated to the IAQ and energy efficiency, procedures defined in national standards were followed [7, 8].

2.2.1 Indoor Air Quality (IAQ)

According to the thermal regulations in Portugal it is mandatory to carry out IAQ audits in office buildings [7, 8]. In this study a complete IAQ audit was not performed, only a set of physical and chemical pollutants were measured in several offices with portable measuring equipments: Testo 435 (CO_2 and CO); TSI DustTrack II (PM10); ZDL-300 (HCHO); ZDL-1200 (O_3); Photovac 2020ppb (VOC).

2.2.2 Air tightness

The air tightness of the building is also an important indicator of the IAQ and of the energy performance of a building and it can be obtained by the building Air Changes Rate (ACH). If the building is naturally ventilated this parameter can be estimated using the methodology presented on the Portuguese building thermal code [9]. However, in existing buildings, a more accurate ACH value can be obtained using measuring equipment such as the blower-door, which will pressurize/depressurize the building, measuring the air flow that enters/exits the building.

3. Results

The results obtained through the measurement campaigns performed on several case studies are presented below according to the type of analysis done. In Figure 2 are shown the offices where the measurement campaign was performed, i.e., all the offices with permanent occupation. Some additional measurements were also performed outdoors (temperature, relative humidity, pollutants, L_{Aeq}).

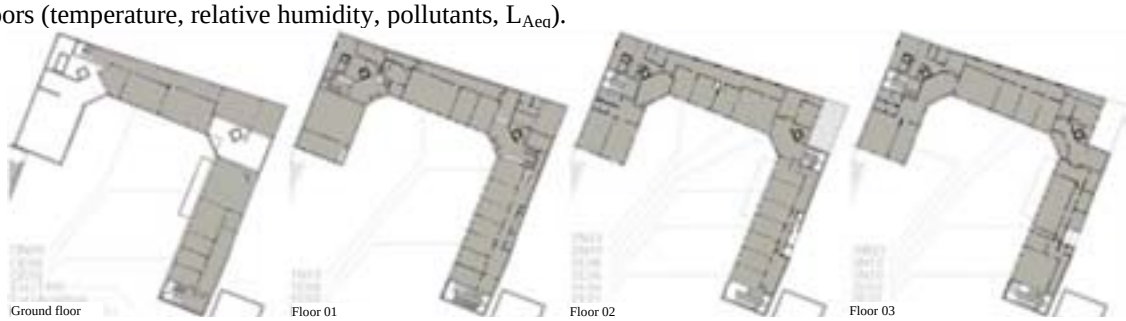

Figure 2. Measured rooms (first number represents the floor, the letter represents the orientation of the room, the last two numbers represent the room number)

3.1 Indoor Air Quality (IAQ)

The Indoor Air Quality (IAQ) was assessed through the measurement of the concentration of physical pollutants (CO, CO_2, CHOH, VOC, O_3, PM_{10}). The presence of radon and microbiological contaminants was not assessed since they require significantly higher measurement times, and thus were scheduled for a 2nd measurement campaign.

Figure 3 shows the results of the carbon dioxide and monoxide (CO_2 and CO) measurements for the different office rooms of the building that were studied. The measurements shown considerably lower concentrations than the maximum limits since the occupants open the windows and the outdoor concentration is also low.

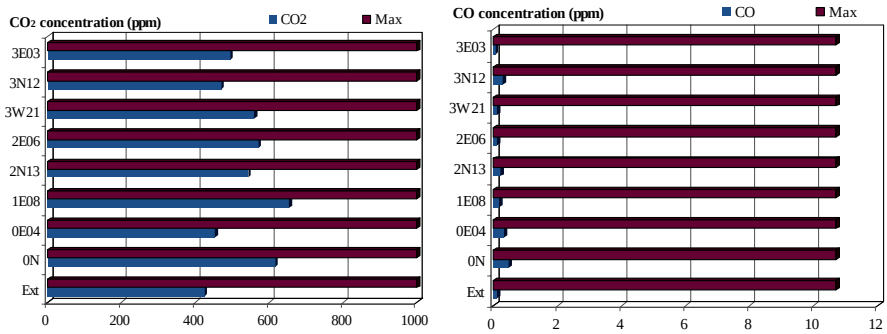

Figure 3. CO_2 and CO concentration and maximum reference values

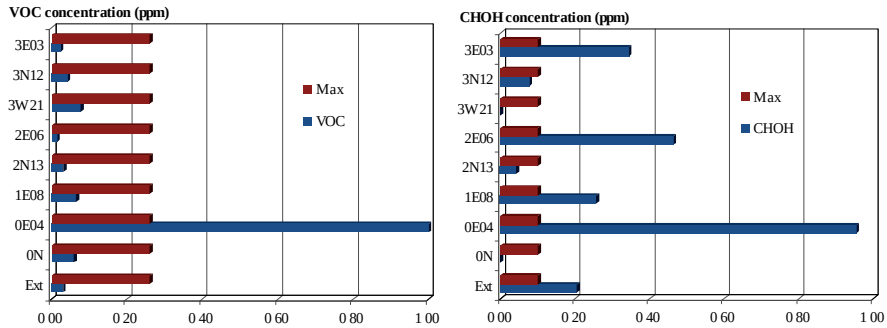

Figure 4. VOC and CHOH concentration and maximum reference values

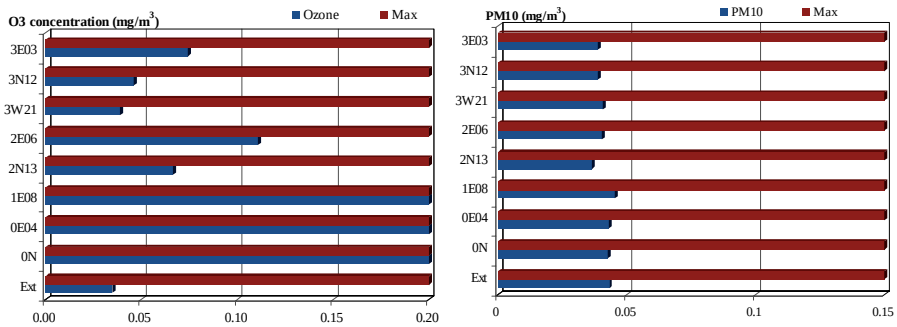

Figure 5. O_3 and PM_{10} concentration and maximum reference values

Figure 4 shows the results of the volatile organic compounds (VOC) and formaldehyde (CHOH) measurements for the different office rooms of the building that were studied. The measurements showed a high concentration of volatile organic compounds in the room 0E04 – a laboratory – where several reagents are used. A high concentration of formaldehyde was also measured in the exterior and in rooms 0E04, 1E08, 2E06 and 3E03.

Figure 5 shows the results of the ozone (O_3) and suspended particles (PM_{10}) measurements for the different office rooms of the building that were studied.

The high ozone concentrations are probably due to the outdoor concentration (intense traffic) and the presence of laser photocopiers in some of the rooms. Also, the air movement between spaces transfer the contaminant between rooms. The suspended particles concentration does not present a problem and are mainly due to the outdoor concentration, as the building is located near heavy traffic circulation road.

3.1.5 Air tightness

A blower-door was applied to measure the number of air changes per hour (ACH) of the room 1E08. The minimum air change rate according to the Portuguese thermal code is of $0.6h^{-1}$.

The air change rate of the room, obtained from Equation (1) [10], was of 1.03 h^{-1}.

$$Q = C \times P^n \quad (1)$$

with:

Q – Air flow rate (m^3/s);

C – Flow coefficient ($m^3/s/Pa^n$);

P – Pressure difference from indoors and outdoors (Pa);

n – Flow exponent (-).

The air change rate is quite high and will result in substantial heat losses in winter and heat gains in summer. Thus, interventions at this level are also essential to increase the energy performance. Mainly through the replacement of the windows and use of mechanical ventilation systems with heat recovery, which will be the most efficient way to achieve the optimum values for the air change rates, with minimum waste of energy especially in winter.

3.2 Energy Analysis

Taking into consideration the results of the IAQ and air tightness assessment, an estimation of the building thermal behavior was performed using Energy Plus 5.0 simulation code [11]. The building characteristics, envelope construction solutions, shading systems (venetian blinds on the first floor and roller shades on the second and third floors on the outside, these systems are sometimes complemented by sliding shutters and venetian blinds in the interior), lighting systems (tubular fluorescent lamps and sometimes compact fluorescent lamps), appliances, air-conditioning systems were also assessed and occupation and systems use schedules were defined in accordance with the Portuguese thermal code [7]. Most of the rooms have a water radiator associated to a 20 years old centralized diesel boiler, several rooms have also a electric radiator (1500 W) and a fan (45 W). Some of the spaces have portable split system for cooling.

Besides the actual situation, two refurbishment options were studied: thermal insulation placed inside (6cm of cork and 1.3cm plasterboard) and thermal insulation placed outside (6cm of expanded polystyrene). In both options a suspended ceiling with a 10cm thick layer of cork and 1.3cm plasterboard was added to the roof. The existing windows will be replaced by aluminium with thermal break with double clear glazing with venetian blinds placed on the outside. Table 1 presents the main building envelope characteristics considering the original state and the two refurbishment options.

Table 1. Main building envelope characteristics

	Walls	**Roof**	**Windows**	
	U-Value [W/m2.ºC]	U-Value [W/m2.ºC]	U-Value [W/m2.ºC]	Shading Factor (inc. glazing and shading device)
Original	1.90	1.40	6.20	0.45
Refurbishment - outside insulation	0.49	0.30	3.30	0.11
Refurbishment - inside insulation	0.48	0.30	3.30	0.11
Maximum Value allowed	1.60	1.00	-	0.56

Only with the refurbishment of the envelope, considering an ideal HVAC system with efficiency of 100%, the heating needs will be reduced in 45% and the cooling needs in more than 25% (Figure 6, left). The annual reduction is more than 40%. With the installation of a pellets boiler (efficiency of 60%) and the chiller (COP of 3) in addition to the improvement of the envelope the installed power needed is reduced in more than 20% (Figure 6, right).

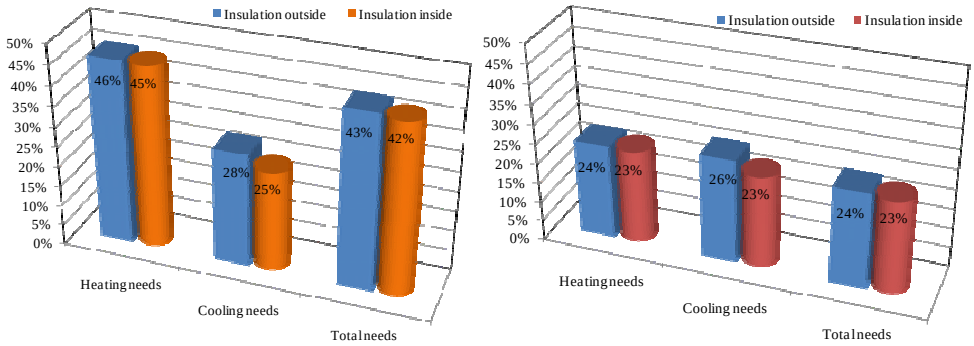

Figure 6. Percentage of reduction in the heating and cooling needs (left) and percentage of reduction in the heating and cooling power (right) due to building retrofit

4. Conclusions

This paper presents the operating conditions assessment as well as the Indoor Air Quality of a Portuguese office building. The measurement campaign was divided in two major areas: characterization of the operating conditions of the buildings and Indoor Air Quality.

With the operating conditions assessment carried out, it was possible to identify some of the most critical problems of the building, the ones that need particular attention during the rehabilitation interventions.

The measurement campaign confirmed the necessity of reducing the envelope U-values, using higher insulation levels, since the original building values are always higher than the recommended values by the Portuguese legislation (0.6 and 0.45 $W/m^2.^oC$ for walls and roofs, respectively), and in some cases even higher than the maximum allowed values (1.6 and 1.0 $W/m^2.^oC$ for walls and roofs, respectively). Since the results obtained applying exterior or interior insulation are similar, it is recommended that, when possible, use a continuous external thermal insulation layer since it also correct the many thermal bridges in the buildings envelope. If the exterior insulation is not an option, like in this case, as due to the location of the building - Porto historical center - the façade must remain with the same aesthetic, thus the only solution to improve the envelope thermal performance is to apply insulation by the interior.

It is also important to reduce the uncontrolled infiltrations through the envelope, using more airtight window frames and doors, with adjustable air inlets to ensure an adequate air change rate and using mechanical ventilation systems with heat recovery units. However, the control of the air change rate must be done very carefully in order to ensure the indoor air quality, since, even with high air change rates, there were detected high concentrations of some pollutants like volatile organic compounds and formaldehyde, and also small concentrations of ozone.

It is important to enhance that the occupants' behaviour has a significant effect on the indoor environmental quality and energy efficiency of the buildings and must be taken into consideration during design phase of the rehabilitation processes. They should be informed of the correct way of using the buildings to ensure the comfort conditions, indoor air quality and energy efficiency. The existence of a "building manual" is a way of achieving this purpose.

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INTERACTIONS BETWEEN ANCIENT HERCULANEUM AND MODERN ERCOLANO

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Abstract

Archaeological sites throughout the Mediterranean are important cultural tourism attractions and catalysts for development. Inevitably, however, development either leads to the growth of the modern town around sites or to the modern being sacrificed in order to excavate and utilize the heritage. The issue that needs to be faced today is the relationship between these two worlds that differ in structure and purpose but which are linked by their co-existence and which interact in the context of development. Approaches which focus either only on site management or instead on modern development risk marginalizing either the site or the town. Herculaneum in the Bay of Naples, Italy, is a valuable case study for understanding the problems that can result from parallel, yet independent, development of the ancient and modern towns.
The Herculaneum Conservation Project and the Herculaneum Centre, together with the Civil Engineering Department of the Second University of Naples, have undertaken urban research in order to understand how to improve interaction between the archaeological site and the modern town. Particular emphasis has been placed on Via Mare, an 18th C residential district of some 25.000 square metres, which connects the historic centre of modern' 'Ercolano' to the sea and directly abuts the archaeological site on its north and eastern edges. An array of social, economic and environmental problems have threatened the survival of this urban area and its close-knit community in recent decades. However, these threats can perhaps be translated into opportunities if urban regeneration is approached in an integrated way. This paper presents the initial results of this work.

Keywords: urbanism, archaeology, conservation, participation

1. Introduction

The modern town of Ercolano lies immediately south of Mount Vesuvius, near to Naples. It was called Resina until the 1960s when its name was changed to Ercolano, in honour of the Roman city of Herculaneum, which had been destroyed by the eruption of AD 79 and over which Ercolano is built. This name change took place at the end of a long excavation campaign under the archaeologist Amedeo Maiuri (1927-1958) that uncovered about a fifth of the Roman town, equivalent to about 45,000m^2, which has become the archaeological site of Herculaneum [1]. The process which led to the rediscovery of the ancient town and its presentation to international visitors took place in parallel to the expansion of the modern town, which, thanks to the post-war economic boom, included an exponential population increase until it became the ninth most densely inhabited town in the Naples area and one of the most populous towns in all Italy. These two parallel processes began under a policy of participation, which was partly spontaneous and partly encouraged by local institutions. However, gradually over time the two separated leading to a loss of the benefits of a more participatory approach and causing a growing physical and social division between the two towns. Today Herculaneum is largely unknown by the local community who consider it to be inaccessible and the site has become a sort of separate town within the town. The site lives its own life due to an autonomous management system which does not involve local institutions [2] and due to an international community that has tried to safeguard it and which every year leads to the arrival of hundreds of thousands of visitors [3]. At the same time, however, ancient Herculaneum which was lost and rediscovered thanks to an enormous human, cultural and economic investment, has risked being lost again due to indifference and hostility of the places and people which surround the site. At the same time, modern Ercolano suffers from the urban and social damage caused by the protracted process of separation. The future sustainability of the archaeological site is, therefore, intrinsically linked to the area that surrounds it and only the coherent further development of the ancient and modern towns together can both guarantee heritage conservation and also contribute to social and economic wellbeing. Since 2001 when the Herculaneum Conservation Project [4] was launched, there has been an attempt to use partnerships between local institutions, heritage agencies and international partners to establish a process of conservation, maintenance and sustainability of the archaeological site, based on broadening participation, by using an opposite approach to that normally taken: one that goes from the international community to the local community. This research stems from this collaboration and focuses on understanding the local dynamics of the historic centre of Ercolano, where the site is located, and on their potential influence in the development of integration processes between the ancient and modern towns.

2. Defining the study area

Figure 1. Satellite image of the area. (Image: Google Earth)

The modern town of Ercolano stretches along a narrow north-south strip from Vesuvius to the sea (8,5 km). The main routes run perpendicularly to that strip, while there are only a few winding north-south routes [5].The historic centre lies around the so-called Golden Mile [6], one of the transversal axes that is known today as Corso Resina and which runs along the north side of the archaeological site. The archaeological site of Herculaneum lies to the south of Corso Resina. Access to the site is in line with the road that connects the local train station with the entrance to the archaeological area. The historic town centre is the most populated area in the town's territory, where average population densities are among the highest in Europe, with many families who live on the poverty line if not under it, and with the added issue of many young families who are attracted there by low rents. The urban fabric is largely in a state of decay and building works without planning permission are common, in particular extensions for increasing residential space. Decay and illegal building modifications are particularly noticeable along the main roads, where, during this research, it became clear that 72% of the buildings are illegally modified in some way and 44% of them are in an advanced state of decay. Moreover, the historic centre, as was noted in a study carried out by the town council's Urban Herculaneum programme [7] in the period 2000-2006, is undergoing a phenomenon of 'peripheralization' with the continual decentralization of shops and businesses. This phenomenon is also a result of the policy of closing the archaeological site off from the town and the low level of tourism development based on the site itself. Almost all shops are found along the main roads, in particular on Corso Resina, while the side streets have almost none, even if they are key traffic routes.

Despite the decay phenomena and economic impoverishment, the historic centre enjoys a majority of eighteenth-century buildings, among which there are many important structures including 22 of the Vesuvian Villas, that are mainly found along Corso Resina. This road is the main route that has maintained greatest vibrancy and is the equivalent of the typical 'piazza' of a historic centre, in terms of its ability to attract people. It is this economic, commercial and social vibrancy that contrasts strongly with the side streets that cross it.

2.1 The Via Mare neighbourhood

One of the streets that crosses Corso Resina is Via Mare, the road that is the subject of this research. The Via Mare that can be found on maps from the eighteenth and nineteenth centuries as Vico Mare (not 'road' but 'lane'), is certainly an older route which connected Corso Resina to the sea. The road, narrow and paved, runs steeply down to the south, connecting the historic town centre with the sea. The buildings that give onto the street are mostly eighteenth century, as can be seen by the fact that they already appear on the 1775 map by the Duke of Noja, and they are laid out around structures known as 'ramps' which are an architectural typology that overcome the drop in ground level to the south and west with a system of ramped arches and embankments. Overall the buildings are in an advanced state of decay, due to the chronic lack of maintenance. Since the nineteenth-century and twentieth-century excavations, the eastern side of Via Mare has been expropriated and the buildings demolished. Thanks to Law 640 of 9 August 1954 the clearance area included the remaining area that gives onto the archaeological site and under which the Roman forum lies. That which is today known as the Via Mare neighbourhood consists of the buildings at the northern end of the road, where there are numerous residential buildings, even if they are all on the west side, as the archaeological park lies to the east, which is divided from the road by an imposing boundary wall and a drop of more than 15m down to the site. Residents' homes do not just look onto Via Mare, but also onto four 'ramps' leading to the west, which are steep lanes or stairways. Data collected for 2008 reveal that there are just under 400 people who live in the Via Mare neighbourhood, residents have an average age of 33 years and there are a large number of women with school-age children [8]. There are no businesses in the area and there is currently only one shop. There is a chronic lack of parking spaces, ineffective infrastructures (street lighting, sewers/drainage,

electricity and water) and there are no green spaces or recreational areas. In the face of this urban decay, fortunately the residents have a strong sense of belonging and with the help of the Herculaneum Centre they are creating a residents' association. Since 2007, when the town council carried out the demolition of collapsing buildings in order to guarantee public and private safety, the neighbourhood has seen further architectural and urban changes with the disappearance of another section of the buildings on its western front. However, the cleared area has not yet become useable by the local community, but unfinished works means that the site has remained fenced off.
The Via Mare residents, like the rest of the local community, do not have any financial or other incentives to visit the site, such as reduced ticket prices or events. Only the local schools, thanks to free entry for children organize visits to the site, and these have recently taken on an added dimension thanks to a initiative organized by the Herculaneum Centre to provide new material to the schools and which has encouraged their pupils to become 'ambassadors' for their heritage and its protection through a process of promoting greater understanding and sense of ownership [9].

3. The relationship between the modern town of Ercolano and ancient Herculaneum

Historically the periods in which modern Ercolano has thrived have coincided with those of greatest dialogue between the site and the town, the latter encompassing not just the urban fabric but also its social and cultural aspects (for example, the Bourbon monarchy's enormous interest in the site or the Grand Tour visitors). How to connect the site and the town has been an unresolved issue since early excavation works. This problematic relationship became worse as the excavation area was extended. From the start of this epic period of excavation, Amedeo Maiuri had tried to deal with this problem, paying considerable attention to how to relate to the modern town and its residents, even going as far as to launch collateral initiatives that added land to the coastline in restitution for the area expropriated for archaeology [10]. Moreover, collective participation in the archaeological campaigns, with many Ercolano residents involved in the excavation and restoration works, helped create a sense of social involvement, as has been understood through an oral history project organized by the Herculaneum Centre which also revealed the close ties this also created between the site, Via Mare and other key points in the town, such as the local market [11]. Half a century later and the oral history project is also attempting to foster intergenerational dialogue between Ercolano's senior citizens and the younger generations so that the memory of this enormous undertaking and the community's contribution to it will not be forgotten and that a sense of belonging will be reinforced. Afterwards, for a series of problems that range from the management dynamics of the newly-created site to the heritage authority's increased need for security, every portion of land that passed from the town to the archaeological park tore into the urban and social fabric. From the excavation of the Decumanus Maximus to that of the ancient shoreline in the 1980s and to the Villa of the Papyri [12] excavated in the 1990s, attention to the physical and social boundaries between the two towns was drastically reduced, while barriers, fencing and boundary walls increased. The *limes* of the archaeological area has gradually become a fortified boundary that separates, isolates and protects from that which is outside. The edges of site were cut into increasingly vertical escarpments in the attempt to gain every possible metre, maintenance routes along the escarpments were forgotten and partially-excavated archaeological structures were abandoned because they were too complex to preserve. At the same time, while the heritage authority changed management model and the contribution of the Ercolano residents decreased, the site underwent a progressive closure into itself. New models of tourism and socio-economic changes in the town's population also had an effect, with exponential increases in population density and significant poverty levels, as did growing levels of organized crime. Until the early years of the twenty-first century, the archaeological site was managed and visited in complete isolation from its surroundings. Physical barriers such as boundary walls even deprived local residents of the view of what should have been considered their heritage, while visitors to the site had little or no contact with the modern town, and the heritage authority had no dialogue with other local institutions. Local institutions and community did not participate in site management on any level.

Figure 2. One of the 'ramp' buildings in Via Mare, as seen in the mid twentieth century. (Image: Archive of the Soprintendenza Speciale per i Beni Archeologici di Napoli e Pompei)

Early on in the twenty-first century, there was a growing need for the local institutions to collaborate in the development of Ercolano's tourism, a greater attention to policies for enhancing and safeguarding the urban area (in particular, with the creation of the Urban Herculaneum programme) and the creation of forums for dialogue, such as the Herculaneum Centre, which have all led to a changed scenario in the last few years. In addition, this has highlighted how much the sustainability of a site such as Herculaneum is closely tied to its relationship with the surrounding town, and how the potential economic, social and cultural development of the town must depart from its relationship with its heritage. The *limes* of the archaeological area is beginning to become a *limen*. The word *limen*, in fact, though similar to *limes* and also related to the concept of a boundary, properly means 'threshold' and in a figurative sense, the beginning of something. In fact, if *limes* is usually understood conceptually to mean a sort of *terminus*, *limen* is associated instead with a *principium*: it is the threshold, that which allows entry and, therefore, can be a means of relationship, meeting and communication. The *limes* is exclusive, the *limen* is inclusive.
This evolution in approach, which since 2006 has led to various collaborative initiatives, such as obtaining co-financing for a new site entrance and ticket office, along with the public opening of the avenue between the old and new entrances, has also created the conditions for a series of ambitious projects for the edges of site. In the case of a new park at the entrance too, which was created with European funding in the context of the 2000-2006 Regional Operational Programme for Campania, the heritage authority signed an agreement with the town council for its management: in this way the town benefits from new gardens in the heart of the historic centre with views of the archaeological site. At the same time, thanks to the Herculaneum Conservation Project the archaeological site's conservation conditions were brought back to manageable levels with the consequent reopening of many areas to the public. Since 2006, the Herculaneum Conservation Project's efforts have been supported by a sister project, the Herculaneum Centre [13], which also includes the town council among its partners, and whose objectives include that of improving the relationship between the local community and its cultural heritage.

4. Research on the Herculaneum's western *limen* and its enhancement

The modern road of Via Mare and its surrounding neighbourhood is one of the main routes connecting the modern and ancient towns. Around this route it seems appropriate to promote some form of urban development that places the archaeological site back within the town and also the sustainable development of the agricultural areas that lie between Corso Resina and the sea and surround the archaeological site itself. The results shared in this study are largely analyses that will inform future phases of work. A study area was identified where the building chronology of the structures and their state of maintenance was examined (figures 3-6). Next an evaluation was carried out of the hierarchy of the roads and the location of business activities, along with an evaluation of green and recreational areas (figures 7-9). This study has provided an overview that encourages and supports plans for enhancing Via Mare and its neighbourhood as a pilot project for reintegrating the archaeological site and the historic centre and to trial participatory activities in support of its sustainability and appreciation. In fact, the area's potential could be promoted in terms of social (dense population), urban (the unresolved connection between the town and the sea), architectural and natural (quality of the built environment and the green agricultural areas that could be converted to urban green spaces) issues. In particular, along Via Mare significant amounts of green space have been identified which, correctly integrated with the vernacular architecture that is laid out around ramps, could form the basis for the creation of a park that includes green areas (agricultural park and farm tourism), the built environment and archaeological areas (cultural park) in a *unicum* which allows an integral and integrated use of the urban, cultural and social history of Ercolano.

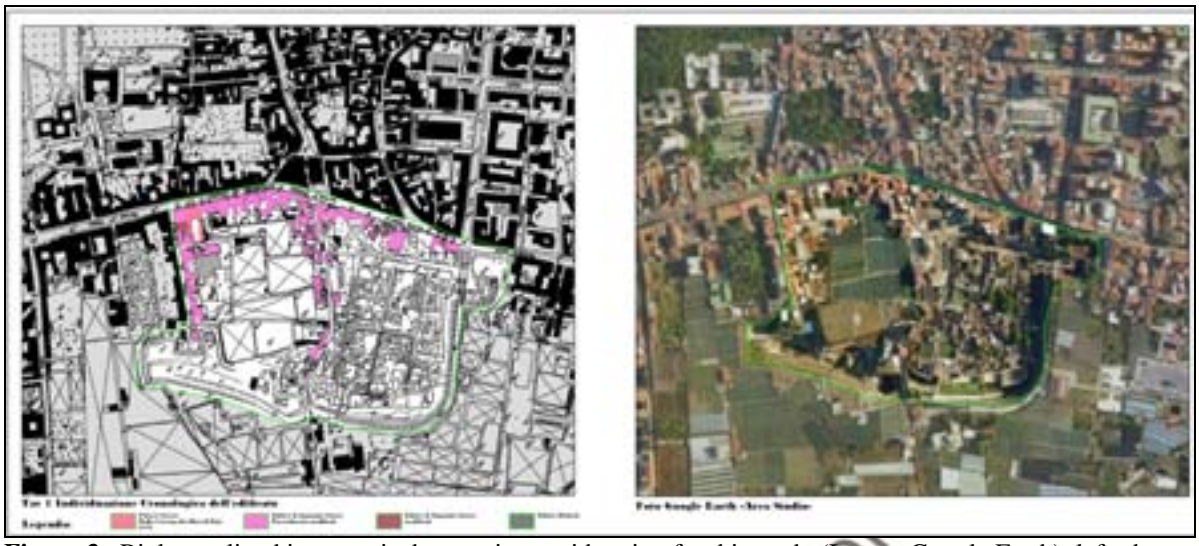


Figure 3. Right: outlined in green is the area in consideration for this study (Image: Google Earth); left: the chronology of the built environment (Image: Antonio Ronca, Seconda Università di Napoli)

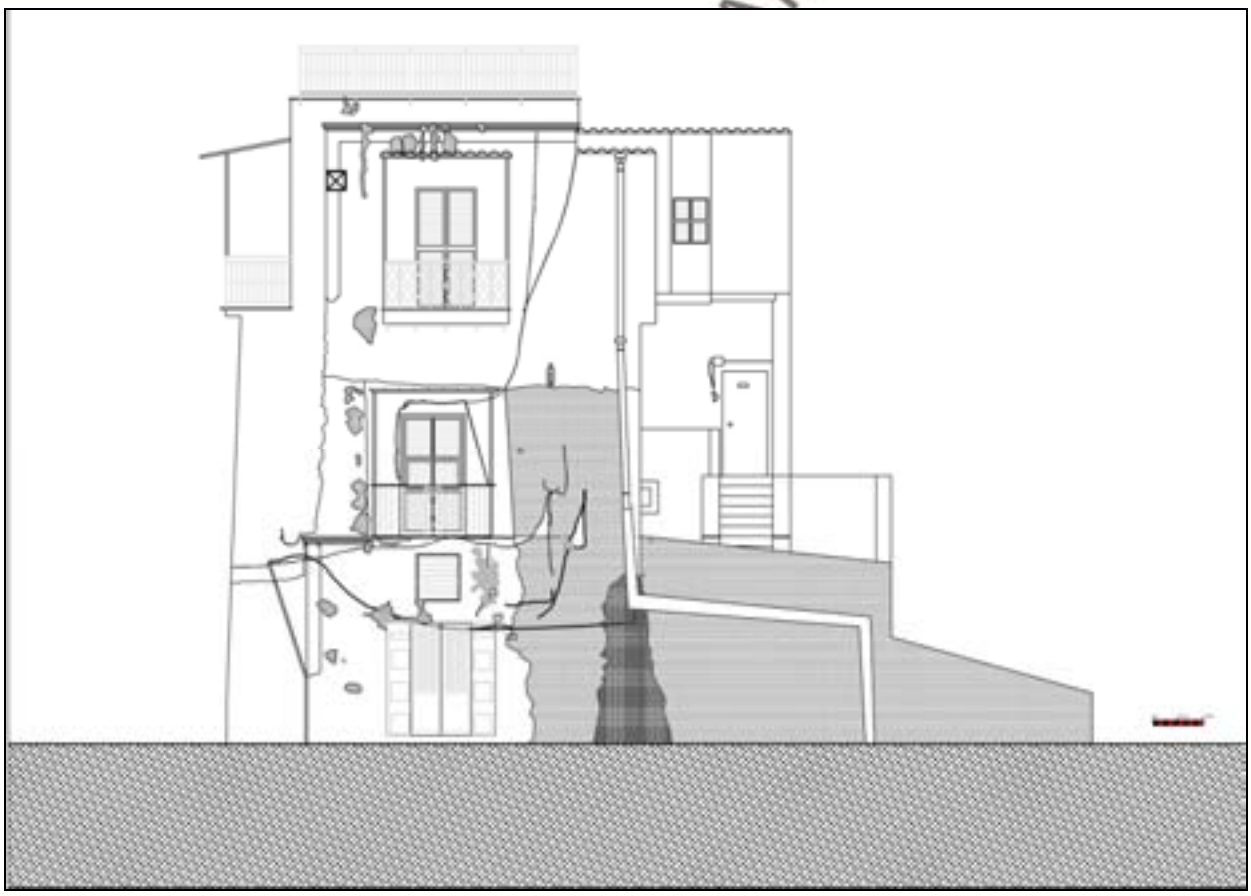
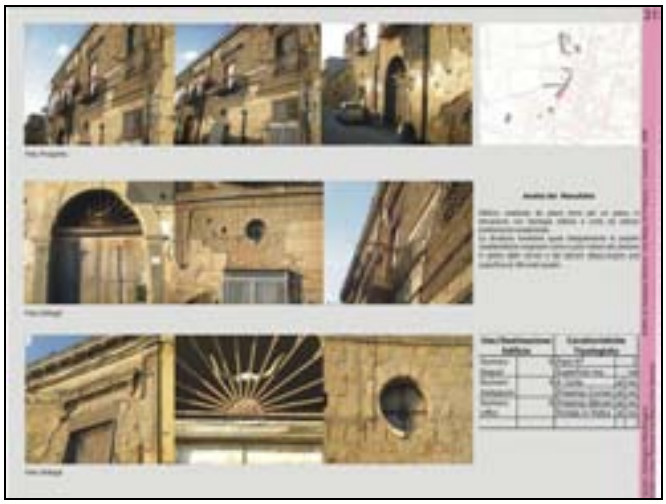
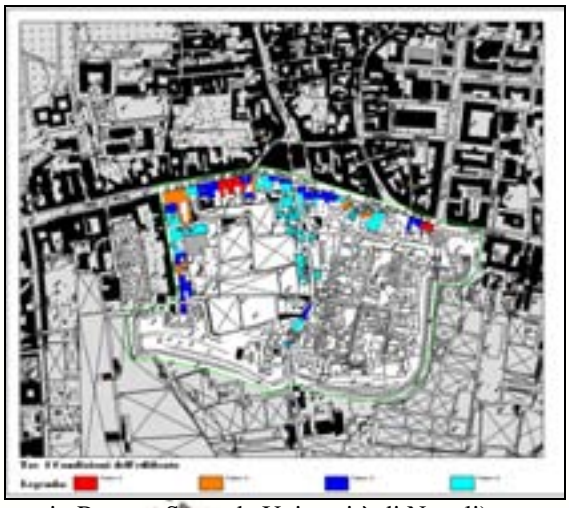
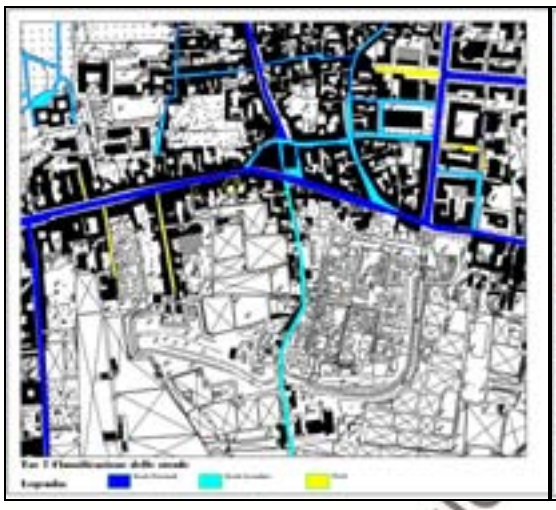


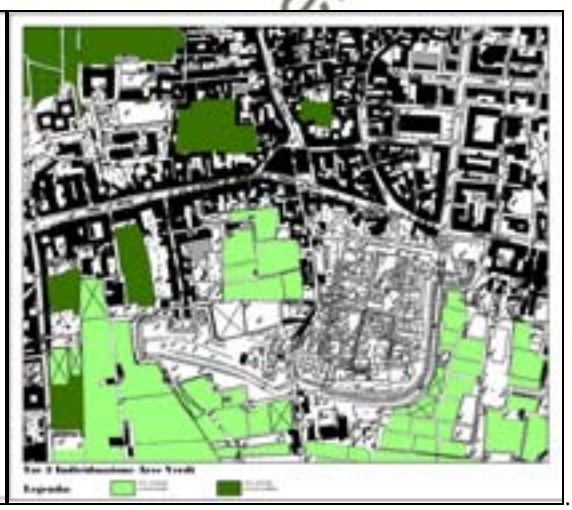
Figure 4. An example of the typological analysis of a building in Via Mare. (Image: Antonio Ronca - Seconda Università di Napoli)





Figures 5-6. Mapping of the decay of the buildings. (Images: Antonio Ronca – Seconda Università di Napoli)





Figures 7-8. Left: the hierarchy of roads; right: green areas. (Images: Antonio Ronca – Seconda Università di Napoli)

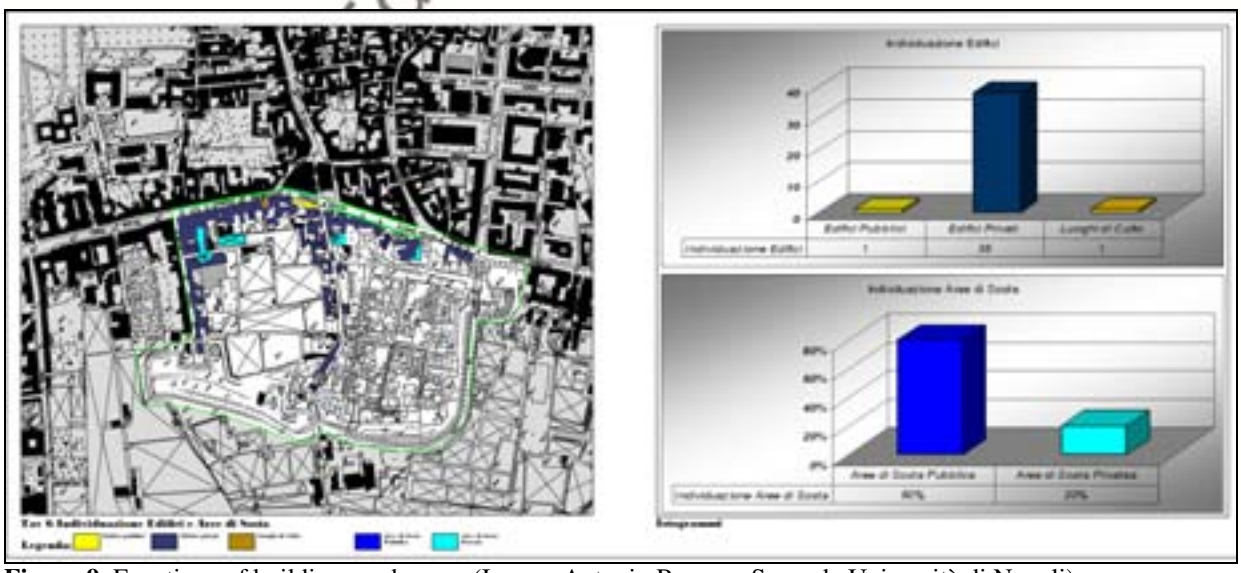


Figure 9. Functions of buildings and areas (Image: Antonio Ronca – Seconda Università di Napoli)

5. Conclusion

The research carried out so far has highlighted how the north-west *limen* of the archaeological site, while bordering an area of serious urban and social decay, contains all the potential elements for creating genuine visual and physical access to the site.
In particular, extensive privately-owned green areas were discovered (hidden from view by the particular topography of the area), containing greenhouses and old agricultural buildings, which have the potential to become the core of an urban park/agricultural public park with close links to the archaeological site and the Vesuvius National Park.
The area's built fabric is unique in the town's building history and could be perfectly integrated along with the archaeological site into a cultural park. Within these buildings it would be possible to encourage small businesses and trades tied to cultural and natural tourism. Such activity would be not only be sustainable from a commercial point of view but, together with urban improvements, would help readdress the social, economic and environmental weaknesses which today forbid this neighbourhood to turn threats into opportunities and become a sustainable community taking the best of the surrounding urban fabric, the archaeological site included, and giving back as much as it gives.

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Converting a large scale brick plant to alternative/renewable fuels in an industrializing country

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Abstract

Using renewable fuels in a large scale industrial brick plant in a newly industrializing country can add up to substantial environmental, technical and financial benefits. This project is carried in Morocco out under the auspices of a CDM Clean Development Mechanism fuel switch project at the SBBC, Societè Briqueterie Bati Chouia S.A., brick plant in Berrechid in Morocco.

Keywords: brick, clay, CDM, fuel switch

1. Introduction

The energy question is of paramount importance in the brick industry. Usually between 25 and 40 % of the operational cost of a brick yard are energy related. The use of renewable or alternative sources of thermal energy [1] is limited to a few select manufactures. In northern Italy a small brick maker uses rendering fat, vegetable oils and biogas, in Germany a facing brick and roof tiles producer uses recycled lubricants, in Germany, Spain, the Netherlands, US and the UK some manufacturers use landfill gas and in Austria one company is running on waste motor oils [2]. The project in Morocco [3] is a first of kind and encountered substantial, mostly bureaucratic, difficulties.
SBBC, is the largest single brick maker in Morocco with a plant made up of three parallel top fired tunnel kilns totaling a production capacity of < 1,600 metric tons/day. These kilns are actually equipped with petrol coke burners for the soaking zone, the zone of the kiln where the bricks are kept at a constant temperature for the ceramic conversion process, and with fuel burners for the preheating zone, the zone of the kiln where the bricks are slowly heated from ambient temperature to the temperature required for the ceramic conversion process. The brick driers are equipped with fuel burners.

Official statistics for Morocco indicate that it relies for 97% of it's energy needs on imports from foreign countries (ADEREE – Agence Nationale pour le Développement des Energies Renouvelables et de l'Efficacité Energétique, 2011). The total renewable generation capacity in the country is estimated by ADEREE to be approximately 2.1 GW and is mostly solar and wind. Biomass is not accounted for in any government or UN organizations statistics.

Table 1: Substitutive fuels considered for the project (Bank Al-Maghrib – Bulletin Trimestriel Mars 2011 N°. 127).

VIII - 4 - PRODUCTION ÉNERGÉTIQUE

Période	Charbon (1000 t)	Électricité nette en millions de kWh	
		d'origine hydraulique	d'origine thermique
2001	1,9	856,4	12 141,0
2002	-	842,0	13 067,1
2003	-	1 441,1	13 695,8
2004	-	1 600,9	14 769,9
2005	-	1 411,8	17 539,9
2006	-	1 585,3	18 054,8
2007	-	1 318,1	18 041,1
2008(*)	-	1 359,8	18 648,6
2009(*)	-	2 952,3	17 465,6
2010(**)	-	3 630,8	18 410,0

(*) Chiffres révisés.
(**) Chiffres provisoires.
Sources : - Ministère de l'énergie et des mines
- Office national de l'électricité.

Morocco has two refineries that are located at Mohammedia and Sidi Kacem and have a combined capacity of 154,901 bbl./d (24,627.3 m3/d).

Morocco's electrical sector traditionally has been controlled by the state-owned Office National de l'Electricité (ONE), which the government reorganized in 1995 in order to regain profitability. Due to a growing population and economic development, Morocco's electricity demand is increasing rapidly. Power shortages and a desire to control public spending have led the Moroccan government to make more use of the private sector to meet the country's power needs. The state's share of electricity generation likely will decline to 40 percent by 2020. However, ONE will continue to be solely responsible for distribution and transmission of electricity in Morocco.

The country's two largest electricity power stations at Mohammedia and Jorf Lasfar are both coal fired. Morocco produces a small and declining amount of coal from a mine at Jerada. Jorf Lasfar became Morocco's first privately operated power station in 1997, when it was taken over by a U.S.-Swiss consortium. In 2005 a 350 – 400-MW combined-cycle power plant began operation in Tahaddar (Wikipedia).

A program to promote energy from biomass is being implemented, aiming at reaching about 1,000 MW of electricity from biomass by 2020 GERES : Groupe Energies Renouvelables, Environnement et Solidarités - FreemE project newsletter 2 February 2011).

2. Suitable fuels

The choice of alternative/renewable fuels that might be used in a brickyard in substition of or in addition to fossil fuels is manifold [4]:

Table 1: Substitutive fuels considered for the project

Type	LCV	kW/Unit	€/Unit	€/kW
Rendering fat	≈ 36.30 MJ/kg	≈ 10.00	≈ 120.00 – 180.00 €/t	0.012 / 0.018
Recycled frying fat	≈ 36.30 MJ/kg	≈ 10.00	≈ 80.00 – 350.00 €/t	0.011 / 0.044
Organic oils	≈ 35.00 MJ/kg	≈ 9.50	≈ 500.00 – 925.00 €/t	0.053 – 0.098
Biogas	≈ 14.50 – 27.00 MJ/Nm^3 at 25°C	≈ 4.00 – 7.00	0.24 €/Nm^3 corn - 0.45 €/Nm^3 organic waste	- 0.050 t / 0.024 net of investment in equipment and machinery
Landfill gas	≈ 14.50 – 21.60 MJ/Nm^3 at 25°C	4.00 – 6.00	k.A.	k.A.
Synthgas	≈ 5.50 – 12.50 MJ/Nm^3 at 25°C	1.50 – 3.50		-0.045 / 0.018 net of investment in equipment and machinery
Wood	14.4 / 18.00 MJ/kg	3.00 / 7.50	15.00 / 30.00 €/t	0.036 / 0.042
Olive oil processing waste - solid	14.4 / 18.00 MJ/kg	3.00 / 7.50	15.00 / 30.00 €/t	0.036 / 0.042
Olive oil processing waste - liquid	≈ 35.00 MJ/kg	≈ 9.50	≈ 500.00 – 925.00 €/t	0.053 – 0.098
Fruit processing	14.4 / 18.00 MJ/kg	3.00 / 7.50	15.00 / 30.00 €/t	0.036 / 0.042

Type waste	LCV	kW/Unit	€/Unit	€/kW
Waste based fuels	11.00 – 27.00 MJ/kg	2.00 – 7.50	- 15.00 / - 30.00 €/t	- 0.002 / - 0.00

Availability depends very much on local market conditions: For the SBBC project in the end the choice, based on technical and environmental impact considerations, has been narrowed down to 4 fuels:

- Liquid residues from the production of
- Wood (including firewood, roots, etc.) from government owned or managed and private sources;
- Fruit processing residues from government owned or managed and private sources;
- Olive processing residues from government owned or managed and private sources.

In a later stage the use of wood has been, due to questions concerning sustainability, excluded from the list of possible fuels. For the use of the fuels of choice a comprehensive environmental and local market impact study has been submitted to the UNFCCC (United Nations Framework Convention on Climate Change).

The availability of the various biomasses considered in this project is within a range of:

- 50 km waste wood and food processing wastes;
- 100 km waste wood, food processing wastes and some olive processing wastes;
- 150 km waste wood, food processing wastes and olive processing wastes;
- 200 km , food processing wastes and some olive processing wastes.

Figure 2: Availability of selected biomasses

3. Energy and environmental benchmark data

Compared to installations manufacturing similar products in Europe the SBBC plant in Morocco is on pair with the European brick industry manufacturing similar, hollow bricks, products:

Table 2: Energy consumtion

Best perfomance SBBC	737 kJ/kg brick (176 kcal/kg brick)
Average SBBC	1 235 kJ/kg brick (295 kcal/kg brick)
Average Industry	1 316 kJ/kg brick (314 kcal/kg)

The greater the efficiency of the plant the more successful is a partial or total conversion to renewable fuels. In this case we have a situation that is almost 15% better than the industry average.

4. Dryer

The removal of water from ceramics industry products is an energy-intensive process, using large amounts of energy. A dryer in a brick plant is in part operated with thermal energy from the cooling of the fired brick in the tunnel kiln and in part with additional burners that are operated whenever the recovered heat from the cooling is not sufficient. Usually in the case of continuous or semi-continuous chamber dryers with relatively long drying cycles in the range of 15 to 30 hrs the thermal energy from the kiln is, under normal atmospheric conditions, sufficient. Rapid dryers, as the ones used in the majority of the brick plants installed in the Maghreb area and the Middle East, do require, due to their higher specific heat requirement, additional thermal energy that in general is generated with the aid of burners of substantial capacity. A 500 to 800 t/day brick plant might be equipped with burners having a total capacity of 3 to 6 $MW_{thermal.}$ These burners can advantageously be substituted in total by combustion chambers, like in the example of SBBC, running on olive oil filter cake. The lower calorific value of these filter cakes is on pair with wood or slightly less. The drying behaviour of a product depends on the shaping characteristics and three key operating parameters — temperature, relative humidity and airflow. These key factors play an important role

Fuels such as olive filter cake are CO_2 neutral. They generate, as all cellulose fuels, dust and ash. The ash, considerate the limited amounts, can be used as an additive in brick making [5]. No secondary wastes are hence generated. Smell emissions, the filter cake does have a foul and sour smell, are a problem and require ventilation.

5. Kiln

A tunnel kiln in a brickyard is a relatively simple apparatus that can be operated with either solid, liquid or appropriate solid fuels. The kiln is, from a technical point of view, a counter current heat exchanger. The burners necessary to generate the thermal energy required for the ceramic conversion process are placed in the crown or on the sides. A tunnel kiln is roughly subdivided in a pre-heating zone, a firing zone where the ceramic conversion process mainly occurs, and a cooling zone. In the tunnel kiln, packs of bricks set on a car train on rails move through the kiln one after the other. During their journey, the cars move towards, through and past the stationary firing section at the center of the structure. During its travel the brick set on the kiln car is slowly heated up to the desired firing temperature and then cooled down again.

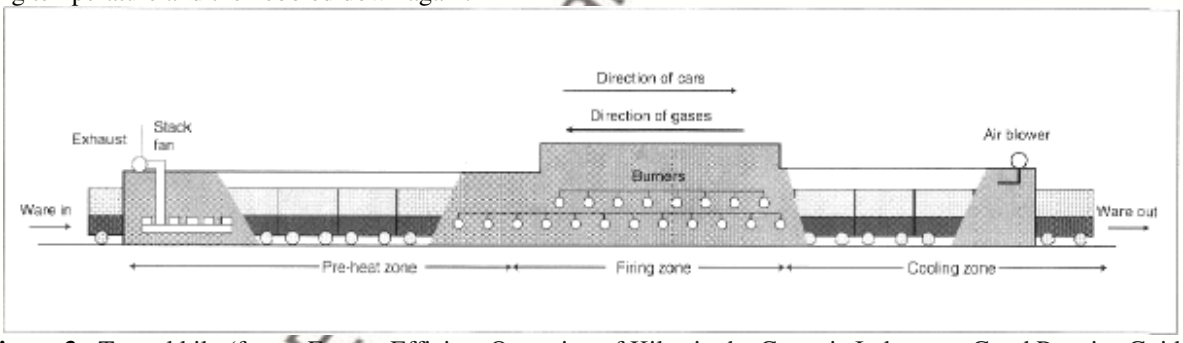

Figure 3: Tunnel kiln (from: Energy Efficient Operation of Kilns in the Ceramic Industry - Good Practice Guide - Department of the Environment, Transport and the Regions – UK 1996)

On one of the tunnel kilns a number of burners have been substituted to be able to run a oleaginous wastes from olive oil production. This waste derives directly from the olive oil production. It does feature a lower calorific value similar to the one of a boiler oil but does contain small amounts of water and, above all, is of much lesser pH value (acid). This causes corrosion to the usually employed pumps, piping and burners. A completely new technology had to be developed and tested.

4. Conclusion

Is this project rewarding from a financial or environmental point of view? The bottom line is positive. The CO_2 emission baseline, the emissions before the partial fuel switch, have been calculated on the base of the accepted emission factors in an average of > 75,000 metric tons CO_2 per year. The fuel witch will allow to reduce this emissions by about 22,000 metric tons CO_2 per year and later, with the use of new body, combustible substances mixed to the brick itself, renewable fuels, by another ca. 10,000 metric tons CO2 per year. Going green will hence half the current statistical CO_2 emissions. The revenues from this project will certainly be an incentive for the investments necessary.

The substitutive fuels used are also, on per calorific unit base, of lesser cost than he fuels used at the moment. Of course this situation can not be generalized. It is true for this particular case in this particular place under particular conditions.

The project proves that there are viable alternatives for at least part converting a large scale brick plant in a industrializing country to run on renewable fuels. This contribution to the environment would certainly not have been possible without the foresight and availability to take risk both financially and technically of the the owners of the brick yard, the El Eulj family.

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LIVING. RELATIONSHIPS, FORMS E TYPES

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Abstract

The proposed contribution delves into the subject of living in the Mediterranean contexts, aiming to identifying a "line" of cultural references upon which the basis of contemporary research project can be founded.
This approach is investigated through an architectural-historical analysis that chronicles the "central threads of continuity" which have created, with the passing of time, a close relationship among the various spontaneous settlement stories, the projects of the critical Modern period, the contemporary experiences that reinterpret the elements of the Mediterranean tradition, resting upon the contextual project. In particular we will explore: the worlds of traditional Mediterranean living architecture, especially referring to Sardinian and North-African settlement models (the internal areas of Sardinia, the area of pre-Saharian villages and the Moroccan Atlas); some projectual experiences of the first protagonists of the Team X in the ex European colonies; some recent projects of the contemporary habitat in the Mediterranean area, where, subjects as consistency in terms of identity, continuity and innovation emerge.

Keywords: Habitat, Relationships, Fabrics, New micro-urbanity

1. Introduction

The protagonists of the Team X, especially Alison and Peter Smithson and George Candilis, during the debates of the CIAM and through their projectual researches, pointed out the complexity of the habitat concept.
If we analyze this term, starting from the words and the thoughts of the designers themselves, it is possible to reflect over some items that bind the historical-traditional Mediterranean settlement fabrics to some of their significant projects and contemporary projectual experiences.
Subjects such as density, modifiability, appropriation, fabric, form and type refer to a common idea of Mediterranean habitat, highlight its peculiarities and the intrinsic value in terms of history and identity, factors that are not given by the elements of "decorum and skin", but by the structure of the habitats, by their being relational systems. This represents the permanence and the current value of the Mediterranean habitats and it is an indispensable assumption of the contemporary project in these contexts

2. Habitat for the mankind

The debate on the subjetcs of Habitat started during the CIAM 9 in 1953 in Aix en Provence when some architects such as Candilis Josic and Woods, the Smithsons, Van Eych, brought the positions stated until that moment from the Modern Movement into question.
The idea that an only model of habitat could be created to define the "Charter of Habitat" brought the concept of habitat itself into question from the start, included its inner meaning which considers the man in his environment; in that occasion the protagonists of the Modern Movement can't avoid a comparison with other cultures of living and their expressions. The emergency of the post-war reconstruction which would have led to the application, on a large scale, of functionalist ideas and industrialization in series, brought the effectiveness of these approaches into question. During the convention the heterogeneous picture brought out the common willingness to understand and catch the reality in which the architecture should have been inscribed in opposition to the *tabula rasa* of the Modern Movement and its abstract idea of the context.
The new ideas for habitat found a place in an extremely diversified positions related to man; they were referring to a "[…] conception du logement plus diversifiée, plus en rapport avec une humanité qui est moins réduite à ce qui la réunit biologiquement qu'à ce qui la différencie culturellement […]" [1]
The Team Ten, created immediately after the CIAM 9, played the starring role in this debate. Since the Sixties, the studies of the group were directed toward the reasearch of a kind of habitat which was as close as possible to reality and context. Being open to the modifier interventions of society and man were therefore flexible and full of variables of modification [2]; the studies started from the tradition, the everyday life, the interpretation of reality as an element able to re-establish the relations between society and place of living, man and spaces in public and domestic life.
In 1961, during the International Convention of Architects (U.I.A.) about the new technologies of habitat, it was possible to point out again the complexity of the subject.

As Candilis said about this event: "Des discussions passionnées se sont engagées pour découvrir quelle serait la tecnologie appropriée à l'habitat. Peter Smithson, architecte anglais, a localisé "le grand malentendu": "pour trouver le mode de construction d'un objet, il faut, avant tout définir cet objet'' [3]. With a sharp look to the European living settlements, Candilis, seeing the flat and upsetting aspect of assembled lodgings, stated : "Les – logements juxtaposés – ne doivent pas se confondre avec l'habitat" [4].
In that period, the aggregation models for juxtaposition of residential units, according to logics referred to a structure meant as a system belonging to a branch of research developed especially in Japan through the Metabolists, were proliferating. The Dutch structural engineer also developped these ideas: Piet Blom, starting from the structure of the *mat-building*, elaborated a tridimensional residential system, made of rhomboidal modules.
The results and the consequences of this line of experimentation reached the top with the habitat '67 by M. Safdie, where 364 prefabricated modules allowing the construction of 158 lodgings of 15 different kinds, including big garden-terraces, organized according to the user needs', were proposed.
Regarding these experiments, about 15 years after Candilis, Brian Brace Taylor in an essay called « *L'utopie est-elle habitable?* » announced some weaknesses related to the extremism of this kind of research: "Les recherches actuelles portent en effet beaucoup plus sur la tecnologie de la construction que sur les modes possibile d'habitat; les solutions proposte, souvent-brillantes, ne font que reconduire une forme d'habitat basée sur la cellule familiale. Aucune recherche prospective n'est vraiment conduite sur l'expression, en terme de logements collectifs, des grandes mutations économiques et sociales que connaissent aujourd'hui les sociétés post-industrielles. On se contente généralement de projeter, pour des structures sociales existantes ou passées, des objets qui risquent d'être obsolètes dès leur mise au point. Ce décalage entre technologies avancées et manque d'imagination sociale est d'autant plus tragique que rien, ou presque rien n'est tenté dans ce domaine. Si l'on peut prévoir, avec des certitudes relatives, les morphologies et systèmes sociaux de demain, rien n'est avancé quant à leur expression spatiale et surtout quant à leur habitat" [5].
Some of the projectual experiences developped by the protagonists of Team Ten are really important in this sense, since they refer to a concept of habitat which is flexible, adaptable, highly concentrated, given by the repetition of the type. However, these habitat qualities don't lead to an evolution in terms of high technology systems, but they are considered as a potential of modifiability of a fabric in relation to the spontaneity of the processes concerning the transformation of a society.

2.1. Formal systems and Mediterranean settlement fabrics

The projectual research of the protagonists of Team X, were very tied to the context, brought to the formulation of two types of compositional-formal logics: clusters and mat-buildings.
Clusters are the result of formal systems that develop and deforming their shape become irregular, their open form creates versatile and organic aggregations. The cluster was a significant step during the projectual experiments and the researches of Candilis, Josic and Woods and the Smithsons; in the early '60 these designers elaborated new forms at an urban scale having a high degree of modifiability and binding to the context, the fabrics and the outstanding architecture..
Mat-buildings are intersections repeated until a texture, a modular system is found. The nature of the meaning of the mat-building can be compared to the abstraction process of the Mondrian plant: starting from a natural, organic form as a plant, a form that branches and grows (here is the reference to the cluster as a starting point) we obtain by means of a second abstraction process to the composition of black lines organized according to a modular texture of white fields and primary colours – a fabric.
The mat-building is an architectual system horizontally developped made of a texture that articulates and creates an out-and-out fabric. Used as a method and a structuring technique effective against problems of quantity and production the story of the use of this approach is old; the issue *Forum* [6] of 1959 dealt with the "organized Casbah. The traditional settlement model of the *casbah* is a clear reference, in fact some of its texture structuring elements as the presence of frequent points of stop in the path, of narrow streets, the eternal sketchiness (element at the basis of an open and changeable system), the connectivity of spaces, the presence of "intermediate spaces" (in the meaning formulated by Van Eyck), the non monumental character, the interchangeability of uses and functions were at the basis of the new experimentations of the settlement system on a "mat" model.
Through these two systems of settlement formation laid the desire to go beyond the monumental and the centralization of the isolated architectural item (as for the Modern conception); by means of the modular texture of the mat-building a serial and automatic repetition of the residential types was not generated, instead an intersection, an alternation of forms, volumes, empty and full, according to variables and specific configurations, was created. In the end, the expressions of identity and a bigger adaptability to every context with the passing of time were researched.
The systemic character of the mat-building is well described by Alison Smithson who, following the text of Candilis, Josic and Woods for their project in Bilbao, writes: "Las partes de un sistema toman su identidad del proprio sistema […] Los sistemas tendràn màs que las tres dimensiones habituales; incluiràn la dimensiòn del tiempo […] Los

sistemas seràn lo suficientemente flexibles para permitir el crecimiento y la intercambiabilidad a lo largo de su vida" [7].
In the issues published during the '60's and the '70's of *Architectural Design* and *L'Architecture d'Aujourd'hui*, some pictures of traditional habitats were sporadically included as an introduction to some papers of the Smithsons and Candilis dedicated to the mat-building, these pictures were considered as examples from which their new ideas about "forms for habitat" arose.
A picture presented by Alison Smithson in *Architectural Design* 9/1974 representing Honan, an underground city in China, is extremely interesting: "the negative pattern of living Honan, where path, tree, communal/social space was clear to the horizon, not cluttered with offensive semi-d's: a regular irregularity" [8]. A type of settlement not representing its image and that must be known and discovered from the inside, introvert in the conception of the spaces. The picture shows a continuous cover, which is pierced only by the patios. The patios seem to be dug in the ground. The ground/cover is a new plan, a field to farm and at the same time a roof.

Figure 1. Atlas Moroccan villages; photos by Silvia Mocci

The association with the roof terraces of the Moroccan villages from the Northern Atlas, of the pre-saharian *casbah*, of the Sardinian mountain villages, is spontaneous. The extraordinary structural clearness, typical of the Mediterranean settlement models, just as their compact shape, horizontal, porous (given by the repetitive and crucial system of the patios), are the elements from which the conception of mat-building is developped. In these traditional systems the elements such as flexibility (expressed in the possibility of growth and modification), easiness in composition and connectivity of the spaces, meant as an interconnection and association of parts, can be found; these characteristics also, are at the basis of the mat-building formal models.
It can be cautiously stated, that the Mediterranean traditional settlements, such as the rural villages and the casbah in Morocco as the medinas in North-Africa and the fabrics in Sardinian villages, in the Southern part of Spain and Portugal (Andalusia and Algarve), can be considered as real mat-building, since within the framework the functions and uses of the spaces improve and enrich the fabric. The mat system is characterized more by the use than by the form; but, uses change and the form is modified by the time according to typological-settling rules based upon interconnection and growth. The texture of the traditional Mediterranean mat-building uses the elementary cell as a module which organizes the evolutionary spontaneity of the texture itself, of its development in terms of aggregation, typology and structure. The patio type is at the basis of Mediterranean living. The patio type and its other versions are the cultural reference of the Mediterranean settlement systems. At a single building scale, the patio is the heart of the house, through the wall is the element of mediation between street and inner spaces of the house, it is a working space and a place of daily housework. At a settlement scale, the patio type, repeated and aggregated, creates a compact and highly concentrated fabric.
The traditional Mediterranean settlements – spontaneous – are highly concentrated and dense, and this can be read in their structures, in their organizational system for spaces and functions, in their vocation to be places where direct relations with territory, environment and man can rise. It is not a case that some members of Team X learn from the tradition to define their thought against the new conception of habitat systems. They reinterpret the traditional settlement structures taking out the rules. In the light of these ideas, we have the first projectual experiments, where the patio type (according to the traditional model of Moroccan villages) becomes the founding element for the conception and the composition of the habitat. Candilis, Josic and Woods, in the projects for Kuwait City and Fort Lamy, and the architect Elie Azagury in the project for the renewal of the *bidonvilles* in Casablanca, propose a settlement model based upon the patio house, experimenting with complex aggregation solutions, having a continuity with the traditional habitat models typical of the place and the specific social realities. This way, they

experiment individual and collective settlement models (whose logic arises from a careful reading of the traditional settlement models), explore the subject of the patio type with buildings horizontally and upward developped by means of a modular mat.

Figure 2. Atlas Moroccan villages, photo Silvia Mocci;
social housing Casablanca by Elie Azagury; photos archive Silvia Mocci and Giampaolo Salice.

Moreover, Candilis and Josic studied the buildings for residential use and the historical urban structures in Chad and Casablanca, the Smithsons were interested in the old Kuwait city and in the popular areas of London and Giancarlo De Carlo was "reading" the historical and rich fabric of many medieval Italian cities.
In particular, for the city of Kuwait the group of George Candilis proposed the renovation of the outstanding fabric through its recomposition with some experimental habitat pieces. With pieces of compact fabric, the architects experimented with some solutions which took into account the climate, the traditional uses of the house spaces and the specific family relations in everyday life. Through this project they carry on their reflection about individual and the collective habitat. The approach used to renew Kuwait City is the result of the researches published, in part, on the February-March issue in 1968 of *Architecture d'Aujourd'hui*; in an article called "Le mythe de l'habitat individuelle", George Candilis says: "L'habitat est avant tout un environnement où les hommes vivent. Vivre seul ou vivre en société. Le mythe d'habitat individuel, en opposition à l'habitat collectif, c'est la démostration de la confusion et de l'ignorance. L'habitat est toujours collectif, L'habitation doit toujours être individuelle. Il ne faut pas confondre les différentes formes de structures et de groupements d'habitations avec la notion de l'habitat" [10].
A project where the two systems of cluster and mat-building are mixed together is the one of Fort Lamy [11] (1962), the capital of Chad, prepared by Candilis, Josic and Woods. The city, during the years of political-institutional changes, was divided into an African area, including the patio houses of the thick traditional urban fabric, and an European area designed during the French colonial period. The two settlement morphologies, on the one hand the traditional habitat and on the other the big European buildings, were divided by a huge empty space called "health zone". For this area Candilis, Josic and Woods proposed a settlement system to reconnect – physically and structurally – the two sides of the city.
With this project the group sharpened the principles of cluster and mat-building as models able to combine the right relation between the architectural scale and the urban scale; their combination can also join together the two sides of the city by means of a complex structure creating a single system for the ramifications and the texture.
In Fort-Lamy the "big street", delimited and defined by the adjoining buildings where the collective activities take place, represents the first level of structuring settlement. Then we can find a second element of the fabric, the line of the public space ramified through narrow streets and alleys distributed as platforms of the urban fabric. Therefore, we can see a gradual change from public space – linked– to private space [12].
"The first stage of an aggregate is represented by the assembling of cells round the street. Several streets leading to one public square form a district [...] the gathering of several districts leads to the notion of an urban scale"[13].
From the words of Woods, we can fully understand how the coexistence of the settlement principles of cluster and mat-building represent an attempt to suggest again and re-establish the settlement logic of a historical consolidated city – the designers bring the relations between house, street, block and city, as elements representing different "degrees of association" from private to public, into question – highlighting and organizing a project having some structural elements able to support the development and the spontaneous transformations of the settlement fabric, itself.

The concept of modification, which has its roots in the historical background and fabric, is really important here. The drawings in the technical boards of the project proposal clearly refer to the traditional settlement structures, from which the designers can extract the principle of the outstanding urban structure and research the system elements of the formation of historical fabrics. "Dans cette propositions il ne s'agit pas d'importer une "Nouvelle Architecture" dans un pays de grand bâtisseurs des temps passés. Mais d'établir un système de lotissement souple et divisible comportant toute l'infrastructure, permettant le contrôle de la croissance accéléré de la capitale" [14].
The relations that the designers wanted to create with the existing context concern the private and the public: the composition of the volumes creating a fabric of houses, is articulated at various levels and includes the characters of the African traditional architecture against climate, articulation, composition and use of closed and open spaces; in the same way, the public is defined by the relations with the built-up areas, the street is sometimes covered, sometimes is defined by the line of the house fronts', stressing the inextricable relation between private and public spaces.
The designers prepare various settlement types; the relations, spatial, visual and of neighborhood, generate the flexibility of the public space within the mat: "Chaque logement – étant a deux niveaux – constitue une partie de la rue" [15]. Just as in the traditional settlement private and collective depend one on the other, both in social and architecture: "What reveals the true nature of a society is neither the shape of its cells nor their standing but the relationship between the individual and a collective. … In our proposal the street tends to be the vital element of a new urban structure. It brings life to the inhabited cells and changes this agglomeration into a living complex" [16].

3. Systems of contemporary habitat

Reading the project of Candilis for Fort-Lamy, according to structural and typo-morphological aspects which have been pointed out, allows to identify many affinities with the project of Avaro Siza for the Quinta of Malagueira in Evora.
In this case, just as in the previous one, the coexistence of cluster and mat-building is noted. Together, they "solve" a piece of settlement fabric in ancient Evora.
The affinities regard the formal and organizational conception of the settlement system – the trace of the Roman aqueduct in Siza's project, having a strong symbolic value, clearly refers to the cluster - but also to the common research of a relation with the context and the identity of a place, the participation and the really important role of the inhabitants (in one case protagonists- in part- of the choices, in the other subjects giving rise to the project idea).

Figure 2. Atlas Moroccan villages; Modification and tranformation of social housing Casablanca by Candilis-Josic-Woods; Malagueira-Evora by Alvaro Siza; photos Silvia Mocci.

In both cases the use of structural elements can be pointed out, they are founded on qualities of identity, on their value of system, and sometimes on their evocation; in Fort-Lamy's project, the street, where the services are structured and the hierarchy of public space begins, arises from a reinterpretation of the traditional urban settlement with which the new has to compare; in the same way, in Malagueira the new infrastructural hanging duct, recalling the historical aqueduct, is the structuring element of the fabric, proposing questions more directly related to functional, technological and services aspects.
The complexity of the intervention at a urban scale, and also the complexity of the basic unit made of residential blocks, where the elementary cell is the patio house, are solved starting from the interconnection between the structure logic of the cluster and the one of the block, that as a mat-building creates an ensemble of various densities, empty spaces, patios, and concentrations according to a repetition of various types of lodgings, residential detached houses aggregated, with the patio facing the street or at the bottom of the lot, linked in double belts, having a common median wall for the root canal treatment and the opposite aspects [17].
Another important project is the proposal awarded at the Ideas contest for the renewal of Santa Catalina's area in Medina Sidonia, Spain. The designers had to face a form and a urban environment thick and with strong identity-

traditional peculiarities related to urban structure, historical building types and their changes. The proposed project is a habitat apparently confused and not clear, but at the same time extremely flexible in the articulation of uses, volumes and spaces. Within this system, the patio plays a starring role, sometimes it is a fulcrum for the distribution and articulation of the volumes, sometimes within a single residential building. In this sense, it can be said that Santa Catalina's project is a contemporary interpretation of the settlement logic of the mat-building for its ability to be highly concentrated, to grow, change, and being flexible. Reinterpreting the fundamental concepts that create the traditional settlement structure (sequence of spaces, empty and full, patios, modular volumes and flexibility), the designers have elaborated an organization which can control these variables. The result is a fabric made of a regular texture given by the repetition of a single fundamental unit. These units cluster to form some modules with which, through their aggregation, a big variety of types is generated having the chance to lose some units to leave some space for patios, as to gain some other new to develop and grow (just as an organism) in a flexible way and leaving space to the willingness of appropriation of the inhabitants. The kind of flexibility brought by the designers, invites to the implementation and the "spontaneity" of its development and has an open character which can give an answer to the contemporaneous social and family structure.

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REDISCOVERING OLD TRUTHS

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Abstract

Sustainable development and eco-principles feature heavily in current architectural debates, research and investigations. Given the current state of hectic imbalance affecting all aspects of human society and, graver still, this almost depleted planet we're based on, it was high time architects started inquiring into the conception and producing of objects mindful of environment, resources and the people they're meant for. In the hype of new trends and ever evolving eco-technologies, however, we seem to have lost sight of a fundamental idea: that sustainability is nothing more than an ancient wisdom rediscovered - the wisdom of traditional architecture.

Throughout history and across continents, this wisdom of building and space-making has been exercised instinctively, as an inherent part of tradition; it is common to all members of a cultural group, almost genetically coded into them. Thus, traditional architecture has been, up until the Industrial Revolution, and still is, in certain parts of the Globe, quintessentially "sustainable": it is made by the people themselves through direct translation into shape of their specific way of life, core values and cultural particularities; it seems to organically belong to the environment, a link reinforced by the use of local, readily-available materials found in abundance; its relationship with landscape and climate is not one of unidirectional conditioning, but rather, one of symbiosis, of bending to certain determinants while making clever use of them in compensatory ways; and finally, it is shaped with both fierce economy and astute utilization of resources. Therefore, it is beautiful as only things not consciously striving for beauty can be.

We propose a brief comparative study of sustainability principles originating from Mediterranean and continental traditional architecture (case study: Romanian) - chiefly, the use of: local materials according to their intrinsic qualities; natural elements such as light, shadow, air and wind in particular spatial configurations; spatial structures (the porch, the inner courtyard) as means of building efficiency.

Keywords: Traditional typologies, landscape, materials, light

1. Introduction

At first glance, a comparative study between traditional Mediterranean and Romanian architecture might seem far-fetched, considering our country's geographical position and its relative remoteness from the Mediterranean Sea – in fact, it is more often thought of as a Balkans country. But when one takes into account the historical and cultural connections between Romania and several Mediterranean countries, as well as the surprising similarities in climate and terrain topography – both of which constitute determining factors in the shaping of architecture - it becomes obvious that there is a more than solid basis for comparison.

Being a country situated at a geographical and cultural crossroads, a place of meeting and, more often than not, of confrontation between Eastern, Western and Southern cultures, we have had a tumultuous history. Starting with the conquest of Dacia by the Romans (our Latinity being one more characteristic connecting us to the Mediterranean space of Latin derivation), under continuous attack from migratory peoples and, finally, carrying on difficult political relations with the Ottoman Empire for the better part of the Middle Ages, the Romanian Principates found themselves under sustained cultural influences issuing from the Mediterranean Basin: Byzantine, Ottoman, and, more notably, Greek (XVIIIth century administration). Naturally, the result is a blending of the aforementioned cultural influences and characteristics, visible in multiple aspects of Romanian society, including architecture.

And speaking of architecture, the Mediterranean world and Romania share a common architectural conundrum, especially when it comes to architecture for the many: the crisis of the individual house. Barring the vast majority of the populace, who reside in collective housing, most people no longer dwell in homes, but live in houses, in architectural objects which are a mere sum of modern materials and uselessly squandered techniques. We have lost the connection to our traditional way of thinking and building a home which expresses us and our culture, and which allows us to carry on and transmit our cultural identity. Furthermore, these houses are too poorly built, expensive, inefficient, and woefully disregarding the environment.

This paper aims to be more of a manifesto, rather than an actual study. We mean to show what can be learned from traditional architecture, what we can recover from it: the essence of built identitary structures, which should be at the basis of architectural creation, and a way of building sustainably and affordably, without falling prey to the mirage of high-tech materials. In the end, a strategy, applicable to both Mediterranean and Romanian architecture, should emerge: what to draw upon in order to build sustainable homes which preserve and make cultural identity thrive. Granted, the notion is not quite novel; however, it does bear repetition and analysis until it actually becomes common architectural sense.

With this goal in mind, we shall try to pinpoint sustainability and identity in traditional architecture by focusing on four criteria: socio-cultural determination/conditioning and landscape integration; use of locally sourced materials and their respective techniques; spatial structures and configurations (the porch, the veranda, the space under the roof, the cellar, the layout of the homestead); use of natural elements (sunlight, shadow, air and wind) in order to achieve optimal comfort. Each criterion will be illustrated with comparisons of dwelling typologies common to both Romanian and Mediterranean architecture: the monocellular house, the pluricellular house (both compact and articulated volumes), the homestead (house with a courtyard) and the house with a garden.

2. Socio-cultural determination/conditioning and landscape integration

For the purposes of this study, we chose to take into account the traditional architecture of primarily agrarian areas, since, up until the latter half of the XXth century, the overwhelming majority of the populace was engaged in agricultural activities; naturally, these activities forge a certain type of existence, comprising specific culture, traditions, habits and inheritable archetypes, which, in turn, coalesce to form the spirit of the Romanian peasant. Three notable aspects of this spirit, shared with several Mediterranean cultures, are the utmost attachment to land, the importance of community and a sense of justified permanence issued from centuries of distilled traditional values. Just like in Mediterranean regions, they shape the rapport with nature and the land, fix spatial structures and provide the common basis for an architecture which, in form and style, is wildly varied.
Romanian architecture approaches landscape with great modesty: it integrates itself seamlessly into the natural setting with such innate skill that it might have sprung from the very scenery. Again, as for Mediterranean architecture, this can be traced back to a life mostly spent outdoors, working and socialising; therefore, the entirety of the natural setting represents the framework of rural existence. One might think this to hold true solely for isolated houses, but even the three types of Romanian villages focused on agriculture and/or farming respect this rule [Figure 1] .
The dispersed pastoral village and the scattered village resemble each other greatly, but with the first being a settlement less dense than the latter, and spread out over a significantly larger territory. However, they both have in common the same type of territory appropriation: the overlay of a network of roads, paths, delimited terrains of different agricultural uses and buildings over the actual landscape, so that their relative positions and spatial relations translate into thorough human ownership of the land which, paradoxically, remains very deferent of natural elements. Homesteads, courtyards and buildings make judicious use of terrain topography but they do not try to shape it in any way. Even enclosures act as no more than landmarks; thus, the space of the courtyard is still natural space, and the homestead is more of a jigsaw puzzle where pieces interconnect via landscape segments, rather than an area sliced out of natural territory.
The grouped village also subscribes to this pattern, although, carrying in its configuration the seeds of urban space, does so on a grander scale: the homesteads incorporate natural jigsaw pieces (gardens, orchards) but connect via spaces of community interaction.

Figure 1. Landscape integration

3. Spatial structures and configurations

It stands to reason that spatial structures and the materials used for construction work in junction in order to give shape to architectural archetypes which reflect culture and identity. Still, in order to better illustrate the sustainability aspect but also for the sake of brevity, we will treat them separately.
On the territories occupied by present-day Romania, the monocellular house is the oldest type of one-storied dwelling: placed on ground-level, of a rectangular shape in plan comprising a single multi-purpose room for all indoor activities and covered by a sloped roof (2 slopes in the first stages of evolution, later exclusively 4 slopes), it bears remarkable resemblance to its Mediterranean counterpart. In fact, this simple composition of two simple

volumes (rectangular prism and regular, rectangle-based pyramid) proved so essentially *correct* (in terms of satisfying all physiological, cultural and symbolic needs of the dweller), so *functional* and *efficient*, that all other individual rural dwelling forms derive from it.

The monocellular house later becomes bi- or tricellular, and also gains another floor and a partially underground cellar; the next step in evolution is the pluricellular house, of either simple or articulated volume - two main rectangular prisms form the volume, and the more complex roof extends partially over entrances or turrets, thus adding vertical accents to a well-balanced composition. Naturally, no pastoral or agricultural house can exist without annexes; their development, relations with the house proper and the way they sometimes form a well-defined enclosure give us another couple of typologies: the homestead (making up the bulk of scattered and dispersed villages) and the house with a garden (more often found in dense, grouped villages). It is obvious that traditional Romanian architecture has a penchant for mostly rectangular, simple volumes, at most articulated in simple compositions, a trait we often encounter in the Mediterranean way of traditional building [Figure 2].

But the defining spatial element for traditional Romanian architecture is the **veranda:** present in all but a few dwelling configurations, it is a complex space, rich in uses, functions and meanings. Technically, it is an open, often pillared, but always roofed space, indispensable to the functional scheme; it provides a gradual, sheltered transition from the semi-public space of the courtyard to the intimate space of the dwelling proper, but also works as an extension of interior space and its activities. The veranda is where one *looks out from* but also where one *is seen looking from*, thus serving as a place of social interaction; in fact, due to its complexity and rapports with the house, the courtyard and the immediate village (or natural) vicinity, it almost single-handedly delivers the essence of traditional Romanian spirit and architecture. In terms of composition, the veranda pulls together the volumes of the roof and of the house, becoming the centre of equilibrium, although remaining a non-materialised volume, defined only by the eaves of the roof, the plane of the main façade and the elevated foundation - a feat of striking architectural subtlety [Figure 3].

Moreover, it is a place of compositional and functional fluctuation, where the constant ebb and flow of interlocked sunlight and shadow dictate over the general image the house presents, and over the chronological succession of activities. For, just like Mediterranean architecture, Romanian architecture is, first and foremost, an architecture of sun and shade: the house both seeks the sun, and shies away from it in the protective shadow of its veranda. The Mediterranean space, however, due to its multiculturality, has developed numerous version of this brilliantly intricate space: the veranda, the porch, the peristyle, the patio, even the rooftop terrace. Incredibly diverse, yet serving as the quintessential feature of their respective architectures, they are identitary structures.

When it comes to sustainability, nothing could be more efficient than the base-veranda-roof system, especially when it comes to thermal comfort: it moderates temperature extremes and regulates temperature inside the house. Firstly, the house is placed on an elevated base, of either thick wooden timbers or stone; the aim is not only to insulate and raise the house above freezing ground covered in snow, during the winter, but also to provide a foundation element of great thermal inertia. Heat from the sun is stored during the day in order to be released at night - the base acts like a hotplate for the house. Conversely, during hot summers, it keeps the inside of the house cool. The pluricellular house is sometimes built on a stone (or brick) ground-floor (usually partly ensconced in sloped terrain, functioning as cellar, storage, or space for various activities), with the upper floor reserved for dwelling – same principle as the stone base, but significantly more effective. A counterpart, buffer-zone to the base or stone ground-floor is the space under the roof; seldom lived-in, used mainly for storage, it holds a volume of air of considerable insulating capacity: it keeps unwanted heat or cold, depending on the season, away from the core of the house. Lastly, the veranda works with the roof's eaves (often protruding considerably from the body of the house) to shield from the scorching mid-day and afternoon summer sun, but in winter lets sunlight warm the façade of the house almost throughout the day.

Figure 2. Dwelling typologies

Figure 3. Spatial configurations

4. Locally-sourced materials; techniques

As previously mentioned, our climate is extreme: summers are very hot (+40-45° C) while in winter temperatures habitually drop as low as -10, -15° C. Therefore, the other main aspect of material and technique choice, other than availability, is their versatility in ensuring thermal comfort all year round (protection against the sun in summer and good insulation in winter); the following materials, material combinations and techniques may be found in all the aforementioned dwelling typologies. As a rule of thumb, no matter the material, all elements of interior/exterior separation are as thick as possible for good insulation and good thermal inertia, especially load-bearing walls [Figure 4].

The primary and most abundant material in traditional construction - and here is where it differs greatly from Mediterranean construction - is wood, used for structural elements (ground level foundation beams, load-bearing walls, timber frames), non-structural ones (wall in-filling and partitions, shingles, enclosures) and, last but not least, furniture and decoration. Wood is a warm material, easy to work with, highly versatile and allowing for very brief construction times; its use has engendered quite diverse, region-specific architectural images for basically the same typology.

Earth, in various construction techniques, is also used to great effect for load-bearing walls: compacted earth, mud-brick with vegetable matter, baked-earth brick, or even layers of clay and vegetable matter on wattling. A clever use of the actual ground is worth a mention: dwellings partially excavated into the soil - *the bordei*. Another subset of the monocellular house, this house has half or two-thirds of its interior height underground, with walls made of wooden planks and of compacted earth. Roofing consists of timberwork and either mixture of compacted earth and vegetable matter, or thatched straw. The *bordei* is a particularly effective and enduring typology. Born out of a defensive strategy (camouflage), its success is due to significant thermal efficiency: it remains cool in the summer and quite warm in winter (maintaining a constant 8-12° C).

Stone, while extensively used in Romanian architecture, remained a material reserved mainly for defensive, religious architecture programs or the privileged dwellings of noblemen. In rural architecture it is used mainly for constructing the base of the house, the ground-floor cum cellar, and only rarely does it constitute the main building material for the entire house. These exceptions preponderantly cluster around the Black Sea coast and the plateau of Dobrogea, where the influences of Mediterranean cultures (mainly Greek and Turk) were felt the strongest, and where consistent minorities of Mediterranean peoples thrive to this very day. In Dobrogea, the house with garden and/or orchard typology is frequent, built of stone with timberwork for roof structure and covered with roman tiles. The plateau also features some more exotic typologies, such as the house where the porch is fashioned by the actual walls of the house, or variations on the Turkish house with exterior sofa.

Straw is also used extensively: for roofing, in almost all regions of the country, and even for in-filling or non-load-bearing walls in some parts of the Danube Delta. As an insulating and waterproof layer, straw works splendidly, and thatching techniques have adapted in order to put it to good use in a great number of typologies. For instance, in the Apuseni Mountains, where it rains and snows more heavily than in the rest of the country, roofs are steep-sloped and made of thick thatching, whereas in the Danube Delta, where very little rain falls and winters are gentle, their slopes are reduced and more breathable thatching of moderate thickness (straw or reeds) is used.

Figure 4. Use of materials

5. Use of natural elements

Firstly, the sun: orientation is, of course, key. The traditional house seeks and faces the sun: its veranda and main façade almost always face south in order to ensure both heating and sun protection, as previously stated. Furthermore, the walls, thick and with few openings of small dimensions, soak up heat from the sun in order to release it at night.
Secondly, air: the traditional house ventilates naturally, using air currents created by opening of certain sets of windows and sometimes in conjunction with the flute of the chimney. Romania has strong winds, especially during the winter - once again, the large eaves of the roof and compact walls with small openings help ward against them; the energy of the winds, however, has been harnessed in order to turn windmills. And speaking of mills, water, the most vital element of them all, has also been used to power watermills (which often include the miller's dwelling) and even archaic versions of the washing machine (large hollows dug into the ground along the path of fast streams, and lined with wooden planks; the stream flows in, creates whirlwinds which wash clothes and linen, then flows out).
Thirdly, even the soil is put to use in keeping the semi-buried house or the cellar cool during the summer and warming them up during the winter by either insulating the house from all sides, or acting like a hotplate for the ground-floor or first floor, due to its high thermal inertia.
Like Mediterranean architecture, traditional Romanian architecture makes use of the elements to shape its characteristic image (sun and shadow interplay) and to make inhabited spaces as comfortable as possible.

4. Conclusion

This paper has sought to recount all the characteristics which make traditional houses not only identitary structures, but also the very definition of sustainability, and to stress the idea that rediscovering the old truths and the wisdom of traditional building can serve current architecture far better than integrating cutting-edge technologies and materials into one's design. In fact, if one would only make the effort of adapting and updating these old truths to modern construction and conceive houses whose sustainability is an intrinsic quality rather than an afterthought, architecture might begin to progress along the path to solving the issues of individual housing.
In the long run, this strategy proves not only less costly, but also more effective, and it all adds up to respecting five simple principles: taking the essence of that identitary structure and moulding it into a house suited to its intended user and their culture, and not producing for them objects worthy of architectural exhibitions, yet devoid of meaning; integrating the house into the landscape, not reshaping the latter to suit the house; sticking to compact volumes or straightforward articulations, and not forgetting that simplicity and complexity are by no means mutually exclusive; using local materials, craftsmen and techniques; remembering that it is far wiser to work with the natural elements rather than against them.
It is all so plainly obvious, but all too rarely heeded.

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NEW ACQUISITIONS ON PALAZZO MARZANO IN CARINOLA

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Abstract
A Carinola, realtà urbana casertana situata nell'antico *ager Falernus* e nota dagli albori del secolo scorso, grazie agli studi di A. Venturi, come "Pompei del Quattrocento" per le sue peculiari architetture catalane, si trova il palazzo un tempo residenza di Marino Marzano, genero di Alfonso il Magnanimo. Risalente alla seconda metà del XV secolo, l'edificio presenta lo schema della casa a corte.

Articolato su due livelli, in origine era più esteso rispetto alla conformazione attuale ed occupava un'intera *insula*. La tipologia della casa a corte caratterizza diffusamente, in diverse configurazioni, il patrimonio edilizio carinolese. Sistema-base della formazione dei centri agricoli dell'Europa mediterranea, a Carinola offre testimonianze negli episodi più rilevanti, come appunto il palazzo Marzano, ed in quelli meno noti, non per questo di minore interesse tipologico-formale.

L'articolazione della corte – condivisa da più nuclei familiari – sfruttava l'orientamento, la massa termica delle strutture e la disposizione delle aperture, per creare buone condizioni di abitabilità. Lo schema minimo comprendeva, oltre alla corte stessa, l'androne ed una scala posta su un lato, per l'accesso al piano superiore, con ambienti di solito introdotti da un loggiato.

Il palazzo ha subito nel corso del Novecento vari danni, causati dalle distruzioni belliche e da eventi naturali, nonché da diversi restauri, tra cui quello condotto negli anni trenta, non guidati da logiche di preservazione delle stratificazioni, bensì dalla discutibile esigenza del ripristino "in stile". Attiguo alla corte più nota è un cortile minore, sinora mai indagato, con una loggia – anch'essa su due livelli – ascrivibile al XVIII-XIX secolo, in passato parte integrante del complesso immobiliare.

Keywords: Campania region, metrology, traditional construction, measure-chronological analysis

1. Introduction

The court yard house features the architectural heritage of Carinola town. It is the basic system of the agricultural centers of Mediterranean Europe and it offers examples of relevant episodes, like the Palazzo Marzano [1].

The court yard, shared by several families, used the orientation, the thermal mass surrounding the structures, the arrangement of open spaces to create good living conditions. The most simple scheme is presented by a hallway and a stairway on the one side, providing an access to the upper floor, with rooms preceded by an arcade. The typological system was more complex in the most important buildings.

2. Palazzo Marzano: historical and structural characterizations

Situated on two levels, the building originally was more extensive than the present structure and occupied an entire town block. During the twentieth century it has undergone various damages and destructions caused by war, natural events and several restorations, characterized by the wish to create a stylistic restoration, without preserving its stratifications.

In fact, in 1938, Armando Venè, Medieval and Modern Art superintendent of the Campania region, informed the Minister of National Education who wanted to make a stylistic restoration of the monument, bringing it back to the original form it had in the fifteenth century, without preserving the recent stratifications [2]. The various restorations protracted over the years have erased almost all traces of the original masonry construction techniques.

The construction of Palazzo Marzano and other contemporary buildings nearby was coincided with the union (1449) between Marino Marzano and Eleonora d'Aragona, the illegitimate daughter of Alfonso il Magnanimo. The palace was built by emulating instances of constructive catalan culture. The marriage between members of two families did embellish the province of Terra di Lavoro with catalan gothic style buildings.

Shortly after the marriage Marino Marzano railed against his brother-in-law Ferrante, which caused the loss of property (1464) and his death. The conflict erupted after the death of Alfonso il Magnanimo (1458) and the ascent to the throne of his son Ferrante. Riccardo Filangieri fixed in 1458 the term of the work of the building [3]. The disappearance of Marzanos, however, did not lose the character which was acquired by the site.

Figure 1. Carinola (CE), Palazzo Marzano, view of the court yard (XV century).

3. New acquisitions: the court yard of the XVIII-XIX century

This research analyzes the lower court yard of the palace next to one of best known, never analyzed before. This area with a lodge on two levels, attributed to the XVIII-XIX century, was once part of the building.

The photographic, metrical and material survey of the lodge (entirely built in gray tuff of the Campania plain), was used as the basis for the measure-chronological analysis [4]. It was conducted by applying known research protocols [5], which allowed to date the structure, studying the conformation of its masonry and the elements that constitute it.

The court yard is damaged, because the owners never carried out the maintenance work. In fact, the lodge has been shored up to prevent collapse and is attacked by various forms of degradation, in particular by the presence of tree vegetation, which in parts has also caused serious structural damage.

As the structure of the XV century, the lodge of the XVIII-XIX century has a double row of arches. The first level which refers to the first half of the XVIII century, has three arched openings with rings realized with quickly shaped elements arranged in two registers. Instead, the pillars are built with so-called "bozzette", high on average 22-28 cm and 70-90 cm long.

The second level refers to the first half of the XIX century, it is also divided into three arched openings, with rings similar to those of the first level. The pillars of the second level are built with so-called "blocchetti", with dimensions similar to the previous but better elaborated. The outdoor areas are fully covered by cross vaults.

Figure 2. Carinola (CE), Palazzo Marzano, view of the court yard (XVIII-XIX century).

Figure 3. Carinola (CE), Palazzo Marzano, court yard (XVIII-XIX century), lodge. Material survey.

4. Conclusions

Studies on masonry construction techniques are intended principally to achieve - and repeat in other areas of study - the mentioned above research protocols, used here to analyze Palazzo Marzano.

They qualify through the recognition of features of the buildings would not otherwise detectable, the modern culture of the protection of historic buildings, aimed at their preservation and safekeeping for the benefit of future generations, according to the timeless teachings of John Ruskin.

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[2] A. Venè wrote: "dall'esame delle annesse fotografie, prese così, alla buona, durante il corso dei lavori, salvo a trarne un sufficiente numero ed in maniera più perfetta, ad opera compiuta, codesto On.le Ministero può già rendersi conto dell'importanza del restauro il cui risultato sarà certamente quello di restituire all'ammirazione degli esteti e degli studiosi una delle più belle espressioni di architettura catalana, importate dagli Aragonesi nella Campania nel Sec. XV". ACS, Ministero P.I., Direzione Generale AA.BB.AA., div. II, 1934-40, Napoli Provincia A-M, B. 259, class. 6 monumenti, "Carinola. Casa Martullo".

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[4] "Measure-chronological investigation is based on the survey and probabilistic analysis of a large number of samples and entails defining the chronological features of each construction element (wall, arch, ceiling, wooden floor, roofing, grating, door and window frame, floor covering) thus allowing individual characteristics to be ascertained and providing indications on the ideal materials to be used in its conservation". Guerriero L., and Cecere G., "An Approach to Defining the Features of the Building Heritage: Metrology of Traditional Construction Elements in the Neapolitan Area", in Elwazani S., Malhis S., and Al-Qawasmi J., "Responsibilities & Opportunities in Architectural Conservation: Theory, Education, and Practice", vol. 1, *CSAAR Press* (2008).

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About urban insertions and space discontinuities

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Abstract

The issue of urban insertions is still a very present-day debate, and a sensitive topic when discussing urban tissues of architectural, environmental or historical value. The entire professional community, heritage commissions, and civil societies (in areas where this experience of urban life already exists) are trying to find the optimal solution without affecting the already culturally-established space which has current or potential value to the city. The questions are simple: how to intervene? why intervene? is there a safe response generated by marketing potential investor - municipality? What is the best way to intervene if the new insertion can be connected to an already existing structure: by embedding it but still without affecting its value? And most of all is the important question WHERE? Can one intervene in a constituted tissue, linked to the networks of the cultural space – paths, trails, landmarks, landmark buildings, valuable buildings, valuable elements which belong to the atmosphere, to the social factor, to communication and anthropology – without spoiling altering the algorithm established as valuable for the area / city.
Known tendencies of the modern city are to agglomerate the center by aggregating suburbs, thus the center and the central poles of cities are undergoing a process of continuous tension and pressure towards densification, and even height growth by addition of high buildings.
The definition of discontinuities creates the premises of 'filling' these holes in the urban fabric, with + or – spaces, but always in predefined sense of original context , without which the urban insertion could be challenged and remain unaccepted in the life of city images.
This article proposes a discussion about continuity and discontinuity, holes, and insertions in the Mediterranean space.

Keywords: **value, discontinuity, continuity, insertion**

1. Introduction

The old and the new are two major yet completely opposite directions of tackling the development of European city and the city of the future. When discussing the European city or the city of the future, one confronts two major yet completely opposite directions of development: the old and the new. This conflict dominates contemporary society and political reality of European cities beyond the different theoretical considerations.
The topic of urban insertions is still a very present-day issue, and a sensitive subject when discussing urban **tissues of architectural, environmental or historical value.[1]** The entire professional community, heritage commissions, and civil societies (in areas where this experience of urban life already exists) are trying to find the optimal solution without affecting the already culturally-established space which has current or future value to the city. The questions are simple: **how to intervene? why intervene? is there a safe response generated by marketing potential investor - municipality? In what way should one intervene if the new insertion can be connected to an already existing structure: by embedding it but still without affecting its value? And most of all important is the question WHERE? Can one intervene in a constituted tissue, linked to the networks of the cultural space – paths, trails, landmarks, landmark buildings, valuable buildings, valuable elements which belong to the atmosphere, to the social factor, to communication and anthropology – without spoiling altering the algorithm established as valuable for the area / city.**

2. A question of insertion ?

A trend would be maintaining continuity of the 19th century city, according to which we still conceive the city as a series of grids of blocks built / extruded urban islands. This type of city is close to the European soul due to the sense of familiarity of space and buildings, but also because we are used to navigate as citizens of urban space, participating in social and cultural life of the city.
Working with this urban grid proved permissive and robust in integrating tourism, media, new technologies applied to buildings while shading the details of unoccupied (un-built) space.
Many (design)briefs specified by professionals aiming to fill some spaces with buildings, or only with uses, found a response in the regeneration of a particular area, in the shape of a building integrated in terms of expression and texture or on the contrary through a statement-manifest-building, the later being in a relation of contrasting expression but also a support of the concept of cultural space-valuable space, adding or not, depending on the

zoning, elements of detail meant to integrate signs/signals of reference. In both cases the **new insertion has the tendency to form by overlaying the predefined and constituted space -** an **arguable** process in all circumstances: how will the new insertion integrate as shape, texture, silhouette, or use? Will it generate conflict or not? Will the conflict be "deployed" directly in the urban space? Or only in the adjacent cultural space, fueled by numerous debates between different categories of professional public and civil society. Will it be accepted or not? Or even generate the expected marketing contribution?

What would be the future look of an established center which permanently accepts insertions? How will the atmosphere be in urban scenery that changes proportions, textures and even space regulars - people who actively inhabit by living, work or leisure, or types of possible present and future space visitors attracted by the charm of the space or the activities taking place. Will it attract or reject? Will it draw whatever space regulars desire or will it generate sporadic undesirable social effects?

3. Filling the holes in the urban pattern

Known tendencies of the modern city are to agglomerate the center by aggregating suburbs, thus the center and the **central poles of cities are undergoing a process of continuous tension and pressure towards densification, and even height growth** by addition of high buildings. Population growth in major urban centers is one of the urban stress factors which makes difficult the optimal extension of the suburb territory, and which is pressuring for insertion into the central or valuable areas.
Contemporary urbanism tackles new principles of master planning: **ecological urbanism, sustainable urbanism, effective urbanism, cohesive public space based on multiculturalism and tradition, with the intent to counterbalance the effects of global, demographic and climate challenges**.
Setting a "method" has always been questionable, so was the creation of architectural "objects" considered an obsolete approach. Connecting to activities and public space has become mandatory, as well as conceiving objects based on the dynamic-cinematic perception principle, movement sequences, different in approach to static perception- usual framing; memory of place and time, considered extended over the future space, created another approach in interpreting successive analysis of overlaid networks of space.
In the 'Manifesto for a Cinematic Architecture', Pascal Schoening states "the true essence of architecture is no less cinematic than complete transformation of solid-materialistic architecture in the process of changing forever bright and inspirational events energized where past, present and future act in spatial time defined by the duration perceivable through our senses and structured by our mental ability, hence the effect of the independent movement of matter in space which is physics cinematic and which is emphasized by often contradictory revelations of the type of cinematic sequences in films of the narrative memory thus reaching otherwise impossible space and time simultaneity."**[2]**

A direct quantifiable method would be to count the points of space - buildings, styles, functions, trails, landmarks, signs - on different levels, can lead to a spatial algorithmic analysis forming networks – urban meshes of diverse criteria and human perspectives; the study of space overlays on urban layers can generate diagrams of multi-oriented surfaces functions.
The city considered a superposition of layers of functions, relationships, activities, time, space and memories, becomes a cluster of successive networks, more dense or ' relaxed ', to which the architecture insertion is destined to fill correctly the space. A 'filling' not allowed by topographical mapping lines would mean a dysfunction, a wrong or a free gesture.
The object – center of perception no longer exists in itself, at least in concept, freedom of perception breaks it based on the principles of successive-waves, compensating the functions of the sign of a generative center, and establishing with existing networks that relationship of polarization in flow, while avoiding the readjustments of successive layers of the urban environment. Contemporary architecture heads towards narration of intents and the interpretation of space lines in the sense of decomposing and naturalistic generalization of a hybridized environment through the patina of time along with the technology of contemporary functionality.
Momentary discontinuities, isolated or overlapping city networks could mean an immediate need for intervention on the repetitive layer / layers in a coherent approach to the types of successive discontinuities in a manner of network/networks "repair" by intervening the way of 'repairing' the network / network components by acting upon the components of the cultural space.
Superimposition of these diagrams may have as purpose a momentary or permanent identification of space "holes" or space of "nodes" as possible space key-places.
"City space City, or better said, architecture space starts by making holes, turning into a continuous and spongy fluid that gives room to change and facilitates the meeting participants - subjects." (Who will 'act' in new located space) - *The Metapolis Dictionary of Advanced Architecture.* **[3]**

This formal algorithm would mean a decoding the meanings of urban space, and a supposition to support at the level of cultural -social-anthropological continuity of urban spaces predefined as valued status spaces. I am referring here urban identical only to themselves **[4]**, as unique spaces, by particular historical setting - 'cores' or city centers, disposed as packed form or as axis along the lines of major landscape - river / hills / waterfronts / historically set landscape lines - castles, city walls etc..
"Holes are changing/surprise 'playing cards', agents of 'nothing', 'non-box' can be played at the best moment, infiltrated, exposed and converted into almost anything. Holes are also weak and easily manipulated, small - in line - and the same, in situations that are confused with 'windows'; regrouped they show their potential above all in difficult operations. The strategy of self-dissemination or size change proves them to be very effective in well-rooted layers and boxes. Holes were first foundation of the "boxes". Gordon Matta Clark knew this - and opened them. Holes are a project. "- *The Metapolis Dictionary of Advanced Architecture.* **[5]**

4. Conclusions

Due to education and habit, European individual expects to cast himself and his life over a valuable cultural background filled with history and an active memory of emotionally evocative events at the community level.
He is used to spend his free time in the pedestrian areas and plazas, as well as to travel the urban promenade paths for the sake of aesthetic pleasure. And if it this is the community space, he becomes tightly involved with the urban events he can attend or become a part of.
Completion of activities or routes also depends on changes in the built environment, but such interventions should not be defined only in 'hollow places' of space. Here we can mention the actual holes in physical space generated by missing buildings or areas, holes in the space of anthropological representation – like the gaps in the routes, the missing links in the space of human architectural-perception language, a lack of shape connection between activity and space or the lack of reference or continuity or the existence of conceptual 'threshold' of space difficult to surpass in learning and experience of the aesthetic.
No doubt the built environment of the city is the most important background; it is a part of life and image, of urban memories, but especially part of the sense of belonging to a certain city / space or not, and it is another network of textures, lines and urban scenes.
Lack of identification may lead to confusion, depression, or complex psychological effects, with repercussions on daytime behavior or an increase in aggression and boredom, but also to a lack of emotional reference and targets – talking of the 'afluenza' **[6]** syndrome enunciated by Oliver James, in his book with the same name.
Defining the discontinuities creates the premise for 'filling' these space holes, with + or - spaces -, but always in the predefined sense of the original space, without which the urban insertion could be challenged and rejected as part of the life of city images.

Acknowledgements

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INTERIOR PARTITION WALLS İN MEDİTERRANEAN CLİMATES
Lightweight versus heavyweight

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Abstract

The aim of this paper is to analyse the environmental and functional performance of interior partition wall technologies existing in Mediterranean climates, specifically on Portuguese territory. The evolution of interior partition walls, namely by the evolution of its weight, is presented and discussed. "Light-tech" bets on the introduction of more efficient systems by the weight reduction of constructive elements. This allows saving material and energetic resources, what constitutes a relevant response to the growing concerns over environmental issues and incertitude on economic development. But if lightweight solutions can be potentially interesting from the point of view of the environmental impacts associated with the production of materials, on the other hand it can be problematic from the point of view of the thermal comfort energetic demands. In a Mediterranean climate, the insufficient thermal inertia and acoustic insulation, due to the reduced mass of its constructive elements can constitute a severe problem. But thermal mass can be assured by slabs, exterior walls and in dwellings' dividing walls. The functional problems associated with lightweight solutions are not as relevant in internal partitions. Apart from this, lightweight sandwich configurations can be used to increase thermal and acoustic insulation if the air gap between external finishing layers is filled by absorbent materials, such as rockwool.
This paper focus on the advantages of the lightweight existing partition walls and it is expected that may contribute for the development of new partition wall technologies. The traditional lightweight solutions are compared with the conventional heavyweight solutions. The analysis shows that interior lightweight partition walls present lower environmental impacts than the heavyweight solutions.

Keywords: interior partition walls and environmental sustainability assessment.

1. Introduction

Interior partition walls are thin elements built to divide the indoor space into rooms or other compartments. The importance of these building elements is reflected in the global construction cost, estimated by Köning et al [1] at about 15 percent in office and administration buildings of European countries.
Generally, partition walls are non-load bearing. In terms of structural resistance, it needs only to be strong enough to support itself under normal conditions of service. Others requirements of a partition wall are: the capacity to resist to accidental impacts resulting from the occupation of the building. Weight plays an increasingly significant role when it comes to the environmental impact of a building. In general lightweight solutions present less embodied energy and save fuel on transport to the building site, and can be designed with smaller assembly fittings [2].
Addis & Schouten [3] refer that partitions have emerged as building sub-systems as result of several factors, including the development of frame construction where internal walls are no longer required to have a load-bearing function. These elements are often used to include electric and hydraulic infrastructures, supporting suspended furniture, lighting or decorative objects. Due to emergent aspects like - the speed of organisational and technological change; the increased number and complexity of services to be accommodated; quality and aesthetic issues and the need for acoustic separation of areas, the contemporary internal partition walls present new challenges.
In European Paleolithic period, the use of animal skins supported by large bones or wooden poles to construct interior dividing walls in caves constituted an important innovation for future developments of exterior artificial dwellings, where the structural supporting element is independent from the covering layer (Figure 1) [4].
By analysing the evolution of internal partition walls, shown at Figure 2, it is possible to verify that an initial tendency for lightweight solutions evolved to heavyweight. However, nowadays it can be verified a tendency to the return of lightweight solutions that can include easier construction/deconstruction design principles.

Figure 1: Reconstruction of a pre-historic shelter founded in the interior space of a cave in Lazaret, Nice [4].

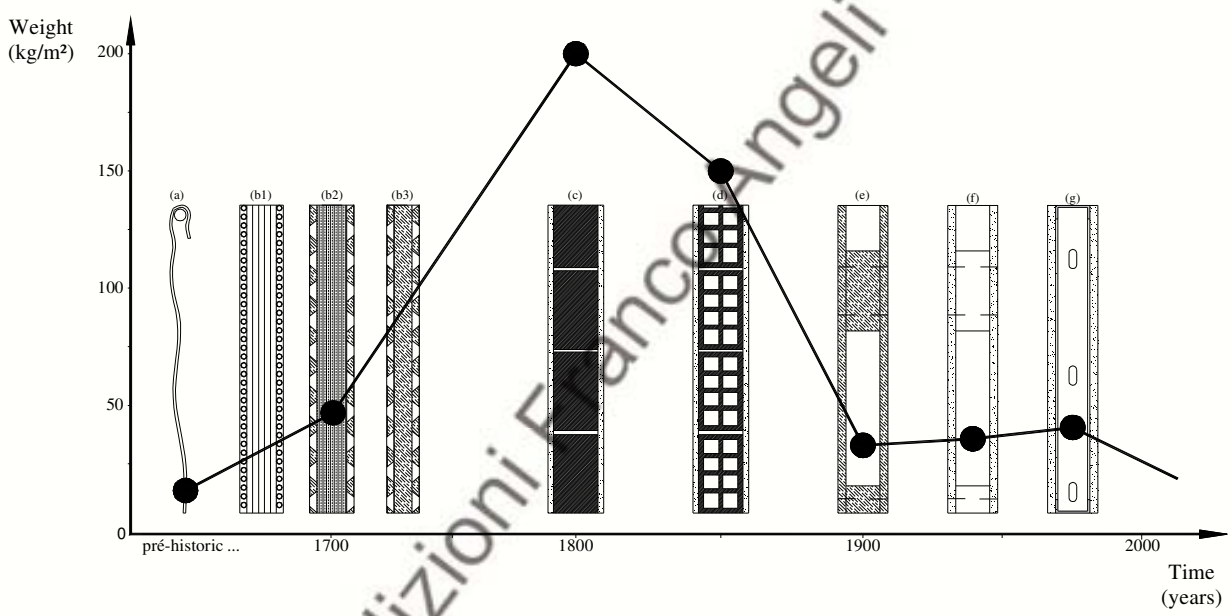


Figure 2: Weight evolution of the interior partition walls in Portugal throughout time: (a) animal skin coating vegetable poles or bones; (b1) mat canes filled with reed; (b2) Wattle and daub filled with straw; (b3) wattle and daub with planks; (c) Solid Brick; (d) Hollow Brick; (e) Wooden board with timber frame; (f) Plasterboard panel with timber frame; (g) Plasterboard panel with metal frame.

The most representative type of contemporary building construction in Portugal consists of steel reinforced concrete structures with hollow brick masonry walls and beam and pot slabs. The conventional system of interior partition walls is simple pane non structural hollow brick. This solution have demonstrated reasonable thermal and acoustic performance, fire behavior and durability, but it presents disadvantages in term or embodied energy, lack of flexibility, recyclability and reuse.

2. Interior partition wall solutions in Mediterranean Climates

Mediterranean-climate regions are located approximately between 40º latitude north and south from the equator, usually occurring on the western side of continents. It is characterized by high availability of solar resources in winter and some coolness of the nights in summer, which offer a good opportunity for achieving thermal comfort at low energy cost and reduced CO_2 emissions, if an appropriate design of the building envelope is adopted, including shading and thermal gains, complemented with thermal mass [2] [5].

2.1. Cases of studies in Continental Portugal

This study take as reference the lightweight constructive solutions of existing dividing walls in south Europe, and specifically in Portugal. All over the country, but with higher incidence in North and Centre, the traditional

lightweight walls that can be found are made with timber frame and planking combined with mortars and masonry. However, the vernacular examples vary between regions due to the availability of raw materials.
The examples shown on Figure 3 illustrate the evolution of the dividing wall solutions in Portugal. The most common solutions that can be considered as vernacular [6] are: blocks of earth dried in the sun (adobe) - characteristics of clay-rich zones, essentially in the south regions of Alentejo and Algarve, and the wattle and daub (Figure 3(c)) widespread through all the country, called as "tabique" (in all Portugal) and as "taipa de fasquio", (in the north region of Minho). This last one is made up of wooden planks placed vertically or in diagonal, over which are placed horizontally small strips of trapezoidal section, in which is adhered the mortar. Other solution combines timber frame filled with canes/reed. However, due to the lost tradition of techniques employed and consequent rising cost of hand labour, these solutions gave way to other wall types, such as the massive brick (Figure 2(c)), which later derived to the hollow brick wall (Figure 3(d)).
The use of ceramic hollow brick in non structural masonry became increasingly common, either by economic as well as ease of implementation reasons. With thicknesses, without finishing plaster, varying between 7 and 22cm, but more frequently with 11cm in interior walls, this system became the preferred solution and still remains in present times. Even if new and more efficient solutions are appearing in the market, most of them cannot compete with hollow brick, not only for the economical cost, but also due to the conservative mentality of the diverse agents of the construction sector.
One exception is a solution that has been experiencing a great development since the 70's, the plasterboard panel. First it had a timber structure filled with a honeycomb cardboard in which were fixed the plasterboard plates (Figure 3(e)). Later, around the 90's, the wood structure was replaced by light steel gauge frames (Figure 3(f)). This type of partitions can be built with 51 × 76mm or 51 × 100mm studs spaced at 400 or 600mm, depending on the type and thickness of the wall finish used.

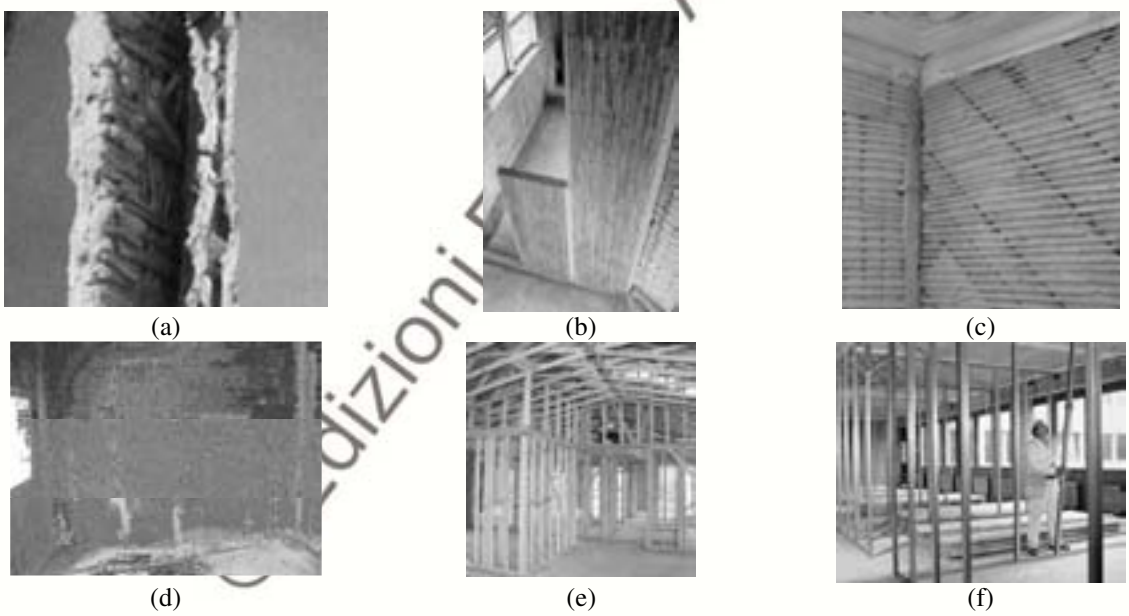
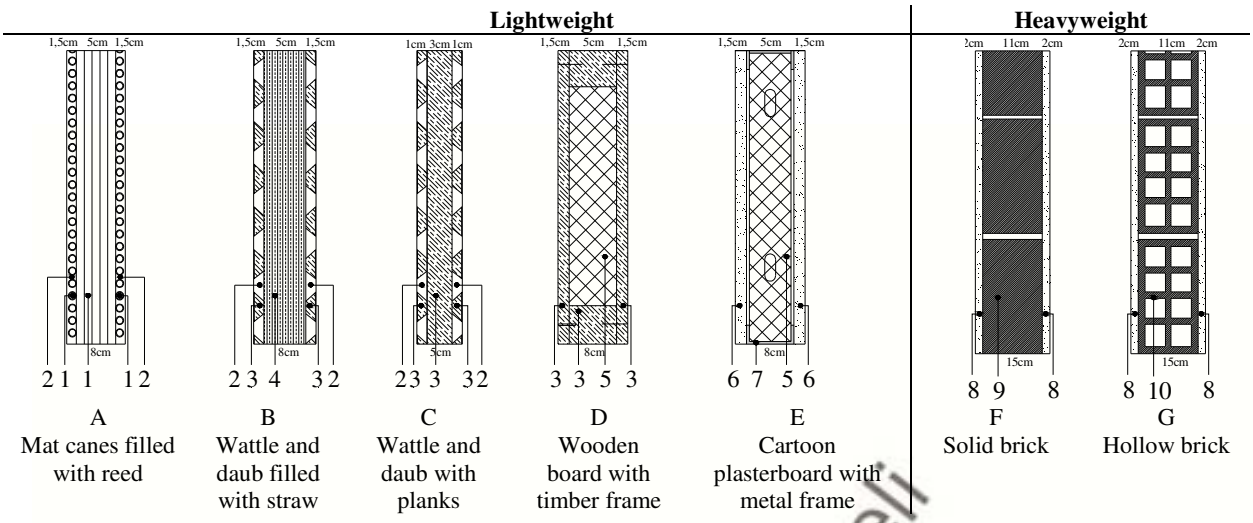


Figure 3: Non-loadbearing partitions walls in Portugal: (a) Mat canes in Lagos, Portugal; (b) wood frame filled with reed/straw; (c) Wattle and daub partition in Guimarães, Portugal; (d) Hollow brick; (e). Timberboard with wood frame; (f) Plasterboard with light steel gauge frame.

2.2. Environmental assessment

The environmental impact assessment of an internal partition wall solution result directly from the attributes of the materials used, such as its embodied energy, its thermal properties, and from the way the solution is built and maintained. This study compares (Table 1): heavyweight conventional masonry partition wall (figure 4G), solid brick wall (figure 4F) with lightweight solutions such as mat canes filled with reed (Figure 4A), timber frame filled with straw (Figure 5B), wattle and daub (Figure 4C), wooden board with timber frame and rock wool insulation (Figure D) and plasterboard partition wall, that is the most common, with light steel frame structure and rock wool (Figure 4E). These solutions present two considerable differences: the weight and the type of building technology. The lightweight solutions allow a lower specific embodied energy and other more favourable environmental impact indicators. Compared to conventional heavyweight solutions, such as hollow brick walls (Figure 4G), solid brick, lightweight solutions allow also easier deconstruction/reuse scenarios.
The values presented on Table 1 result from a numerical simulation based in reference data [1] [7] [8].



Legend: 1. Canes/reed; 2. Plaster withsand; 3. Local pine wood; 4. Straw/ reed; 5. Rock wool; 6. Cartoon plasterboard; 7. Gauge steel frame; 8. Mortar; 9. Ceramic solid brick; 10. Ceramic hollow brick and 12. PVC/ Polyester membrane.

Figure 4: Transversal sections of lightweight and heavyweight interior dividing wall technologies analyzed.

Table 1: Environmental impacts of the considered solutions.

	Lightweight					Heavyweight	
Impact categories	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Specific Weight (kg/m^2)	17,5	28,0	39,0	19,0	30,4	386,0	179,0
EE [1] (kWh/m^2)	37,0	27,6	14,3	12,8	61,7	456,9	139,8
GWP [2] (g/m^2)	971,0	2462,0	4182,0	2330,7	14386,7	69646,4	23218,0
AP [3] (g/m^2)	7,6	20,2	35,2	29,6	114,0	723,4	217,1
COD [4] POCP[4] (g/m^2)	104,5	214,0	229,0	28,0	2210,9	6324,8	2340,3
Generated Waste (g/m^2)	161,5	323,0	698,0	1012,0	2552,4	30725,0	6052,4
U value[6] (W/m^2.ºC)	0,6	0,7	1,4	0,6	0,7	2,32	1,8

[1] EE (Embodied Energy).
[2] GWP (Global Warming Potential) in equivalent CO_2 grams.
[3]AP (Acidification Potential) in equivalent.CO_2 grams.
[4]COD (Chemical Oxygen Depletion) in equivalent NO_x grams; POCP (Photochemical Ozone Creation Potential) in equivalent.NO_x.
[5] Generated waste in production process.
[6] Coefficient of Heat Transmission [8].

3. Results and discussion

3.1. Lightweight versus heavyweight constructive solutions

From the results presented in Table 1, comparing the lightweight and the heavyweight constructive solutions, it is possible to conclude that environmental impact is lower in lightweight solutions. Between lightweight traditional Mediterranean solutions, like A B, C and D, the better solution is A, Mat canes filled with reed, except in COD/ POCP and PEC indicators. However, solution D, wooden board with timber frame filled with rock wool, present a good environmental performance too, with the best values of EE and COD/POCP indicators, but it presents the second worst level of Generated Waste, when compared with other lightweight solutions.
The heavier of the lightweight solutions, C, presents the worst thermal performance. However it presents a low EE.
From the analysis of the solutions presented it can be concluded that to achieve a solution with low environmental impact levels it is necessary to reduce the quantity of materials used, especially those resulting from a more industrialized and high energy consumption producing process, with high EE, such as gauge steel frame or rock wool. For example, reed and cork present a lower EE than rockwool.

4. Conclusion

Lightweight interior partition walls are certainly a wiser option in many situations as these can be more flexible and even portable, in some cases. The lower quantity of materials used in lightweight solutions allow a lower specific embodied energy and other more favourable environmental impact indicators. The reduction of material inputs to the minimum is a way to achieve higher eco-efficiency in a building and thus open the way to the development of efficient interior partition systems. The need for more sustainable construction innovative solutions has also motivated this study and development of materials and construction technologies using lightweight materials.

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NEW SUSTAINABLE BUILDING SOLUTIONS IN SARDINIA

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Abstract

The awareness of human activities results on environment produces the need to research solutions able to cut down them.
In architecture it is desirable that this awareness lead to eco-responsible actions as the use of renewable natural materials that are found and made *in loco*.
The research of local natural materials (such as straw-fibre, pure virgin wool from indigenous sheep of Sardinia and vegetable fibre) and of reusable load-bearing (such as pallet) with the analysis of dry construction technics (such as the platform method) have led to building solutions not much energy-addicted, according to the Life Cycle Assessment (LCA), but much comfortable by a thermal and hygrometric point a view.
The purpose is to suggest sustainable technical solutions saving an architectural landscape in which building materials are the essence of local language.

Keywords: natural materials, LCA, sustainability

1. Introduction

In the last decades the awareness of pollution effects on human health and of narrowness of material and Energy resources has sprung a growing attention on environment.
Current statistical data show that the most impressive productive field is the building one, this is according to CO_2 introduced in atmosphere and to raw materials impoverishment. Buildings we live and work in, where we spend 90% of our life, use mainly 40% of primary energy and 40% of raw materials and produce 30% of rubbish.
Architects, engineers and builders should relieve this uncomfortable situation by suggesting sustainable building experiences and actions for the Energy consumption control.
Competitiveness in the production field should be based not only on low cost of materials but also on their sustainability: in the last period commerce is full of stuff labelled as 'sustainable', 'biocompatible', 'ecological', etc.
According to this reference frame the requirement to understand the real path toward buildings and materials sustainability is more and more relevant, the same goes to achieve this sustainability by simple choices made in a responsible environmentally friendly way and to architectural quality benefit.
Firstly this research wants to expand a planning method supplying bio-responsible actions, especially in the decisive step of materials and building technics choice, attending an holistic approach that includes the technical-architectural analysis, the study of the context and of the social-cultural, environmental and financial systems.
This methodology set oneself the target of studying new really sustainable building solutions suitable in the Sardinian and Mediterranean context.

2. Method

The research arises from the development of subsequent analyses and goals that, starting from general notices, as the definition of 'sustainability' and 'sustainable development', arrive to the determination of technical-scientific solutions related to the real architectural field (as from LCA approach until the research of local natural materials and their sustainable employment.

2.1. Sustainability and sustainable development

The word 'sustainability' is ever more present in our daily talk and the adjective 'sustainable' is often associated with whatever idea or plan related with the notion of 'development' and 'future' in financial, social, environmental and institutional field.

The definition of 'sustainability', currently and widely recognised, is bound up with the concept of 'sustainable development' dealt in the Brundtland Report expounded in 1987 by the WCED (World Commission Environment and Development). This report contains the following definition:
"*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:*

- *the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and*
- *the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs*".

Every action that involves in a transformation should aim at satisfying present and future generations needs, by giving up injurious actions to economy, society, environment and institutions.
A less methodological and more numerical definition of 'sustainable development' can be deduced by the economists David Pearce, Kerry Turner and Ian Bateman thought's interpretation [1]: 'sustainable development' occurs when the rate of extraction of natural resources is so much to assure its preservation by keeping in natural balance its final rate of reproduction [2].
This research plans to study sustainable building solutions, that means to explore techniques and materials that observe the three following rules of a sustainable management of resources in the long term [3]:
1. for renewable resources, the employment rates shouldn't beat the resources regeneration rates;
2. pollutant emissions shouldn't exceed ecosystems assimilation skill;
3. non-renewable resources should be used so that their employment rate is limited to renewable substitutes creation's rate.

2.2. *Life Cycle Assessment* (LCA)

Life Cycle Assessment (LCA) is an instrument introduced for the first time in 1993 to manage 'sustainablely' every process, product or activity[4].
Life Cycle Assessment, according to SETAC (Society of Environmental Toxicology and Chemistry) definition is "*a process to evaluate the environmental burdens associated with a product, process, or activity by identifying and quantifying energy and materials used and wastes released to the environment; to assess the impact of those energy and materials used and releases to the environment; and to identify and evaluate opportunities to affect environmental improvements. The assessment includes the entire life cycle of the product, process or activity, encompassing, extracting and processing raw materials; manufacturing, transportation and distribution; use, re-use, maintenance; recycling, and final disposal*".
'Life cycle thinking' means to be conscious of damages or environmental capability present in every step of the life cycle, trying to balance and to make positive environmental, financial and social effects by defining product's dangers definition and its environmental opportunities.
At the same time an environmental sustainable building activity should assure the minimization of own environmental effect and the reduction of its damage risk; this is possible observing the entire life cycle and the energetic exchange of building system.
Energetic and environmental wastes regard not only the building and its interaction with the users, the climate and the ground but they contemplate also the raw materials supply, the building system use and reuse and its final disposal. So it's important that this method support planners since the early step of planning, such as the building materials choice, so that they could achieve bio-responsible actions.
The absence of objective evaluation criteria, that can be scientifically certified, has sprung the need of a method to define what is really biocompatible and that, unfortunately , it is actually object of generic considerations.
This has lead to the definition of guidelines, still in progress, related to European Standards, such as the UNI EN ISO 14040 and 14044 Standards about products' life cycle assessment [5].
According to this reference frame, the 'life cycle' method appears to be essential to this research for the choice of building materials and for the study of building solutions not much energy-addicted but much comfortable by a thermal and hygrometric point a view.

2.3. Natural sustainable materials

In the last years building commerce appears more responsible and aware towards problems like the climatic revolution and the endless resources' waste. Actually, new building materials are assessed in terms of financial, environmental and social bio-compatibility, and someone manages to obtain the Type I, II or III environmental labels [6].
In the architectural field, we are going through a phase related to the rediscovery of material and human local resources history and use: the historical local building heritage is become source of inspiration for a built

environment's new quality. The reuse of renewable natural materials that are found and made *in loco* makes the first move towards a biocompatible architecture based on sustainability.
Sardinia, on its side, is launching on the market local natural products, 'innovative' in their use, such as the sheep wool, the cork, the natural lime mortar for plasters, and other ones, within a sustainable building process moved by the synergistic actions of researchers, planners, producers, local advisers and building operators.

Figure 1. The natural materials and the building culture of the past in Sardinia.

Figure 2. Some local 'innovative' natural material.

This research considers some of these local materials, such as the sheep wool and the straw-fibre, normally used as insulators.
The research is actually oriented towards a vegetable called *typha latifolia* that grows spontaneously along rivers banks or in moist areas and that, advisably processed, is used in Austria as insulating board.
Another material examined is the *pallet*, considered as disused from its usual employment and reused as structural element of a load-bearing board.
The research studies the life cycle of these materials and, supported by scientific literature, analyses their production's energetic contribution, their physical, technical, thermal and hygrometrical features and their use in architecture.

3. Results

The early results have defined a pallet load-boarding panel containing straw-fibre or more slabs of pure virgin wool from indigenous sheep of Sardinia. The panel is supposed installed according to the dry construction technique called 'platform method', actually employed for X-lam load-bearing board assembling.
The next step of the research is to expand the same inquiry (life cycle analysis, production's energetic contribution, physical, technical, thermal and hygrometrical features) to the single panel.
The final purpose is to obtain an environmental certification for the entire building system based on *life cycle* method.

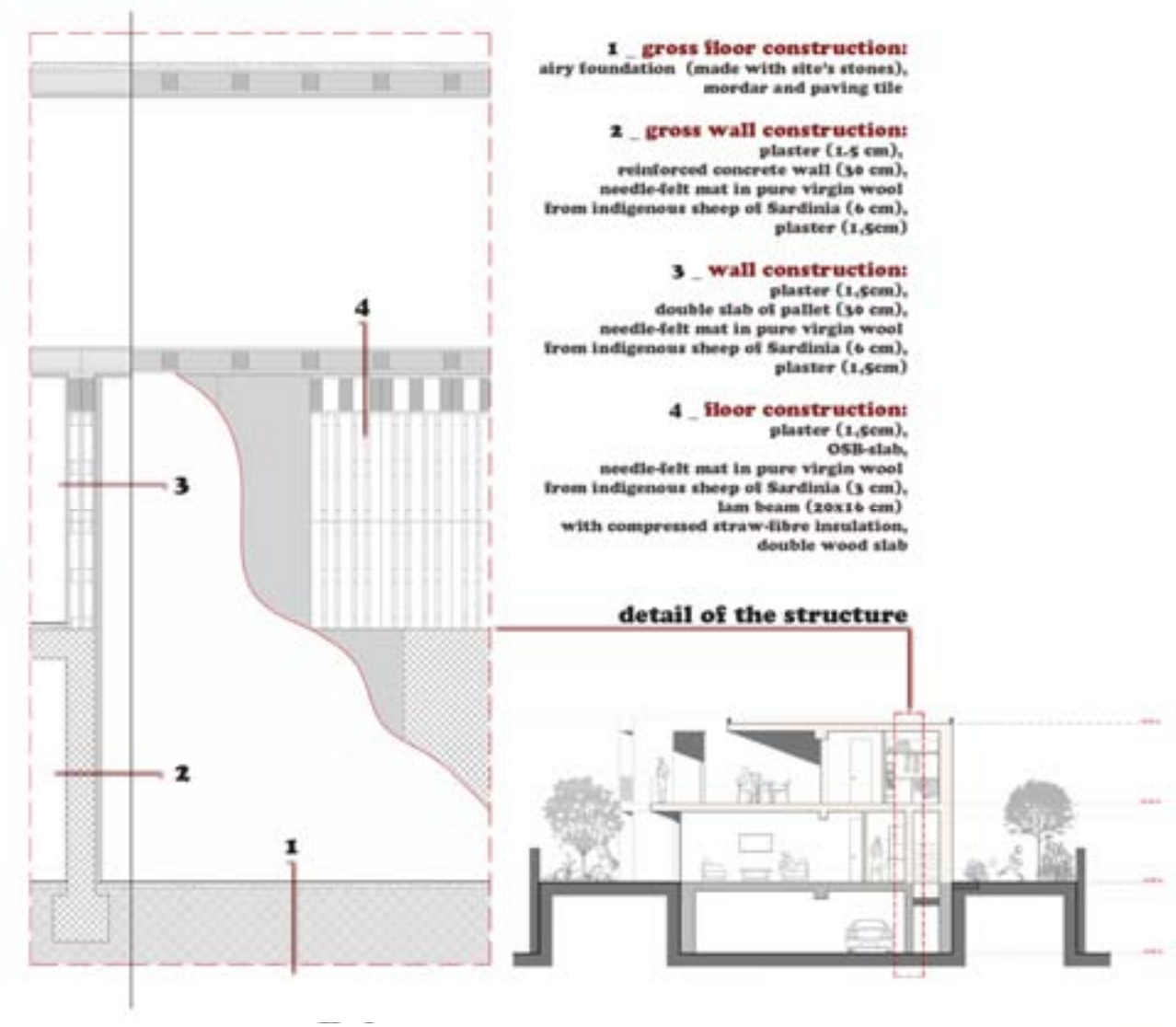

Figure 3. Example of structure made by pallet and wool panel.

4. Conclusions

The research, still in progress, of which we have reported principally the adopted methodology, has had as firm aim to study building solutions with all due respect to the environmental subjects (by LCA approach), to local building identity and culture.

At the same time the research deals with local finantial and social problems, and, in accordance with sustainable development's actions constantly promoted by Public Administrations and financed by European Community, pursues those natural resources (sheep wool and straw-fibre) that, if advisely exploited, could contribute to the crisis clearing in some local productive sector (such as the agropastoral one) and could start new commercial forms and occupational opportunities.

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THE BUILDING ENVELOPE BETWEEN PROCESS AND PRODUCT INNOVATION

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Abstract

In the face of climate change, scarcity of resources, the implications arising from the "unsustainable" and "precarious" construction, the Mediterranean regions have developed their own strategies, without starting at the same time a common approach in residential construction sector.

Therefore, developing and promoting a Mediterranean housing, capable of responding to new environmental and energy challenges, represents an opportunity to identify what to keep and what to transform into the system. By analyzing, in particular, a complex system like the building organization, we understand that product innovation is unsuccessful without innovation project: the development of any innovative system necessarily requires a review of design practices in order to assess coherence, interaction with other technical elements and exploitation of its potential.

For these reasons, the study of the building enclosure in the Mediterranean area is a ground of fertile experimentation to focus on process and product innovation: the latter related even to the evaluation of the entire life cycle of materials and components to be used. It follows, therefore, the need to establish a kind of neovernacular architecture, also based on the principles of "climate-sensitive building", which aims to restore a proper relationship between buildings and environment through a new cognitive approach of building elements and materials, traditional and advanced, in relation to the performance attributes of the same ones.

Key words: Building enclosure, innovative materials, sustainability, hybridization techniques, technology transfer.

1. Introduction

Techniques, technologies, construction methods and architecture have always been so able to adapt to the climatic conditions of the places and conform to their social and cultural context, in particular in the Mediterranean area, characterized by appreciable seasonal varieties. The ability to adapt to climate has represented an important reference for bioclimatic architecture that since the nineties, re-proposed, in an innovative key, some concepts of constructive regionalism but revised in the light of new demands posed by the Modern Movement [1].

From those years, a deep, albeit slow, transforming process starts in the design and manufacturing approach that looks more closely - and especially from necessity - at the "sustainability" not only in terms of saving resources, but also of cultural heritage storage that finds in the Mediterranean habitat a place of common origins and traditions. Numerous researches and studies on the definition of Mediterranean house refer to the idea of a collective art featuring by established contact points in the tradition while delivering innovative and technologically advanced construction methods especially in energy saving, that however report to some construction archetypes, where the climate and microclimate are significative inputs for a different approach to design.

It is no doubt that climate change - that leads today to talk about "tropicalization" - and at the same time, the often disorganized urbanization of the city - which has increased the problems associated with the formation of "heat islands" - have generated significant increases in temperatures, especially in large urban areas, where extensive use of plant represented the most immediate and effective solution for several years.
The energy crisis and the not secondary need of comfort facilities required by users, today more sensitive and careful, is leading the construction sector, albeit through a slow process, to overcome the approval of the technical and technological solutions imposed by globalization to propose buildings adapted to the conditions of the environment and use and / or optimization of local resources in the Mediterranean area are supported by an established tradition of building: more attention, therefore, to the type and shape but also to the enclosure, no longer considered as a simple protection, but a dynamic interface between building body and external environmental system [2].
It follows that the overall quality of a building is related largely to the technological features of its "enclosure", that is "the functional complex element" to which is assigned the task of ensuring an effective balance between internal and external; the temperature range of Mediterranean climates, both daily and seasonal, accentuates the need for both active and passive monitoring of climatic factors to ensure the heating and natural cooling of buildings thus reducing the use of nonrenewable energy sources: this means greater attention to envelope thermal performance,

which must ensure a control of heat loss in winter and control thermal loads associated with the solar radiation in the summer.
In view, therefore, of increasing environmental concerns, in particular the energy problem - which links the "project" to the environmental context of reference - the design approach should not be regardless of local conditions, but it should refer to indications of "climate sensitive building", where passive devices such as thermal insulation, building orientation, are combined with active and innovative devices (solar screens, envelope transparent systems) also fostering the widespread use of renewable energy to meet the emerging instances of eco-compatibility [3].
In this regard, it should be remembered how the innovation of the design process - that determines the morphological-spatial configuration and the technological characteristics of the buildings - is moving increasingly towards these instances, also addressing the productive sector towards the construction of materials and technical innovative elements that optimize the environmental performance of the building system.

2. The building envelope in the Mediterranean area: toward innovation in the design process.

Within the expression "building process", it is necessary to focus attention on the phase of its "decision making process" and, specifically, on the design one whose choices determine the final quality of the building.

The Mediterranean technological culture, as already mentioned, derives historically from a design approach close to the characteristics of the place, climate and resources available, and from the ability to respond - through appropriate typological and constructive solutions - to the social, cultural and environmental needs; it represents, therefore, an useful reference model because, in the wake of the current requirements of sustainability and reduction in energy consumption of buildings, it is unique in providing valuable guidance on design processes in context that can also be enriched with additional stimuli and stresses arising from technological innovation.
In particular, as regards the traditional architecture, it refers to those envelope strategies to ensure for example, natural ventilation, thermal mass and inertia, solar heat gain control, which should be proposed again and updated to ensure an adequate level of interior comfort.
It should be noted also that the environmental and energy control is connected to the thermo-physical behavior of materials and technological solutions used that can offer different levels of resistance to the passage of heat and that are variable depending on the thickness of the material, the juxtaposition of several functional layers and the attitude to transmit heat (transmittance).
The architecture of the Mediterranean area, in fact, has always favored the adoption of "capacitive" masonry, with significant thicknesses and materials with high thermal inertia, such as stone or brick, able to store the heat of solar radiation contributions in winter and to "tone down", that is to reduce in intensity, and to ensure the "phase displacement", ie the phase delay with respect to temperature peaks during the summer.
Referring to the affirmation of T. Herzog, who considers the building envelope to all intents and purposes, the "skin" of a building, working on this in the Mediterranean area means carefully investigating the relationship between interior and exterior, the ability to filter or shield the solar radiation, the contribution, in terms of microclimate mitigation, of space-filter between the external environment and internal environment (porches, balconies, patios, courtyards, galleries, conservatories, verandas) that can stretch, shrink and change, helping to create comfortable conditions inside.

The traditional architecture has produced, in past centuries, several examples that highlight the opportunity to create buildings whose formal and technical-constructive characteristics interact coherently with the environmental context of reference, to enable proper natural air-conditioning of the interior.
The evolution of this approach has led, in recent years, the realization of the "climate-sensitive building", ie dynamic buildings capable of changing the thermo-physical responses depending on varying climatic conditions, as characterized by adaptability and flexibility of formal and technological structures in regard to the external environment. This peculiarity, which is the "adaptive" ability, can be either passive or active; the latter case includes the possibility of changing the conformation of the technical elements in order to activate, therefore, a proper interaction between outdoor and indoor environment. The definition of new construction buildings in the Mediterranean area should be designed in the wake of these project features and technology strategies, in order to respond adequately to the needs of environmental and energy sustainability.
The flexible behavior of the climate-sensitive building permits, therefore, a significant reduction of energy consumption for air conditioning during summer than in winter, often associated with widespread use of renewable energy sources.
In this regard, it is useful to point out that on the basis of the experience of Passivhaus, valuable reference for designing energy efficient buildings in continental climates, but definitely not suitable for Mediterranean climates, was completed in 2006 the research and dissemination project called "Passive-On", sponsored by the European program SAVE Intelligent Energy and coordinated at European level by the eERG end-use Efficiency eERG Research Group [4].

The project aims at the promotion of passive houses in hot climates indicating the design criteria, for the construction of new buildings, which set the standard "Passivhaus" for the countries of southern Europe. Specifically, the developed "Guidelines" pinpoint some patterns of Passivhaus optimized for three Italian climates, referring to North, Central and South of the peninsula since the microclimate characteristics differ considerably depending on the latitude of reference. These models are also geared to meet the levels of summer comfort provided by the EN 15251 rule *"Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics"*, according to the use or absence of active cooling systems; it also makes extensive reference, in the definition of design strategies, to the typological and constructive measures that derive from traditional Mediterranean architecture. These refer, firstly, to the control of the microclimate in the areas surrounding the building, the type and orientation of the same, the characteristics of open spaces in terms of the presence of elements of microclimate mitigation, such as vegetation and water, the surface area to volume ratio (S / V), the thermal inertia of the envelope and the necessary adoption of the elements of screening and systems to ensure natural ventilation of the building.

Another useful reference is the research project "H-OPUS: Praxis Housing for Urban Sustainability - Management practices of housing for urban sustainability", funded by the European Programme for sustainable urban development URBACT II and aimed to define and promote the use of a Design Code for sustainable development in European cities [5]. Specifically, the UO APSIA [6] - DASTEC - Department of the Mediterranean University of Reggio Calabria - has identified as its objective the development of a methodology for the implementation of energy retrofit actions of an innovative type, appropriate to the microclimatic context, to be applied on the building envelope. The definition of the strategies developed took into account the orientation of the facades of the buildings analyzed, in the area of Reggio Calabria, and the performance weaknesses of the envelope elements and the level of adaptability on the existing. The activities have included, also, a phase of energy audit, done by identifying indicators and through thermal analysis of buildings. The research results have privileged, therefore, the interventions of "additive" type, that is the juxtaposition of functional layers that implement the energy efficiency of the envelope: for example, ventilated walls or sunscreen.
In light of the above mentioned, there is a need a design process that is based on the characteristics of permanence and that is focused also on the innovation potential, aimed at restoring a proper relationship between buildings and the environment through a neo-vernacular architecture, based on a new cognitive approach of materials and construction elements of traditional and advanced type, in relation to the performance attributes of the same ones.

3. Materials and building envelope, between tradition and innovation

In recent decades, the evolution of technology has led progressive changes in the structure of the materials that make up the building envelope, increasing performance and complexity, providing designers with an even wider range of possibilities in construction choices. In particular, there is a general process of specialization of matter layers, involved in defining the quality of the building envelope at different levels: from the configuration of the material, which becomes composite or results from assemblage and integration of different materials, up to the detailed characterization of the different layers, from innermost, generally made by the materials for insulation or waterproofing to the external ones that become a real skin of the building.

The innovations produced in the field of materials have radically changed the way we think and build buildings. New products and systems are facing every day on the market, expanding the options available to the designer, but also the wealth of knowledge necessary for a correct use of more and more innovative technologies often based on the use of advanced materials. These materials are "tailored" for a specific requirement [7] by optimizing the performance expressed in relation to the material "content". The advanced materials used in buildings are often derived from technology transfer processes coming from other industry sectors characterized by strong innovation forces (such as aerospace, automotive and biomedical sectors), where research in the field of materials with higher performance is a prerequisite for the development of increasingly efficient products and systems.

In this regard it is useful to mention the doctoral research thesis completed in 2011 [8] which had as its aim to investigate, through a scientific experimentation, the possibility of use and subsequent placement in the building market, of a laminated material, which derives from the aviation industry: the glare. The research was oriented towards the testing and eventually the prototyping of a new component for the buildings with the combination of different layers that allows you to integrate more features into a single material that takes the form of a sandwich panel, with the possible design of a facade system, the relevant part of the sector of the building envelope .
The proliferation of "advanced", "innovative" or simply "new" material; is not simply the result of general market trends that push for continuous development of products offered, but also reflects a changed condition in the relationship between man and the possibility of matter transformation that has pioneered a different way in development and then "creation" of new materials.

The progress and the mutual interaction of different technology fields (biotechnology and nanotechnology, information and communication technology), have, in fact, revolutionized the world of chemistry and materials technology multiplying the potential and prospects. An example is the high performance concrete or photochromic and thermo chromic glass. With the same principle, special production and synthesis processes can reveal some classes of advanced materials: such as nanocomposites, resulting by the coupling of two or more nanoscale materials, represent a new class of materials to which the scientific community and the industry world are devoting considerable attention. In short, the charming characteristics of these nanostructured materials derived from the ability to appropriately combine nanoscale reinforcement with conventional polymer materials, creating new materials with outstanding physical properties and resistance designed in function of the building envelope according to the required application.

Whereas the traditional materials have a well-established use, therefore, a sufficiently in-depth knowledge and a long and extensive application expertise, for innovative materials are not just those made in more recent times as the so-called configurable materials, whose performance levels can be very high in order to meet specific needs. Therefore, the use of innovative materials also implies a different design approach: the material is designed so that it is appropriate to ensure the performance required and not controlled afterwards, depending on design requirements.
Referring in particular to the transparent component of the building envelope is easy to see how, after the advent of the curtains, there has been no radical innovations in terms of typological and conceptual aspects: the principle behind this solution, in fact, is still formed by the creation of a mesh of extruded outlines in aluminum which is given the task of supporting and squaring the glazing.

On this basis, we have grafted a series of small innovations that, without changing the overall approach, allowed us to enhance their performance. Particularly significant in this context were, on one hand the quality improvement of basic products - extruded aluminum and glass - (such as the bioclimatic pergola of the New Palace of Justice in Reggio Calabria, designed by Manfredi Nicolett, stated below in Fig. 1), on the other hand the introduction of solutions such as the thermal break, which solved the typical problem of high transmission of aluminum, open joints, and the complex history of structural walls, which after a period of great success and interest have been the subject of a partial rethinking dictated by the occurrence of a series of problems, then solved with mechanical adjustments. Another front in constant evolution was that of glazing: stained glass, low-emissivity, reflective, high mechanical strength and, more generally, characterized by configurable performances and calibrated as needed, and in future projection - but only for economic assessments, since the technology is already fully available -, thermochromic and photochromic glasses.

In brief: a basic and largely unchanged concept, accompanied by a marked evolution of the components and then an evolution in design. Fast is the overall context of evolution, characterized in particular by a concept of the building envelope as a control place of building energy performance: complex building, therefore, able to interact in an ever more precise and controlled way with the climatic context, or, for Anglophiles, Climate Sensitive Building. Problem and typical goal of this setting is the maximum control of the energy transfer with the least possible contribution of massive plant, which is, then in theory, only called into question to check and correct those situations that the building envelope "smart" is not able to control . There are many strategies used in achieving this goal. First, the classic double envelope that uses, combined in a variety of configurations, the greenhouse effect and the chimney effect, ranging from an outer casing spaced from the inner - the so-called buffer layer or wafer - possibly also crossed by maintenance walkways, to revisiting double layer in a "thinner way" which also provide a varying degree of integration with the interior of the building.

A second line of advanced design is the control of the dispersions. This is known as thermal insulation in case of low conductivity, characterized by thin walls (so-called vacuum panels); of translucent insulation, made of transparent elements characterized by high resistive capacity and high solar factor; opaque elements, variable in behavior and with high heat storage, sometimes translucent, the so-called PCM (Phase Change Materials), consisting of mixtures of salt hydrates and paraffins, which are exploited for their high heat capacity (about 10 times higher than that of water). A third design / plant front is represented by the numerous attempts of technologies integration, based on solar energy within the enclosure.

In this area, especially photovoltaic and thermal technologies have shown off- photovoltaic, with more or less advanced configurations, which can boast good examples also from the purely architectural profile.

4. The innovation of the building envelope in the Mediterranean area: a case study.

In the New Palace of Justice in Reggio Calabria (Fig. 1), designed by Manfredi Nicoletti, a pioneer in the bioclimatic approach, the projected volumes revolve around a space that once again offers, in an innovative way, the tradition of

the Mediterranean squares. Since the microclimatic characteristics of the context, it is shown that the main problem is to ensure the cooling in the summer, the square is protected by a bioclimatic pergola in aluminum and steel, which controls the microclimate, diffuses light, activates ventilation, reduces energy losses and protects from rain and direct sunlights in summer. As for the characteristics of the building envelope, it has been adopted the solution of ventilated facade with the use of traditional materials and the insertion of brise-soleil on the facades that are more exposed to the solar radiation: these technological strategies are designed to ensure the improvement of thermal comfort, optimum use of natural light, direct control of heat gains and high performance acoustic protection against urban noise.

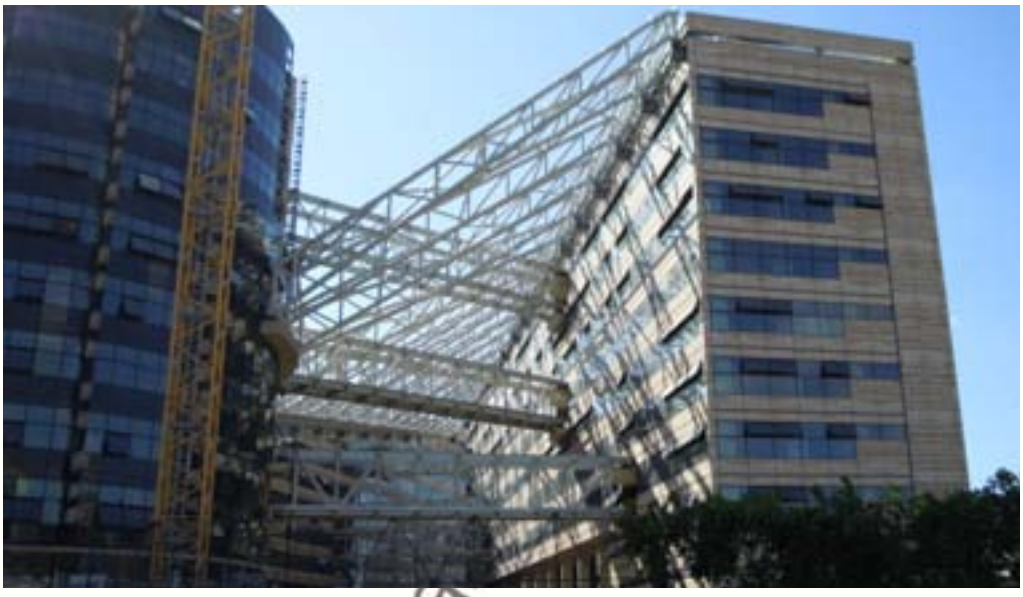

Figure 1. New Palace of Justice in Reggio Calabria, Arch. Manfredi Nicoletti.

5. Conclusion

In this context, it is evident how the design of the building envelope today represents a complex operation, in which very different disciplinary approaches come into contact and are involved. Given the dominant role of technical information for performance monitoring of materials and components of building envelope in both traditional and innovative type, the Department DASTEC of the University of Reggio Calabria, has participated in July 2011 has recently collaborated on a proposal to obtain funding from the PON 2007-2013, Research and Competitiveness, for the "Strengthening of Structures and Scientific and Technological Equipment", obtaining a grant of 8.600,000 €. This proposal involves the construction of a laboratory, the "Building Future Lab", at the Mediterranean University of Reggio Calabria, with instruments – Test Room, Test Cell and Test & Lab - and operational criteria, which are derived from the most current and effective results of research in the field of control on the environmental performance of management and production processes.

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"VALE DOS VINHEDOS"- Landscape and Cultural Heritage
Wood architecture created by Italian immigrants in the South of Brazil

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Abstract

Antonio Prado city, in "Vale dos Vinhedos" country, has the largest national conglomerate of urban wood architecture. The architectural ensemble was built by the Italian immigrants who arrived in the region in 1886. The historical center has 48 houses built in Araucária wood and stone. These buildings were declared national historic landmarks by the "Instituto Nacional do Patrimônio" – IPHAN due to their importance as a representation of the heritage built and preserved by the immigrant's descendants for future generations.

But the preservation of Italian colonial roots does not depend only on architectural heritage. Antonio Prado also keeps traditions, handicrafts, gastronomy and "vitivinicultura" alive. The natural beauty present in this place attracts an increasing number of visitors and industries interested in the heritage and wine production in the "Vale dos Vinhedos", a combination of nature and human work which has created an Evolutionary Cultural Landscape (according to UNESCO) influenced by an association of social, economic, cultural, political and religious aspects. Reflecting in the current evolutionary process and its association and correlation with the environment, the preservation of social context and continuity of the inherited tradition will represent the traces of evolution over time and the story along a historical timeline.

The region includes 25 municipalities. This paper presents the municipality called Antonio Prado, explaining and describing part of the "Vale dos Vinhedos" region, and highlighting the notable Italian immigration architecture of the nineteenth century. In this context, immigrants adapted their European construction techniques to the existing material, the Araucária tree, starting a new genuine architectural style of houses built with long and narrow wood planks and without using metal nails.

Keywords: *architecture; identity; construction techniques; cultural landscapes.*

1 . Introduction

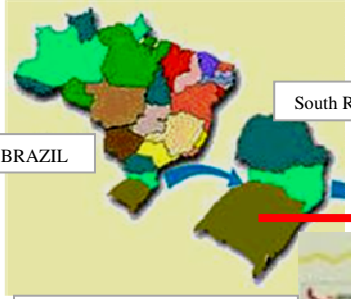
The building of "Vale dos Vinhedos" cultural landscape was highly influenced by Italian immigrants from the Venetia region, who came to the south of Brazil around 1875.

About a million Venetians left their homeland for better living conditions abroad due not only to hard times endured in Italy (economic crisis and other major armed conflicts such war), but also to the intention of expanding their territories through a new colonization program directed to Latin American countries. Part of these immigrants settled in the states of the south of Brazil (Rio Grande do Sul, Santa Catarina, Paraná), where they founded villages and cities. At the beginning, they remained faithful to their Italian culture, traditions and language, and built small and restricted settlements, or villages, that were perfect copies of the "italian villages". As they slowly adapted to new cultural traditions, they started using the material available in the region to build their homes, and finally become an Italian-Brazilian people. Their urban and rural communities had peculiar characteristics, especially concerning the wood houses architecture made of "Araucária", which merged the tradition brought from Italy with the culture

absorbed in Brazil producing a specific and distinct cultural landscape found in the vineyards region of Serra Gaúcha.

2. The Antonio Prado Immigrant Settlement

The "Immigrant Settlement" in Brazil was founded in the 19th when the provincial government launched an immigration policy (in 1848) that donated land and equipment so that immigrants would become landowners and cultivate the land received. "Gleba di Terra" (*Plots of Land*). These "Glebas" were part of lands designated as "fallow ground". In 1875, Italian immigrants built villages and cities and one of them turned out to become "Vale dos Vinhedos" later, a conglomerate of 25 municipalities. The complexity involved in a synchronized study of all the 25 municipalities led to the choice for the cultural landscape of "Vale dos Vinhedos", in the city of Antonio Prado more specifically, and the objective of describing part of this region, highlighting the Italian immigration architecture after the 19th century. [1].



2. Geographic Localization
"Vale dos Vinhedos" -25 cities of the "Serra Gaúcha" (image 01- localization map of the region).
Localization: South region of Brazil
State of Rio Grande do Sul - Serra Gaúcha
Total area: 81.123 km²
Latitude: 33º
Average altitude: 742 meters

Image 01 - map with geographic localization
Reference : EMBRAPA Uva e Vinho - Academia do Vinho/ Universidade de Caxias do Sul-2001.
Publication: The Fine Wine Manufacturers Association of the Vale dos Vinhedos
source: http://www.cnpuv.embrapa.br/publica/anais/igvaledosvinhedos.pdf (access: sep/t2011)

City construction - 1890

Italian descendent immigration family- 1910

Transportation of wine in horse drawn wagons -1910

Group of images (02) historic and cultural heritage of the Italian immigrants of Antônio Prado.
Sour: Municipal Historical Archive of Antônio Prado
Immigrant Museum – Caxias do Sul -http://www.caxias.rs.gov.br/cultura (access may/2011)

The city of Antonio Prado was influenced by the Italian immigration, especially by the people from "Caxias do Sul", forming the 6th Imperial Colony of "Serra Gaúcha", established at the right bank "Rio das Antas" in 14 May 1886. It was baptized with the name "Novo País" (Nuovo Paese – *New Country*)", which was later changed to "Belo País" (Bel Paese – *Beautiful Country*)"; and finally, in honor of the Imperial Minister of the Agriculture, Antonio Prado Silva, who created the colonial settlement of the "fallow" lands in no Rio Grande do Sul [1], it was changed to Antônio Prado. The first immigrants came to the region by an order of the "Immigrant's Hostel" government (Casa degli immigrati)." After that, public funding was destined to the construction of roads, houses and reception of the settlers. The great political events taking place in Brazil, such as the Proclamation of Republic or the Federalist Revolution, in 1893, were no source of interference to the process of immigrant introduction in the "Serra do Rio das Antas", where today seats the urban settlement of Antonio Prado, since 11 February 1899 - decree 220 [1].

Downtown, Garibaldi Square received the first colonial houses of the new immigrant village, called the "immigrant colony", composed by urban plots and rural areas. The square was also the cradle of the first grapevines (grape seedlings), brought by Father Alexander Pelegrini. The immigrants' colonization and establishment beginnings as a community, with their political, social and cultural competences, were built around Garibaldi Square. The center of the new village was projected with a checkered pattern, a typical military engineer organization for villagers in the 19th century.

The traditional architecture of Antônio Prado city, characterized by a composition made of woods extracted from the Araucária trees draws one's attention. All houses had a lower part made of rocks, the "cellar", a reminder of the Italian tradition of constructing a space with a more adequate temperature to store supplies and wine; the place was also used as a deposit of agricultural working tools. These houses were built by immigrants in the passage of the 19th century to the 20th (group of images 02).

3. Architecture created by Italian immigrants

3.1 Construction material: the "Araucária"

When the immigrants first came to the region, they found a forest with a rich and diversified flora and fauna, whose main element was the "Araucária" tree (image 03). During the Italian immigration period the ecosystem went through changes due to cutting of the "Araucária" to build houses and to give place to subsistence agricultures and grape cultivation – the first step to the "vineyards" system. Part of the natural ecosystem was affected but environmental Brazilin laws of protection were able to preserve 43% of indigenous forests.

Image 03- the "Araucária" Woods – Catarinense Highlands.
Source: Marcia Escorteganha may/ 2011

3.2 Construction Techniques

The architecture brought by the Italians to the south of Brazil have a peculiar design. In Italy they used to build their houses in stone because of its abundance and availability while in the south of Brazil the immigrants found plenty of a different material – the wood of "Araucaria" trees. Favorable characteristics of the "Araucaria" wood are its resistance and durability. Besides, they produce long planks for the edification of three-story houses making an elongated façade. One of the first signs of the Italian adaptation in the region was the substitution of stones for wood in the superior parts of the house, living only the cellar configuration unchanged, still in stones – a typical Italian three-story house.

The main characteristics are:

- **Stone cellar** - a space to store supplies, wine and working tools;
- **Ground floor** – a commercial frontal area reserved for a small market of food, shoes or clothing items usually;
- **Second floor** (superior story)- where the family lived;
- **Attic –** bedrooms and food storage room (for some products)
- **Kitchen:** kept initially apart from the rest of the house for the immigrants feared the stove might cause to a fire. As stoves grew safer, the kitchen was incorporated and became a lateral extension of the main construction covered by a shed roof.

Image 04- traditional Italian house built in "Araucária" wood.
Source: www.diezeit.blogspot.com (access sep/2011)

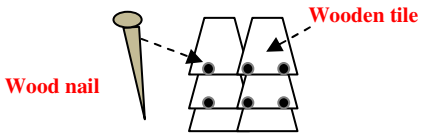


Image 05- Construction technique using wood tiles fixed by wood nails
Author: Marcia Escorteganha- sep/2011

Most of the houses had no painting (image 04), the wood bore its natural color. The "Araucária" planks (0.30 m wide x 7 m high) made the façade look elongated, and the roof was composed of small flat wood rectangles fixed by small "wooden spikes" instead of nails (image 05). With time, the choice for wood in the roofs began to change because of its low resistance and durability against sun and rain. The modern roofs are made of asbestos, zinc or ceramic (French tiles), a modification in the original configuration of the roof.

In the rural area, it is still possible to find the old style roofing. (image 06)

Image 06- typical Italian rural house casa rural - "Araucária" wood.
Source: www.antonioprado.com/atrativos_centro_historico.php (access sep/2011)

A typical decoration on the façades is the "Wooden lacing"- a kind of wood lace-like detailing framing the verandahs and roof borders (group of images- 07).

Group of images 07- Historical and cultural heritage of Antônio Prado.
Source: Municipal Historical Archive of Antônio Prado. www.antonioprado.com.br (access may/2011)

4. Italy as reference

Construction characteristics from some Italian regions were brought by the immigrants, like the three-story houses built in stone. But in the "Vale dos Vinhedos" region, although the houses had a similar aesthetic configuration they were actually built with different kinds of material, going from stone to wood and, thus, creating a new architectural configuration, as we may see and compare by images 08 e 09.

image 08- city view of Belluno- Italy.
Source: www. cuoretriveneto.it/pt/c-belluno.php (access sep/2011)

image 09- Italian wood house in "Araucária" **ANTONIO+PRADO**
Source:**http://2.bp.blogspot.com/ANTONIO+PRADO. jpg** (access sep/2011)

5. Conclusion

The geography the Italian immigrants found in Brazil resembled the one they had left behind, facilitating their adaptation to the "new country". Nevertheless, they never forgot the Italian traditions visible in the construction techniques used to design their villages. Other contributions were the Italian language, or the Italian dialects, which mixed up with Brazilian expressions and gave birth to a new regional dialect known as "Venetian-Brazilian". They have also influenced the local geography with grape plantations and vineyards in the "Serra Gaúcha". The mixture of Italian and Brazilian traditions originated a new culture that resulted in a peculiar tangible and intangible heritage which finds an original expression in the houses built in "Araucária" wood.

The "gaúcha" city of Antonio Prado is considered the biggest Brazilian urban architectural conglomerate built in wood, and this rich architecture was erected by Italian immigrants arriving in the region by the year 1886. In the historical city center there are 48 original houses built in wood and stone, which were designated national historic landmarks by the "Patrimônio Arquitetônico Nacional" (*National Architectural Heritage*) by the Instituto do Patrimônio Artístico Histórico Nacional – IPHAN (*National Artistic Heritage Institute*), a security to their protection and importance as architectural and cultural units to be preserved for future generations and for the first immigrants' families descendants. But more than houses built in wood extracted from the araucaria trees, the lands around are fertile and ideal for the cultivation of grapes, what also creates a natural and cultural heritage related to wine production and the development of vineyards, a special and lively trait of the "Vale dos Vinhedos". The overall aspects of the region confer a unique cultural, historical and natural heritage in the whole world that may be defined as the "*Paisagem Cultural do Vale dos Vinhedos"*.

The city structure reflects the evolution of the process in association and relation to the natural environment where the social context is preserved and stimulates the permanence of inherited traditions, marking this same evolution through time and history in a continuous and relevant way.

The value given to this international heritage is the guarantee that the identity of the Italian immigration in the south of Brazil, which has always helped the region cultural and economic development, will be preserved; provided that this development will also protect the evolution of this natural and cultural system. "Vale dos Vinhedos" is the materialization of the land colonization operated by the European people from Italy, who came to Brazil and introduced alien habits and traditions into our former culture, creating a new cultural trend which resulted in a mixture of the hereditary heritage imported in the immigrants' memories and the traditions and characteristics present in the tangible and intangible heritage of this region, in the south of Brazil.

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Les Remparts de Marrakech (Maroc): caractérisation géotechnique et minéralogique

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Résumé

Inscrits sur la liste du patrimoine mondial depuis 1985, les remparts de Marrakech ont été construits en 1126 par le souverain Almohade Ali Ben Youssef (1120-1135) pour protéger sa toute nouvelle capitale. Ils ont été ensuite étendus pour suivre l'agrandissement continu de la ville, en particulier à la fin du XIIème durant le règne Almohade et au XVIème siècle sous le règne du roi Saadien Ahmed El Mansour.

L'édifice entoure la ville de manière continue, sur dix-neuf kilomètre. Il est percé de neuf portes d'accès et comporte 200 tours carrées servant comme structure de garde. La hauteur des murs varie entre 7 et 10m, avec une épaisseur moyenne de 0.6m, pouvant atteindre 2m par endroit.

L'étude géotechnique (granulométrie, limites d'Atterberg, bleu de méthylène, calcimétrie…) montre une diversité des terres utilisées dans l'édification: graveleuse, sableuse et argileuse. L'analyse minéralogique par diffractométrie aux rayons X a mis en évidence une composition à base de quartz, de calcite, de feldspath et de minéraux argileux qui constituent environ 60 % du matériau. Ceux-ci sont à dominance d'illites (10 %) et de kaolinite (10 %) associés à de la chlorite et de la vermiculite.

L'analyse chimique par fluorescence X confirme les résultats obtenus aux rayons X et montre un pourcentage important de SiO_2 (47 %), d'Al_2O_3 (16 %) de CaO (14 %) et de Fe_2O_3 (7%).

Mots clés : Remparts, Marrakech, géotechnique, minéralogie.

1. Introduction

Les remparts de Marrakech ont été construits par le souverain almohade Ali Ben Youssef (1120-1135). Ils avaient initialement vocation de protéger la ville de Marrakech contre les tribus environnantes, notamment du Haut-Atlas. Ces murs, bâtis par la technique de pisé à base de pierres, de terre et de chaux, impressionnent par leur hauteur (6 à 8m) et leur longueur (plus de 19Km). Ils sont percés par neuf portes et contiennent environ 200 tourelles de garde, avec un passage d'environ 0.6m et une distance moyenne de 35m entre les tourelles [1].

Cette ceinture à fait l'objet d'une caractérisation géotechnique minéralogique et chimique. Les échantillons ont été pris dans la partie sud des remparts (fig1). Les résultats obtenus complètent une étude sur la restauration des monuments de la ville de Marrakech [2, 3].

Fig 1 : Localisation des échantillons sur la partie sud des remparts de Marrakech

2. Résultats

2.1. Caractérisation geotechnique

La présentation graphique des classes granulaires selon la norme AFNOR indique la dominance de la classe des graviers pour l'échantillon Ma4 avec un pourcentage de 42.78% ; l'échantillon Ma2 est dominé essentiellement par les graviers et les cailloux (respectivement 21.82% et 30.19%) ; Ma1 et Ma3 sont plutôt dominées par les graves et les sables grossiers avec des pourcentages qui dépassent 60% pour les deux.

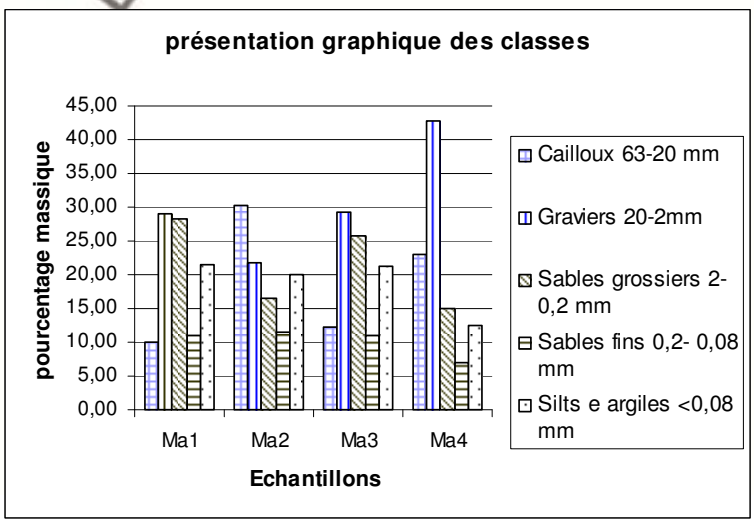

Figure 1: Présentation graphique des classes granulaires des différentes échantillons de remparts

L'analyse de plasticité montre que les matériaux sont non à peu plastiques, avec des indices de plasticité inférieurs à 20. Dans la classification LCPC, les échantillons se répartissent dans les champs des graves limoneuse (GL) et les graves argileuses.

L'étude au calcimètre révèle que les matériaux sont non à peu calcaires, avec des teneurs en carbonates inférieurs à 10%. L'essai au bleu de méthylène donne des valeurs faibles comprises entre 0,2 et 0,8. L'indice d'argilosité est compris entre 0 et 3, ce qui témoigne de l'inactivité de la fraction argileuse et l'insensibilité des matériaux à l'eau, d'où leur résistance extrême au temps.

Tableau 1: caractéristiques des matériaux de construction des remparts

Echantillon	Indice de plasticité	Teneur en eau	VBS	Teneur en carbonate
Ma1	6,5	1,75	0,75	8
Ma2	19,78	1,57	0,19	7,5
Ma3	10,24	0,61	0,15	7,2
Ma4	6,3	1,35	0,23	6,3
Ma5	10	1,96	0,40	7

2.2. Analyse minéralogique par diffractométrie aux rayons X

L'analyse en diffractométrie aux rayons X réalisée sur deux échantillons révéle la présence de quatre phases minéralogiques principales : le quartz, le feldspath, la calcite et les minéraux argileux. Ces derniers présentent le pourcentage le plus important avec une dominance d'illite, de Kaolinite de chlorite et de vermiculite.

Tableau 2: Composition minéralogique principal et en minéraux argileux

	Composition minéralogique principale			Composition en minéraux argileux			
	Quartz	Calcite	Feldspath	Kaolinite	Illite	Chlorite	Vermiculite
R1	17	7	10	25	55	10	10
R2	10	7	3	20	50	15	15

2.3. Analyse chimique par fluerescance X

L'analyse chimique par fluorescence X (XRF) réalisée sur deux échantillons représentatifs a donné les résultats rapportés dans Tableau 3. Ils corroborent les résultats obtenus par Rayons X, avec notamment des pourcentages élevés en silice (SiO_2) et en alumine (Al_2O_3) qui traduisent la richesse du matériaux en quartz et minéraux argileux. Les teneurs assez élevées en magnésium (MgO),), en fer (Fe_2O_3) et à degrés moindre en potassium K2O traduisent également l'importance des argiles dans le matériau. Les pourcentages de CaO, de l'ordre 15%, apparaissent trop élevées au regard de la composition minéralogique et semble témoigner de l'usage intensif de la chaux lors de la construction.

Tableau 3: Composition chimique

	SiO2	Al2O3	CaO	Fe2O3	K2O	MgO
R1	47,57	16	14,58	6,6	4,403	4,05
R2	42,57	17	18,58	7,5	6	5,5

2.4. Conclusion

Les matériaux utilisés dans l'édification de la partie sud des remparts de Marrakech sont des graves limoneuse à argileuse riches une fraction fine non gonflante. Les analyses minéralogiques et chimiques témoignent de leur richesse en argiles, jusqu'à 60 %, ainsi que des teneurs anormalement élevées en CaO qui indiquent l'usage de la chaux comme stabilisant.

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THE URBAN PARK OF ARAGON'S WALL IN NAPLES

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Abstract

As part of strategies to exploit certain particularly significant "Areas" in the 2004 Variation of the Naples' Master Plan, the research team, coordinated by prof. Arch C. Grimellini, decided to explore the theme of "unveiling" of the north-eastern section of the Aragon's walls as they, together with the city walls of Gerona in Spain, are one of the most important examples of defensive renaissance architecture. The exploitation of archaeological and monumental goods must necessarily deal with the rare opportunities to bring to light the testimony of the past, (belonging to a widespread system that today is unfortunately not entirely clear, though it is often well documented), so that to ensure the public enjoyment, while also to clarify both the urban role in origin, and the relationship with the existing urban frame. This intention, which is well adapted to the archaeological sites of Naples, is consistent with the objectives of urban archeology leading to the acquisition of the stratification of settlements as a whole, to be implemented in accordance with programs of research and feed-back included in urban planning. A particularly significant aspect must be recognized in the step from *archeology in the city*, usually known as specific visible items, *to urban archeology*, now understood as a learning - design tool addressed the inclusion of known archaeological fabric (and not unveiled) in urban planning, so there it should be a close correlation between the fabric of existing buildings, which also includes historical and archaeological sites, and the existing settlement. In this sense, the executive design of the master plan defined by the research group, refers to a dual objective: to select the parts for which you can highlight significant testimony and locate around them the larger projects where not only the vision of the exhibit is a priority, but also the knowledge of the ancient plant.

Keywords: urban park, unveiling walls,defensive architecture, archeology.

1. Introduction

The scientific debate on sustainability has found a new field of research addressed the specific issue of conservation of natural resources. Subsequently, with the emergence of this concept, an innovative culture has spread that has gradually led to a redefinition of the objectives and content of urban planning. The environmental issue, as the search is the reference for the real conditions of compatibility between development and environmental carrying capacity, has directed research towards innovative methods and techniques of analysis and intervention, in compliance with the ecological planning of integration tools between the environment and territory.
Within the process of redefining the goals and techniques of control and government of territorial transformations, the concept of protection has acquired a new dynamic nature, not only in reference to the concept of cultural or environmental, but also to the resource. The concept of the Archaeological Park bears the elements of an innovative push towards a new approach to environmental and cultural resources, although the design and implementation planning and management are still debated from technical-scientific and legislation point of view.
The TU490/1999 (Article 99, paragraph 2, letter b) as the next Legislative L. 42/2004, and the D.L. No 62 and 63, March 26, 2008, define the Archaeological Park as "a geographical area characterized by important archaeological evidence and the presence of historic, scenic or environmental value, equipped as an outdoor museum in order to facilitate understanding through appropriate routes and teaching aids". This is an innovative definition that overcomes the dichotomy between cultural and environmental good, as the purpose is also clear of the Archaeological Park not only for conservation of archaeological and its context but also for cultural promotion, through the provision of equipment, courses and teaching materials aimed at the public use of the site. However it should be noted that the concept of the Archaeological Park, although reiterates a close relationship between archaeological and quality of its environment, is not sufficient to enhance their enormous potential. All the Italian archaeological, while failing to define homogeneous territorial areas, may also contribute to the sustainable development of the system where they are located;

we think, for example, the archaeological in consolidated urban environments. For these traces of the past, some authors do not envisage the possibility of creating an Archaeological Park [1]; of consequence they are relegated to the category of archaeological sites, and then excluded their real needs and potential. The same concept of park appears, in the scientific literature, too tied to that one of continuous territorial unit of considerable size, closed and homogeneous. So, to eliminate the confusion that exists within our laws and not to fall into the error of easy defining any testimony of ancient civilizations as archaeological park, it must be noted that this concept should be linked to that one of "a system" of archaeological also with its urban or territorial surroundings, both with low or high value. Therefore it must be established the relationships between the system of archaeological sites and the functional, socio-anthropogenic, physical, geomorphological and environmental systems referred to them.
We must, therefore, propose a systemic approach, within a methodological and operational framework, which recognizes the complex dimension of urban or regional reality, that must be accompanied by a different legislative approach, planning, design and technology. The establishment of such a tool is now a real need, as some urban systems with a considerable number of natural, pre-existing archaeological and historical and artistic treasures, are particularly vulnerable because tourism superimposes its needs for mobility, services and equipment so that the phenomena of discomfort, pollution and congestion are increasing.
If the phenomenon of mass tourism produces imbalance in the territorial system, the Archaeological Park is the appropriate instrument for the use and the promotion of "cultural field" and for sustainable transformations; through the web of relationships with the contiguous realities, it may contribute to the integration of archaeological evidence in the anthropic system, through processes of regeneration, but also to revitalize the economy of the area, by increasing direct and indirect jobs related to touristic activities and by establishing a synergistic relationship between archeology and territory, economy and culture, development and redevelopment.

2. The methodological assumptions

The hypothesis of proposed methodology is aimed at a project of the Archaeological Park both at urban and territorial scale. There are defined the objectives, actions and design methods with care of the complex and multidisciplinary nature of the developed method.
In a first phase the objectives are defined to be pursued for the realization of the Archaeological Park (Table 1), like a functional organization of a territory in homogeneous character, obtained by identifying the relationships between pre-existing archaeological and territorial or urban systems. The preservation and transmission of information are made through a high quality in public use and through an educational action on the analyzed area and the territory. The park should provide greater usability of the site, by means of necessary facilities for tourism and the increase in attendance through: the conservation of sites through maintenance and monitoring of the finds and structures; the reinforcement of the economic flow through proper organization of spaces for the sale and trade; by improving the quality of life with the creation of green areas, environmental protection both for the context and for the site, according to sustainability and environmental compatibility. As the types of archaeological sites are highly heterogeneous, it will determine an analytical-planning approach and different objectives systems. Table 2 shows a possible articulation of archaeological and its possible objectives, from the local scale to the territorial. For each type of archaeological site, and in relation to its targets, it is identified the name of the possible"Park System", and a methodology step "definition of the intervention,".
Than it is possible to identify the mechanisms, procedures and organization for the implementation of the project. Moreover during the construction phase, we will determine a cyclic process of design verification and, if necessary, redefinition of the design objectives. It will be detailed below the operation for Archaeological Park as "network", as it could be that of the Aragon's walls of Naples.
The specific purpose is to link in a system all sites that are part of the archaeological park, by developing their potential and creating a "network" of accommodation, services and infrastructure, so that to establish synergies between different geographical areas of the park. The planned actions will be aimed to the protection and enhancement of the ecological-environmental and archaeological resources, to the clearance from degradation through integrated interventions of requalification, to the creation of nature and archaeological trails, to the reorganization of accommodation and of the mobility system.
When the specific objectives for the Archaeological Park will be defined, an historical-archaeological survey of the studied area is planned, it involves both the finds on the site and the reading of the man-made environment. Then relief and thematic maps are prepared for archaeological resources, and natural

[1] Cfr. Pierdominici M.C., Timballi M., "The Archaeological Park: analysis of a problem," in Art Bulletin of the Ministry of Culture and Environment, No 35 and 36, 1986.

environment to be protected and enhanced. The analysis of decrees and laws will define the congruence between the project and urban planning.
This approach realizes the compatible layout by defining the type, the size and the location of the primary equipment and infrastructure and by creating a new functions of the Park. The design will determine the mobility system, the primary equipment, the technological elements for the paths, the system of signs, the minimum services, facilities for the use of archaeological remains, etc.
The last phase is the implementation according to times and operative mechanisms, through the identification of public and private involved actors and together with outlining the management model of the park. As these steps are complex, will not be sequential, but parallel and they will articulate specific times and ways to integrate the technical and scientific components provided by the proposed method.[2]

Table 1

Objective	Description
Conservation and upgrading of archaeological, natural and environmental	The park is designed to protect and enhance the archaeological resources
System of relations of archaeological sites	System to make the different sites of the Archaeological Park
Creating basic infrastructure	Infrastructure defined to ensure that relations between the archaeological park and adjacent territorial systems
Improvement of the use	Increase in tourists through improved accessibility and services
Increase in tourist numbers	Increase in tourists to generate economic and cultural inputs
Relationship between tourism and territorial system	Increased flow of tourists through the creation of infrastructure and environmental works
Economic input	Economic input resulting from increase of tourists
Creation of young professionals	Creation of young professionals assisting tourists and the protection and management of the park
Business services	New jobs, high-quality
Spreading cultural and scientific	The new transformation from archaeological park brings benefits in time, ensuring the presence of tourists with its economic inputs

[2] Grimellini C., Ceudech A., "Archeological Parks and environmental resources: methodological assumptions for a project definition", in Conference Proceedings: *Policies for environment defense*, Luciano Publisher, Naples 2001.

Table 2

Archeol. pre- existing	Objectives	System archeological park
Isolated in urban Areas	Protection and rehabilitation of archeological and natural	Archeological garden
Constituents in the urban core	Creating infrastructure and increase tourism	Urban park
Widespread in urban areas	Creation of infrastructure and systems	Park diffuse
Suburban areas isolated	Increase in tourist number	Extra urban park
Isolated and spread on territory	Young professionals and services	Network system
Spread on territory	Economic input	Park network

3. The project of the Archaeological Park of the Aragonian walls in Naples

After the conquest of Naples by Alfonso I of Aragon (1442), the extramural eastern became an integral part of the city, it was inserted in the urban area through the implementation of a new boundary wall, which included "intra moenia", in addition to residential buildings arose out of the defensive system of Anjou, also the monastic complexes of San Giovanni a Carbonara, San Gioacchino and Sant'Anna a Ponte Nuovo and Santa Caterina a Formiello. The new wall was perhaps designed by Giuliano da Maiano and it was begun between 1483 and 1484 and, after the Aragon had defined a special financing plan, drawn up to cope, through new taxes, with the huge expenditure for the realization of such an important intervention of urban modernization. From cartographic documentation, and especially from the Lafrery's view (Rome 1566), it is clear that the layout, facing on a deep ditch, proceeded from the Castle of the Spur to the Carmine, with a straight course toward the north, parallel to the Garibladi Course up to the Tower known as "Partenope", than it turned according to a broken line up to the "Sant'Anna" Tower and, from there, to the "San Giovanni" Tower by connecting it to the existing track behind the Donnaregina Angevin Monastery. The new perimeter wall, made of tuff block and covered with piperno block, with a thickness ranging between five and seven meters, represented an evolution in function and form of medieval defensive structures, which has become necessary because of the use of heavy artillery in the strategies of siege and attack of fortified towns.

The 21 new towers, each with its own name, when compared with the more slender and more vulnerable Anjou wall, acquired a more solid shape, in order to oppose a greater resistance to artillery. In fact, they had a sloping base, topped by a cylindrical upper body, ending with the crowning arch structure. They contained a guard post that allowed to climb to the roof and then access the battlements.

The Aragon's wall allowed access to the city through passage and monumental gates, namely:

"Varco di Pontenuovo" (passage), defended by the "San Michele" Tower, which was a secondary entrance reached by crossing Ponte Nuovo on the moat;

- Porta Capuana (gate), with a magnificent marble arch clamped between the two towers "Virtues" and "Honor", that was built in 1480 and designed by Giuliano da Maiano; the older port, closer to Castel Capuano, was moved forward towards the east;
- Porta Nolana (gate) consists of a simple marble arch between the towers of "Faith" and "Hope";
- Porta del Carmine (gate), later demolished, also defended by two towers known as "Fortitude" and "Victory".

During the Spanish Viceroyalty, starting from Don Pedro de Toledo, new works were performed, while keeping the aragonian boundary on the east side, consisted in breaking down part of the old wall on the western side to expand the city limits; at the same time new walls were implemented on the south side on the

waterfront, and north from the "San Giovanni" Tower in the direction of Porta San Gennaro and the next Porta di Costantinopoli.
With the advent of the Bourbon monarchy, because of both social and economic plight, it was decided to demolish the wall on the north side from Via Foria up to Montesanto. In the nineteenth century was also began to fill the ditch, and more precisely under Gioachino Murat was filled the tract from Porta San Gennaro to Pontenuovo (where later garden and residential buildings were seamless realized), and after 1860 the remaining eastern section. By this way new roads were opened (Via Cesare Rosaroll, Piazza S. Francesco a Capuana, Via Carriera grande, Piazza Garibaldi, Piazza Nolana, Via Cesare Carmignano – Corso Garibaldi, Piazza Guglielmo Pepe) even if there was any hesitation to demolish some parts of the aragonian track or to incorporate other new buildings of the nineteenth and twentieth century. Actually there is still significant evidence of the aragonian track along some of the above-mentioned roads, they consist of long stretches of walls and many towers; some of them are flanked the doors and others are isolated, they are the "San Michele" tower in Pontenuovo (Via Rosaroll) and the "Faithful" tower (Via Carmignano). Further along Via Marina, in a flower bed medians, are preserved:

- the "Vado del Carmine", which consists of two elegant pillars; it was opened during the reign of Charles of Bourbon after the demolition of a section of wall;
- the two towers, the "Good "and the"Throne", the latter of Durazzo age, together with the adjacent stretch of aragonian wall; it represents the last of the Spur Castle demolished in 1906.

In the Variation of the Master Plan, which identifies priority areas for intervention, the aragonian walls were added in 22 area - Walls in North-East - and in 23area - Eastern Walls. The 21 area - Market Square - did not include the remains downstream of Via Marina, while the research group, coordinated by Prof. C. Grimellini included in the proposed reconfiguration of the Archaeological Park of the Aragon's Wall.
The described methodology, is aimed to define, both theoretical and operational, an Archaeological Park as an active element in the territorial structure, it was developed up to the formulation of a proposal that, as you can see in the Table II, has set as its objectives:
- Sustainable increase of tourism;
- Urban redevelopment and rehabilitation of the environmental and archaeological areas, as defined in the Master Plan Variation, in relation to:

- Via Foria (from Archeological National Museum to the Albergo dei Poveri) and the director that reaches Via Marina, including the area of Castello del Carmine, Piazza Capuana, Piazza Nolana, Piazza Enrico de Nicola, Piazza San Francesco di Paola (with the possibility of a new station of subway line 2), Piazza Guglielmo Pepe;
- Redevelopment of Via Diomede Marrasi, Via Soprammuro, Via Lavinaio, Via Cesare Carmignano with the elimination of volume abuse on the walls, in order to make visible the towers;
- Improvement of the insula adjacent to the Circumvesuviana station and enhancement of special architectural units;
- "Unveiling" of the moat of the aragonian walls, of the "San Michele" tower and those incorporated in the Garibaldi barracks, in Santa Caterina a Formiello and in the Via Carmignano's curtain, to create green areas but also in compliance with context that include several monumental buildings, nineteenth-century remarkable residential buildings with the elimination of volume abuse on the walls and the creation of a path on the walls;
- Recovery and reuse of the convents of San Giovanni a Carbonara and Santa Caterina a Formiello, with definition of compatible uses in the scientific, cultural, management, tourism, etc.

Here below only a part of the project will be illustrated on the northern sector of the Area 22 including the Garibaldi barracks and the convent complex of San Giovanni a Carbonara and San Gioacchino and Sant'Anna a Ponte Nuovo (already destined to the City Archive of Naples).
Qualifying aspects of the proposal are:

- Elimination of the boundary wall of the Garibaldi barracks on Via Foria;
- Disclosure of the aragonian walls in compliance with the environment, and contemporary revival of the moat as a public park, from the "San Giovanni" tower the "San Michele" tower;
- Confirmation of the Municipal Archives in the convent of San Gioacchino e Sant'Anna with the annexation of the restored tower "San Michele" as exhibition space;
- Location of the Superintendence offices in the Garibaldi barracks;
- Creation of a Museum Centre in San Giovanni a Carbonara consisting of the Church and the Angevin Museum in the former convent that faces the cloisters;

- Revival of the Seripando Library with library funds from the Superintendent (thus also including the one currently housed in the St. Elmo Castle);
- Development of public parks system, including, over the moat park, the garden of palms behind the polygonal apse of San Giovanni, and the new Western garden for elderly and children.

The rediscovery of moat is interesting, its height was determined from a print of the nineteenth century by Achille Vianelli, it was a view of the "San Michele" tower and the Ponte Nuovo, with some characters, as seen from the moat before it was filled. From digital analysis it has been determined the height of the cylindrical body of the tower compared with that of the characters. Furthermore by comparing the height of the tower in the view with that one relieved (10.60 meters), it has determined the depth of the moat which probably is about 7 meters.

The concept is based on the intersection of two lines, laid down on the track of Via Foria and on the layout of aragonian wall, at the entrance of the Garibaldi barracks where the moat wall is divided into three terraces to reach the level of Via Foria, characterized by pillars that, like long, thin stems of trees, hold up the access bridge from Via Foria.

The terraces also hosts commercial activities, accommodation and catering, and in particular the second one is marked by a longitudinal path of water that, on the one hand, remember the water that once flowed down the ditch, and on the other marks and characterizes a physical and perceptual path for the user.

The improvement of the microclimate of the park was formally resolved by means of the inclusion of paths and ponds connected by a fountain that depart from cisterns to collect and purify rainwater and runoff, is used for irrigation of vegetation, both for the public toilets in the park.

This cooling system, had already been used by the Arabs in the past, to cool the interiors and courtyards of the palace of the Alhambra Palace in Granada.Design solutions for open spaces have used the natural resources such as climate, water and vegetation that promote an appropriate level of comfort for the use.

The open spaces of the park, or were very hot due to excessive exposure to sun or cold for ventilation intense. Therefore, systems and solutions used have allowed the creation of microclimatic and environmental well-being through the incorporation of windbreaks, located in strategic locations such as to divert the current of air more aggressive, and deciduous trees to allow more sunshine in the months colder.

The decayed wood retrieved, integrated with the new vegetation in the recreational area designed for children and elderly, were those in the garden of San Giovanni a Carbonara, as documented through cartographic and bibliographic research.

The second terrace is linked with a subway station that was design to connect the underground line1 with Aversa, along the route of the old Alifana. This old project was lost because of the bureaucracy but it would have allowed you to connect the New Museums Centre and the Archaeological National Museum and the Albergo dei Poveri.

4. Conclusions

Much of the archaeological sites lost the correlation with the territory, they are now dropped as foreign objects without any identity: a unique landscape thanks to the intimate connection between nature and archaeological cores, greatest tourist attraction of a well-known area for its high concentration of artistic and archaeological heritage, has been largely destroyed. Therefore, the proposed design of the Archaeological Park of the Aragon's walls of Naples is configured as a place of preservation of archaeological evidence, but also as a means of cultural and scientific disseminating, and control and development for the territorial structure. The project, as the best possible structure of a context, should aim at environmental quality and at the technical and operational efficiency, by defining specific parameters for urban and territorial systems of ancient origin, and by subsequently passing from an uncontrolled and chaotic development in a planned and sustainable one.

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THE CULTURAL LANDSCAPE OF ITALIAN IMMIGRANT IN RURAL HISTORIC SITES

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Abstract

This paper aims at recognizing the cultural landscape in rural historical sites of Italian immigrants as providers of patrimonial value and identity. It studies the building collection of which the implantantion, architecture characteristics and construction techniques, unique in national territory, are witnesses of habits, costums and usage that characterize the immigration area in Santa Catarina state in XIX and XX centuries.
The bibliographic research looked forward to showing the importance of the landscape as a patrimonial value provider and was complemented by a field research held in Urussanga, Santa Catarina state, Brasile. This way it was possible to identify through the inventory of rural sites and visual analisis of the landscape, how the Italian immigrant has transformed where he lived by the spacial organization of his house as well as his relation of exchanging with the nature.

Key words: rural architecture of Italian immigration, inventory, cultural landscape, cultural patrimony.

1. Introduction

The Italian immigrants settled in virtually untouched regions, located in the inlands of Santa Catarina. Such regions were weakly related to the Luzo-Brazilian centers that had already been settled on the coast. Thus, the so-called 'cultural islands' were established. They form virtually unchanged cultural contexts and have great cultural heritage value, basically characterized by the absence of monumentality, diversity of building techniques and architectural typologies.
The southern part of the state of Santa Catarina, due to the amount of Italian immigrants that went there, appears as a region of true Italian-Brazilian culture. It is in this region that the strongest manifestation of northern Italy rural architecture can be found, still currently preserved in old buildings and part of that new buildings, which have kept some typically Italian formal and spatial references. Among the cultural resources, this region has rich heritage, where the significance of collections of historical and cultural interest stand out, representing the municipalities of Nova Veneza, Pedras Grandes, Orleãns e Urussanga (Figure 01).

Figure 01: Location of the municipalities of Nova Veneza, Pedras Grandes, Orleãns and Urussanga.
Source: http://ead1.unicamp.br e www.santacatarinaturismo.com.br

2. The rural architecture and the landscape of the Italian immigration

In rural areas, the sets consist of country house, kitchen, mill and details such as stone-built basement canteen, pitched roof with utilization of attic, small aligned windows and cymatium in stone ashlar. Other important features include kitchen separated from the main body of the house, in addition to verandas and balconies adorned with wood lambrequins.
The architectural heritage of the immigration is provided along a path that depicts a historical process of occupation in the southern region of Santa Catarina, from the second half of the nineteenth century. Situated at the foot of Serra Geral landscape, these buildings stand out for their volumetry and relationship with the surroundings. They are testimonies of cultures and traditions brought to Brazil by immigrants from several parts of the world. The relevant lack of resources led them to use material available in the region and to adapted them to their construction techniques. Thus, in southern Santa Catarina, there are authentic models made of wood, stone and brick.

2.1. The rural nuclei of Italian immigration

Immigrants spontaneously developed in their colonial nuclei a well-designed social and religious structure. Both the government and private property owners did not conceive such areas as social units, there were no areas reserved for religious buildings nor for community. Thus, in the convergence and socialization center of immigration rural communities, chapels with separate belfry started to appear, built on land donated by settlers, with much cooperation of the community. Located in a prominent place, the area was a common place that gathered community activities, such as businesses, halls, schools, and a cemetery as well.

Unlike the European system, the settlers have not employed their architecture in rural villages, but directly on the land. Unlike northern Italy, where they lived in small villages with little land to cultivate and little space available in their homes, the settlers were faced with huge territories unoccupied by Europeans. The placement of immigrants in isolated lots, distancing the families, broke the way they knew life up to about that moment in Italy "(GUTIERREZ AND GUTIERREZ FILHO, 2000, p. 65)
The organization of spaces in Brazil differs from that adopted in Europe. In Europe, the rural residential facilities were built into a single unit, but here they were separated according to each function. This diversity of program appears as the most notable difference in relation to rural housing in Italy, which is due to the difference in climate and abundance of land in Brazil. Figure 02 shows the spatial organization of the colonial land.

Figure 02: Space organization established by immigrant: home to sleep, kitchen, household facilities and complementary building. Property of Idalino Lorenzi Canever, Rio Maior region, Urussanga. Source: Virginia Gomes de Luca, 2007.

2. 2. Italian rural property building complex

See below the buildings that make up the whole Italian countryside property:

The house to sleep: it is the main body, greater in size, and with better finishing. The house to sleep is divided into three sectors: the canteen was partially excavated and built with stone walls to avoid the moisture in retaining walls, and to provide appropriate moisture and temperature conditions in the basement to store salami, cheeses and wines. It has grid or lattice openings for constant ventilation (Figure 03). The residence hall is composed of the central room or hallway more or less wide, unfurnished and around the dormitories, forming two wings (Figure 04). The attic is usually located under the unlined part of the ceiling. The ceiling

on the attic is low, and there are low openings on the front or sides of the house. Because it is warm and dry, it was used for storing grain. (Figure 05).

Figure 03: Partially excavated canteen with front entrance, property of Francisco de Assis Ceron, Rio Carvão region, Urussanga. Figure 04: Residential area, property of Ângelo Bonot, Rio América Baixo region, Urussanga. Figure 05: Attic, two-story of Italina Mourão Soratto, Urussanga. Source: Luca, 2006.

The kitchen is a unit which, when not attached to the house to sleep, appears separately from the main body (Figure 06) or connected by a covered walkway (Figure 07). This can be possibly justified by the plenty of space and materials on Brazilian properties, where it is possible to isolate the rooms from smoke, ashes and odors.

Figure 06: Kitchen separated from the main body, property of Sérgio Maestrelli, Rio Carvão region, Urussanga. Figure 07: kitchen connected to the residence by a covered walkway. Property of Olga de Preza Dominelli, São Bento Alto region, Nova Veneza. Source: Virginia Gomes de Luca, 2006.

It consists of a single room or with an attached room used as a pantry. It was used as a living room for the family before and after the meals.

Household support facilities: Along with the house and the kitchen, they form the set of household activities, such as: water supply (source, well or cistern), laundry, furnace (Figure 08), sanitation facilities, among others.
Regarding sanitary facilities (Figure 09), Posenato (1997) explains that "in the first decades, there were no latrines nor toilets in the homes of Italian immigrants and their descendants. The gradual improvement of living conditions generalized the latrine, often employed over a watercourse.

Complementary buildings: Buildings and spaces organized with the purpose of managing the production of the colonial land, such as animal shelters (stables, pigsties, henhouses) and agricultural employments, storage for cereals (barn), workshops, stills, smoke ovens, among others (Figures 10, 11 , 12 and 13).

Figure 08: Old stove for cakes and cookies. Property of Lívia Maccari Maestrelli, Rio América Baixo region, Urussanga. Figure 11: Sanitary facility (latrine). Property of Idalino Lorenzi Canever, Rio Maior region, Urussanga. Figure 10: Complex formed by smoke ovens, henhouse, and storage barn, owned by Mário de Lorenzi Cancellier, Palmeira do Meio region, Orleans. Figure 11: Sawmill and cereal mill moved by a waterwheel, property of the Bez Fontana family, Rio América Baixo, in Urussanga. Figure 12: sawmill, property of Angélico Ronconi, Rio Salto, in Urussanga. Figure 13: the set consists of sty, barn and storage. Property of Lívia Maccari Maestrelli, Rio América Baixo in Urussanga. Source: Virginia Gomes de Luca.

3. Conclusion

This article aims to acknowledge the cultural landscape in Italian immigration rural historic sites as having heritage value and identity. Thus, it was important to study the built sets which employment, architectural features and construction techniques are testimony of habits, routine and utilization of the immigration area in Santa Catarina during the nineteenth and twentieth centuries.

The cultural landscape category can be applied, in regional and local terms, to those that depict 'the combined works of man and nature' of any human group, and not only the landscapes of exceptional value. The landscape is dynamic and its elements are transformed by the action of natural and cultural forces, in its material and immaterial dimension, through the mark of the culture of the peoples on the areas they have occupied. Thus, the focus of preservation becomes the individual and not the landscape itself, since its value is not present only the 'scenic beauty'. The permanence of the people in the rural area ensures the continuity of the architectural heritage and cultural landscape in Italian immigrant rural historical sites, because it is the people the main element to assign value to the landscape.

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Caractérisation mécanique in situ et au laboratoire d'un pisé d'âge saadien (1578-1603) (sucrerie de Chichaoua, Maroc)

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Abstract

Située à 70 Km au sud de Marrakech, la sucrerie de Chichaoua a été construite par le sultan Saadien Ahmed El Mansour Eddahbi (1578-1603). Dernièrement, elle a fait l'objet de plusieurs travaux de caractérisation géotechnique, minéralogique et géochimique des matériaux utilisés ainsi qu'une caractérisation des techniques de construction de l'époque.

Notre travail constitue un complément de ces études avec notamment une caractérisation mécanique des matériaux à travers des essais in situ, au scléromètre, et également au laboratoire : compression uniaxiale et essai des trois points de flexion.

Les résultats montrent une résistance en compression du matériau de l'ordre de 4,5 MPa, valeurs relativement très élevées par rapport au normal du pisé. Ces données témoignent donc de l'unicité et l'originalité des techniques de construction de l'époque et expliquent la durabilité de ces constructions malgré l'absence de toute trace de conservation.

Keywords: Saadiens, Essais mécaniques, Pisé, Résistance de matériaux

1. Introduction

La sucrerie de Chichaoua, objectif de cette communication, datte de l'époque saadien. Elle a était bâtie par le sultan Ahmed El Mansour Eddahbi (1578-1603). Elle se situe à 70Km au sud ouest de la ville de Marrakech, elle est composé de trois parties, la première est la partie hydraulique formée d'un chute d'eau de 8m de hauteur, d'une gorge hydraulique, d'un canal de fuite, d'un bassin et d'un aqueduc. La seconde partie, actuellement très dégradée, est réservée au broyage de la canne. La dernière partie correspond à la sucrerie proprement dite avec une petite salle de cuisson et de traitement du jus et une grande salle d'affinement du sucre (la purgerie).

Cet édifice, bâti exclusivement par la technique de banchage, a fait l'objet de plusieurs étude de caractérisation à l'échelle nationale et internationale dont le but d'identifier les pathologies que peut subie une construction en pisé et ainsi de déterminer le mode de construction des Saadiens [1, 2].

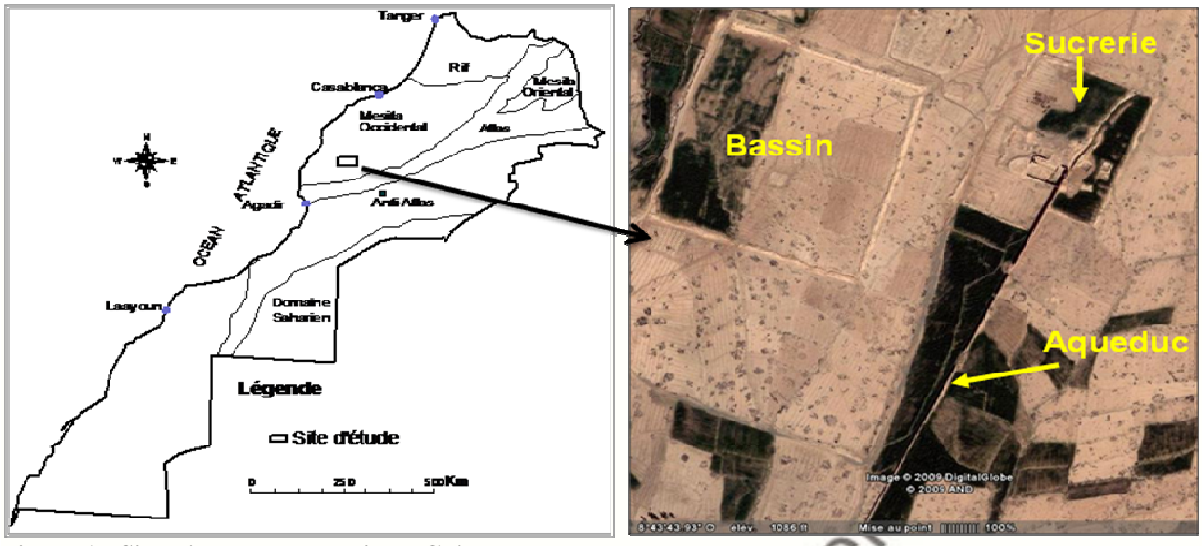

Figure 1 : Situation de la sucrerie de Chichaoua

2. Résultats

2.1. Caractérisation mécanique in situe

La caractérisation in situe des matériaux de construction a été faite par un scléromètre de type Pt. Les résultats montrent une très haute résistance à la compression avec une moyenne de 5,9MPs. Ces valeurs dépassent la résistance normale d'une terre battue qui est d'environ 1 à 3 Mpa. Ceci peut être expliqué par l'irrégularité et l'inégalité de la surface de la terre battue ainsi que la présence des cailloux qui ont augmenté la dureté et la résistance en surface.

2.2. Caractérisation mécanique au laboratoire

Le test de compression uniaxiale [3] a été réalisé sur un matériau tombé de l'aqueduc à la fois et sur des échantillons coupés en forme cubique et sur des fragments de forme irrégulière issus de test de flexion à trois points. Les échantillons de forme irrégulière montrent une résistance à la compression de l'ordre de 1,6 Mpa tandis que les échantillons cubiques ont une résistance à la compression de l'ordre de 3,5 Mpa. La différence de force entre les deux types des échantillons est évidente et peut être attribué à la forme des échantillons.
Concernant le test de flexion à trois points [3] un seul échantillon affiche un résultat, en accord avec les données obtenues à partir du test de compression uniaxiale effectuée. Les autres échantillons ont donnés une charge trés faibles en raison de la présence de fracture développés lors de l'opération de découpage d'échantillons en forme cubique.

Table 1. Proprietés mécaniques

Echantillon	Compression uniaxiale (échantillons cubiques Mpa)	Compression uinaxiale (échantillons irréguliers Mpa)	Flexion à trois points Mpa)
C1	0,80	-	-
C2	1,90	3,70	-
C3	1,98	2,30	1,55
C4	-	4,00	-
Moyenne	1,6	3,50	1,55

3. Conclusions

Essais mécaniques par compression uniaxiale et par le scléromètre a prouvé que la résistance à la pression de la terre enfoncée est MPA environ 4.5 obtenu comme moyenne des résultats de deux essais de compressibilité sur les

échantillons cubiques et d'autres de forme irrégulier. C'est une grande force comparée à celle d'une terre enfoncée normale qui est dans l'ordre de MPA 1-3. Ceci précise que nous sommes confrontés à un matériel avec les propriétés mécaniques élevées, qui témoigne à l'unicité et de l'originalité de la technique de construction des Saadians et donne la raison des bonnes conditions de la conservation des murs malgré l'absence de toute action de sauvgarde pendant des siècles.

Remerciements
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NEW DYNAMIC BUILDING ENVELOPE SYSTEMS FOR MEDITERRANEAN AREA

keywords
Building envelope, dynamic facade, energy saving, renewable energy

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Abstract

The new Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings, the rising cost of fossil fuels in recent years, the high emission and tiny air pollution particles, let us to development new systems facades into current project research ABITARE MEDITERRANEO[1]. The system facades should guarantee a considerable energy saving in office building. The research is characterized by the development of new building envelope components which can ensure the reduction of heat loss, which is caused to insufficient building insulation, including glass facades with reduced heat transfer and the use of renewable energy technologies.

In this particular case, the collaboration with local companies has been possible the development of building envelope prototypes, which can control the performance of it during the year through the integration of shielding, heat exchangers, and phase change, ensuring the reduction of energy consumption.

In the following, we introduce two systems: a ventilated facade systems and double skin facade. In both case the study focused on dynamic envelopes for office building with high-energy performances and formed by the dry assembly of advanced facade components, which analyzing the evolution of façades system in terms of: building construction, innovative systems, smart materials, dynamic system. Aiming to improve building energy performances.

Keywords: Energy Saving, Dynamic Skin, Smart Envelopes, Renewable Energy

1. Introduction

The two facade systems have been developed with the aim of spreading sustainable building technologies in The Mediterranean Area and in Italy. The aim is to develop new facade systems to reach the goals of 20/20/20 and to diffuse regulations that govern energy efficiency in buildings. The European Union established these regulation through the Energy Performance Building 2002/91/CE and EU Directive 2010/31. These aim to diffuse local and national regulations to guarantee high the efficient buildings, using appropriate policies which consider local climate conditions. From 31st December 2018, we must start building zero energy public buildings.
In Southern Europe, we must think about on winter and summer conditions and avoid copy in Northern Europe energy efficiency architectural solutions, to create appropriate solutions in energy efficient buildings. Southern Europe has specific climatic conditions, with the problems of indoor summer comfort, and the consumption of water resources and natural resources. Therefore it is necessary to improve research into new technologies for envelope solutions with regard to the energy consumption.
In Italy, the constant dependency on fossil fuels, oil and methane gas is still high in housing and office buildings sector. At a national level, Italy has adopted the European Directive 2002/91 with the Dlgs. 192/2005, that has been integrated and modified over the years. The new regulation introduce new parameters of evaluation, like the periodic thermal transmittance or the indices of summer energy consumption.
In this paper we describe the two smart facade that we have developed to improve the energy performance of the new office buildings in the South Europe and to reduce the costs of heating, cooling and lighting, responding to national and international energy laws.

[1] http://www.abitaremediterraneo.eu/

2. Advanced shading envelope element and a terracotta slab: "shading screen"

2.1 Technological features

The proposed multilayer ventilated envelope element is composed of two sub-systems: the first, the inner layer, is formed by a dry-mounted system, while the second, the external closing system, consists of a "ventilated wall package". Each of the two sub-systems is in turn divided into several functional layers.
The external closing advanced screen system is composed of extruded brick slabs mounted - through mechanical anchor pins – on metal structure uprights (with a "groove" profile of 300 x 200 x 2 mm) anchored in turn, to the main structure of the building by "L" shaped brackets (around 500 x 500 x 5 mm).
The stratigraphy of the screen is formed by:

- bearing facade substructure (columns, brackets, anchor elements);
- accessory elements and joints (PVC spacer pads with circular section and rectangular shading rods);
- insulating rock wool layer (50 mv);
- control layer;
- ventilation layer;
- brick slabs
  - Shading screen TR1 slab (tile used in two directions)
  - Shading screen TR2 slab (angular horizontal and/or vertical)
  - Shading screen TR3 slab (sill)
  - Shading screen TR4 slab (string course)
  - Shading screen TR5 slab (shading rods).

SHADING SCREEN SLAB

The "shading screen" slab was designed to create a self-shading ventilated facade cladding. The slab is obtained by optimizing the geometry of the outer surface, so that in itself it helps to reduce heat absorption through the creation of the largest possible dispersion area. The "shading screen" slab, indeed, has an outer surface which is 2,8 times the size of a normal dry curtain wall slab.
The slab also features a design of the external surface which can be applied in two different directions (horizontal and vertical), both to suit aesthetic requirements and to ensure protection from the solar radiation under different orientation conditions. The choice of colour also contributes to the thermal improvement of the slab. Light colours are more reflective and less absorbent towards solar radiation, allowing the slab to cool down more easily; on the other hand, in the case of dark colours, the absorption of solar radiation is significantly higher.

Figure 1. "Shading Screen" slab

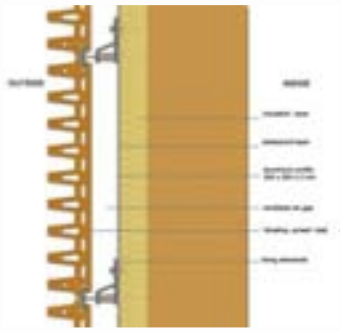

Figure 2. Stratification layer

2.2 Verification of the energy performances of the dry envelope element

The audit was performed[2] through the simulation carried out for a building located in Abu Dhabi (latitude 24.6°N); the choice of location was made to evaluate the system's behaviour under extreme conditions. The audits of the energy performance of the dry multilayer casing element were conducted in three phases:

- hygrothermal tests;
- physical and thermal tests;
- energy consumption on a Test-Room with the application of the facade component.

The simulation was carried out using the energy simulation "TRNSYS" and calculating "ECS" programs. The initial conditions are:

- assessment of an area of 100 sm (10x10 m);
- slab colours: red and sand;

[2] The energy performance of building envelope was developed in collaboration with the Department of Energy "S. Stecco" to University of Florence – prof. M. de Lucia and Ing. D. Fissi.

- size of air gap: 2.5 cm, 5 cm and 10 cm;
- horizontal arrangement of the corrugated outer surface of the slab;
- comparison was made with a terracotta slab with a constant section of 7 cm. This allows to evaluate the performance of the "shading screen" slab in relation to another component that has the best features of the considered range, and therefore the survey is carried out under the most disadvantageous conditions for the proposed slab.

In addition, the survey was developed with a progressive induction methodology of data values from a sequence of calculation steps on various parameters, such as:

- percentage of shaded area of the slab;
- average temperature of the outer surface of the slab;
- heat flow from the outer surface of the slab to the inner surface of the wall.

For the slab of red colour the diagrams reveal, however, an efficacious reduction of surface area exposed to radiation, showing that:

- in the case of eastern orientation[3], the shading of the surface of the slab reaches a maximum of 68.81%;
- in the case of western orientation, shading of the surface of the slab reaches a maximum of 71.51%;
- in the case of the southern orientation, the shading of the surface of the slab reaches a maximum value of 60.09%.

During the calculation phase of the average temperature of the outer surface of the red slab, as in the following stages, comparison is made between the effects of radiation on the "red shading screen" slab and those on the flat slab.
The results show that even if on one hand the temperatures reached by the external surface of the slabs under consideration are very similar, despite the morphological diversity, on the other (as the next stage of calculation will show), the loss of heat by the "red shading screen" is greater than that of the flat slab, demonstrating not only the efficacy of the corrugated surface as a system of heat dissipation, but also that the performance of the corrugated sheet improves even more in the more extreme geographical contexts.

2.3 Case Study Results

The data which can express the amount of energy consumption for heating or cooling indoor air depending on the temperature difference between outdoor and indoor air set operating at 20 ° C, are expressed in Wh, and refer to a volume called "test room" of 10 m per side, allowing for a kind of spatial-energy unit represented by the perimeter of the 10x10x10 unit volume, comparable to the design of a building structure.
The calculation procedure allows detection of:

- average annual consumption of each of the sides of the test room, depending on their orientation;
- average annual consumption of the test room as a whole.

Consumption is obtained as a direct function of the factors considered in the previous stages and includes, as in these stages, the comparison between walls with shading screen slabs, divided into red and sand colour walls, and walls equipped with the reference flat slab.
As shown by the Tab.1 in the case of Abu Dhabi, total energy consumption of the test room by applying the "sand shading screen" slab is higher (+8%) than with the flat slab. This allows us to understand that a light coloured shading screen is inefficient in the analysed context (considering however, as already mentioned, that the simulation is limited to the analysis of the passing heat flow and does not include fluid dynamics evaluations).
Applying instead the "red shading screen" slab the situation is reversed and the same consumption is significantly reduced (-16.1%) in comparison to that with the application of a flat slab, as there is a greater absorption and dispersion of heat. The best results (higher savings) occur on the eastern and western faces, while on the north and south sides, as can be imagined, benefits could be obtained by orienting the slab with vertical corrugations. These excellent results are even more encouraging, as:

- the simulation does not consider the needs of smaller indoor humidity control due to a lower inflow;
- the simulation provides the less advantageous "conditions" for the application of the shading screen, since the flat slab has a greater width (7 cm) compared to the thickness of the common wall slabs (3 cm).

Table 1. Total energy consumption analysis by applying the sand shading screen and the flat slab in Abu Dhabi

ABU DHABI						
	SHADING SCREEN SLAB		**FLAT SLAB**		**DIFFERENCE**	
EAST	144352	Wh	132319	Wh	12033,36	Wh
NORTH / SOUTH	280910	Wh	268438	Wh	12471,49	Wh
WEST	174691	Wh	153250	Wh	21440,58	Wh
TOTAL	599953	Wh	554007	Wh	45945,42	Wh
					8,3%	

[3] In locations close to equator, the east and west surfaces are subject to higher irradiation

	SHADING SCREEN SLAB		FLAT SLAB		DIFFERENCE	
EAST	388603	Wh	491765	Wh	-103162	Wh
NORTH / SOUTH	637477	Wh	729577	Wh	-92099,2	Wh
WEST	466158	Wh	558244	Wh	-92085,4	Wh
TOTAL	1492238	Wh	1779585	Wh	-287346	Wh
					-16,1%	

3. SMART FACADE

3.1 Technological features

The smat envelope is a unitised system modules, "dry" assembled and allows an easy installation on building site. This façade system has a simple geometric design made with two modules: transparent and opaque. The modules can be installed with different geometries and in their frames different types of materials with different colors can be placed

The modules consist of fixed and mobile parts, that can be operated trough automatic or manual controls. The mobile parts, placed in the aluminum frames, are:

- an aluminum shading device
- a transparent panel with stratified glass 4 + 4

A vertical mosquito net made with a metallic grid is placed in front of the indoor transparent module and prevents the entering of animals and insects in the office, and ensuring the night cooling.

The façade system is designed as a double skin façade system, where is possible to customize the indoor skin, the air gap and the outdoor panel.

The dynamic facade achieves good performance in the terms of:

- Thermal transmittance: the transparent indoor wall has a U value of 1,2 W/m2K and the opaque indoor wall has a U value of 0,3 W/m2K
- Acoustic insulation: 50dB
- Mechanical Resistance: the façade has a good fire resistance and mechanical properties and can be tested with accidental and dynamic loads
- Air and water permeability: the weather strip used in the frame avoids the formation of condensation and guaranteed a good air proof
- Maintainability: the modular elements enable to repair, with isolated action of maintainability, the facade system without changing the global performance of the façade

The facade system uses a technological solution with the recessed panels. This mechanism allowed to hide in the aluminum box the mobile elements: the glass panel and the shading device. The recessed panel can bear a weight of 180 Kg.

In the opaque outdoor module can be installed three PV panels that have a electrical energy production between 0,50 and 0,30 kWP. The energy production depends on orientation and localization of the façade system.

In winter the mobile glass panel is placed in front of the transparent module. So the smart facade will have the shape of a double skin facade with a buffer zone that increase its U value to 0.6 W/m2K. In this configuration the façade guarantees a good thermal insulation and doesn't decrease the natural lighting into the work spaces.

In summer the panel with the shading device is placed in front of the transparent module, regulating direct solar radiation and decreasing heat load in the office. The mosquito net is down so is possible to obtain a natural ventilation in the indoor spaces all day long.

The san screen, made with mobile and metallic lamellae, allows to regulate the light and minimize the glare phenomena.

3.2 Energy Simulations

We have simulated the energy performance of the facade system using thermodynamic and lighting software. The dynamic energy simulations have been made in three different climatic zones in Italy:

- Milan
- Florence
- Palermo

And compared to four cardinal directions:
- East
- South
- West
- North

We have built a virtual test room (3) that has a size of 5,00 x 5,00 x 3,00 m and has a wall where is possible to put the following façade systems (opaque and transparent):

1. Window with double glass and thermal break frame. Size: 3,00 x 1,35 (4) m.;
2. Window with double glass and thermal break frame. Size: 3,00 x 2,50 m.;
3. Glass curtain wall with double glass and thermal break frame. Size: 5,00 x 3,00 m.;
4. Glass curtain wall with double glass, thermal break frame and external fixed shading device system with aluminum venetians . Size: 5,00 x 3,00 m.;
5. Glass curtain wall with double glass, thermal break frame and external mobile shading device system with aluminum venetians . Size: 5,00 x 3,00 m.;
6. Double skin façade (unitized system typology) with natural ventilation of the buffer zone. Internal and external layers have size: 5,00 x 3,00 m.;
7. Double skin façade (unitized system typology) with natural ventilation of the buffer zone and fixed shading device system located inside the buffer zone. Internal and external layers have size: 5,00 x 3,00 m.;
8. Double skin façade (unitized system typology) with natural ventilation of the buffer zone and mobile shading device system located inside the buffer zone. Internal and external layers have size: 5,00 x 3,00 m.;
9. Opaque curtain wall made with a insulated panel with rock wool (thickness 8,00 cm) and a window with double glass and thermal break frame. Window size: 3,00 x 1,35 m. (5);
10. Smart façade. Winter configuration
11. Smart façade. Summer configuration without shading device
12. Smart façade. Summer configuration with shading device

The thermal simulations have been done with TRNSYS (TRaNsient System Simulation Program) (6), analyzing for each situations the following parameters:
- Primary energy for heating (Q_{heat}, kWh)
- Primary energy for cooling (Q_{heat}, kWh)

Then we have calculated:
- The total primary energy supply (kWh)
- Heating and cooling consumptions (€)
- Heating and cooling CO_2 emissions (kg)

The simulations show that:

- **In winter months** for the smart facade, the primary energy supply for heating is lower than that required by a brick wall (Case 2, 50% of transparent module and 50 % of brick wall: 4500 kWh). The primary energy supply for the three cities chosen and the four cardinal direction is, in fact, of 4380 kWh.
  But for the smart facade the energy primary need is bigger than that required by a glassed curtain wall and transparent double skin (Case 3: 3450 kWh and Case 6: 3750 kWh) because the solar heat gain decreases with decrease of transparent surface.
  When the mobile glass panel is placed in front of the transparent module the heating needs decreases by the 5%.
  In the future, aiming improve the summer energy performances, could be interesting to evaluat the input given by the use, in the mobile panel, of TIM or other change phases materials.
  The smart facade should be oriented toward south in the purpose to improve the solar heat gains and decrease the energy consumption for heating .
- **In summer months** the smart facade guarantees good energy performance and in the configuration with the shading device placed in front of the transparent module the primary energy need is of 770,00 kWh (reduction by the 70% for the cooling), lower than that performed by a brick wall with central window (Case 1: 1100,00 kWh) and also lower than that of a glass curtain wall or of a double skin with fixed or mobile shading device (Case 4: 1500 kWh, Case 7: 895 kWh, Case 5: 1527 kWh and Case 8: 899,00 kWh).
  The smart facade should be oriented toward south or north so to reduce the thermal loads and the solar heat gains and decrease the energy consumption for cooling.
- **The best orientation** during all year, in Florence and Palermo, is south, with a reduction of primary energy for heating and cooling by the 40%

The lighting simulations have been made with the software Relux, with wich has been possible to evaluate the average of natural lighting in the test room. The simulations have show that the smart façade, that has a transparent module of size 1,50 for 3,00, allows to achieve the following results:

- Good performances in summer months, with a illumination of 592 lux;
- Inadequate performances in winter months, when the glass panel is placed in front of the transparent module, with a illumination of 300 lux.

In order to reduce the energy consumptions for the lighting, the smart façade should be located in the spaces where is possible to have two window located in opposing wall. It's also necessary to install a electronic light system that controls the artificial light and allows to switching on only the lights in areas that aren't reached from the solar radiation.

Figure 3. Smart Facade. Prototype

Figure 4. The dynamic envelope in east facade of the New Centre in virtual environments and ICT of Lucca Chamber of Commerce

4. CONCLUSIONS

The research has involved companies, leaders in the engineering and production of facades: Schueco, Metra, Permasteelisa, Focchi, Cotto Imprunetta, Palagio Engineering. In both cases, the advice of the industrial companies has improved the technological solutions of the production process and of the construction phase.
In the first case, the advanced shading envelope, in particular the "shading screen" slab prototype is being processed. Final results of simulation envisage that the efficiency demonstrated by the proposed slab may help even in temperate climates, especially with regards to hot seasons.
In the second case the smart façade prototype was developed and realized by DAVINI, a Tuscan company, and was used in the construction of the south and east facades of the New Centre in virtual environments and ICT of Lucca Chamber of Commerce . In the next months, finally, we will analyze the real performances of the smart façade applied to the construction of the building in Lucca and in the test cell in Florence, evaluating its energy behavior in Mediterranean clime.

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AREZZO CASE STUDY: THE NEW MODEL OF INDUSTRIAL SETTLEMENT IN TUSCANY

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Abstract

Industrial ecologically equipped area model (APEA) has a key role to consolidate and attract businesses with a high level of technological content and, on the other hand, to contrast an indiscriminate occupational situation in productive areas based on logistics and heavy industry, which has a low added value and great environmental impact.
APEA model aims to developed innovation in production, strengthening research and development already carried out by leading companies in the territory, focusing attention and using available resources to save energy and concentrate on renewable sources as an opportunity for a wide range of innovations not only linked to the energy field, by also to production processes, the civil sector and transport.
TAED department follows San Zeno industrial settlement regeneration project to obtain APEA "status" in observance of Tuscan Region Industrial equipped Area's Regulation

Keywords: Ecologically Equipped Industrial Area, Eco-efficiency, Industrial ecology, Environmental Indicators

1. Introduction

The challenge of Lisbon European Council of 2000, is to improve a new industrial competitiveness at European level, expressed in the economic abilities on a sustainable basis to ensure its population living standards and high growth and high employment rates (Lisbon 2000). So an appropriate change in industrial policy is urgent in order to respect and protect the environment and the welfare and that still need to ensure economic growth.
Eco-efficient Industrial areas are made by technical and management requirements that aims to minimize and manage, in integrated way, ecological footprint in order to start a knowledge process about legislation, economic and social aspects and technical and planning requirements, in order to identify a model of sustainable productive area compatible with the local industrial reality. According to Italian law, in force since 1998, industrial ecology seeks to find the appropriate balance between environmental, economic, and social needs of a system, so some regions have disciplined on that meaning the Ecologically Equipped Industrial Area (APEA - Aree Produttive Ecologicamente Attrezzate) an innovative productive area developed and managed as a real estate development enterprise and seeking high environmental, economic, and social benefits as well as business excellence.
The document describes the key component of APEA model in Tuscany Region, including information about planning, the main environmental challenges, creation of resources management plans, and provision of supporting policies. Moreover we provide details on which industrial areas should be called APEA, with description of indicators and criteria to reach the Regional qualify of APEA. Finally the paper describes the TAED regeneration project of Productive settlement San Zeno, Arezzo, improving the environmental, social and economic performance of companies at each scale, through new services offered by APEA management.

2. The new Tuscan model of industrial settlements

The APEA (an acronym that means Ecologically Equipped Industrial Areas) has been introduced in the Italian Legislative Order by D.Lgs. n. 112/1998, Bassanini law, which expects that Italian Regions discipline, with their own laws, industrial areas and ecologically equipped areas, provided with infrastructures and systems necessary to ensure the protection of the health, safety and environment. The question is to organize the productive site so as to favour the individual settled firms on realizing their own environmental objectives, both economically and technically. Industrial Areas Ecologically Equipped have to be planned, realized and managed on the basis of "ecoefficiency" criteria, in order to ensure an integrated system of environmental aspects, management, reduction and prevention of air, water and soil pollution, the protection of the health and safety as well as a widespread environmental improvement of territory.

The goal of an APEA is to improve the economic performance of the participating companies while minimizing their environmental impacts. Components of this approach include green design of area infrastructure and plants (new or retrofitted); cleaner production, pollution prevention; energy efficiency and inter-company partnering.

To be a real Industrial Area Ecologically Equipped a development must be more than:

- An area with environmentally friendly infrastructure or construction
- A single by-product exchange or network of exchanges;
- A recycling business cluster;
- An industrial area designed around a single environmental theme (i.e., a solar energy driven area);
- A collection of environmental technology companies;
- A collection of companies making "green" products;

Although many of these concepts may be included within an APEA, the vision for a fully developed of this model needs to be more comprehensive.

The main objectives of APEA model are:

- The planning of new industrial estates, technologically and environmentally equipped in order to represent a strategic asset for local development.
- The transformation and conversion of existing industrial estates, through technological and management's actions. This will contribute towards ongoing business efforts to increase competitiveness in these areas.

Developers of an APEA have to make a deeper assessment of potential sites in locating the area. It's priority to consider the characteristics of the local and regional ecosystem, the site's suitability for industrial development, and potential constraints on the pattern of development. This ecological evaluation complements the usual evaluation of transportation, infrastructure, zoning, and other human systems.

The Industrial Area Ecologically Equipped is characterized by common infrastructures and services, managed by a single entity that pursues environmental performances, that positive influences final quality of total area. This new perspective, activated through cluster typical mechanism, allows combining a sustainable productive development with enterprises competitiveness improvement.

The ecological and environmental development of APEA areas are accompanied by a growth in the competitiveness of the production system, offering the companies which locate here economies of scale, jointly-used infrastructure and services, shared environmental management and a reduction in the costs of water and energy supplies.

The "APEA" will be entrusted to a managerial company responsible not only for planning the integrated services and improving production cycles, but also for the planning and development of avant-garde systems and infrastructure, for the right environmental management of the area, with the involvement of all the companies operating here to assist in the attaining of the objectives and, finally, a dialogue with local bodies and communities.

In fact APEA model permits environmental and economic advantages for Enterprises, through adoption of common infrastructures (collective waste platform, energy production plant from renewable fonts, collective water treatment plant, collection of rain water, landscape mitigations) and management solutions (common emergency management, centralized management of green areas and common spaces, purchase groups for energy supply, waste recycle stock exchange, centralized logistics, environmental training area Environmental Management System). Advantages are as follows:

- energy and water consumption reduction
- waste treatment costs reduction
- costs reduction (energy, water, matter)
- maintenance costs reduction
- administrative simplifications and incentives for enterprises
- safety conditions improvement
- imagine improvement

In addition, some common business services may be shared by firms in Industrial Areas Ecologically Equipped: these may include shared waste management, training, purchasing, emergency management teams, environmental information systems, and other support services. Such industrial cost sharing could help APEA members achieve greater economic efficiency through their collaboration.

Small and medium size firms often have a problem in gaining access to information, consultation and know-how. This integrative approach can support such enterprises in overcoming these barriers and gain access to investments they may require to improve performance.

3. APEA regulation in Tuscan Region

The Tuscan Region is an important stakeholder in this commitment and plays key roles in promoting APEA development in its territory, through more aspects as decision making, creating policies, issuing laws and

regulations, organizing pilot activities, providing financial incentives, encouraging innovations in technology and systems, fostering new markets and promoting both education and academic research partnership.

The new Tuscan Regulation (R.T. 2 dicembre 2009, n. 74) clarifies and updates the APEA concept as: "an industrial, craft and mixed use areas, included in multifunctional contests, equipped with pollution and emission control system; APEA are characterized by an integrated and unitary management of infrastructure, services to protect environment, security and health of operators and communities" (Art. 2).

This legislative document, realized in scientific collaboration with University of Florence, Architecture Technology Department (TAeD) and S.Anna Superior School of Pisa (SSSUP), enhances the relationships between different actors – including municipalities, businesses and the local community – and aims to optimize the sustainable use of resources in industrial areas.

The work, lasted three years, aims first of all to define the main features of APEA as follow:

- Sustainable urban planning and design of technological and mobility networks.
- Implementation of synergies between enterprises, through a unit management of centralized technological systems, common spaces, and common services.
- Closed production cycle that aims at the re-use of waste streams, and industrial symbiosis.
- Provision of barriers and other systems for the reduction of any kind of pollution.
- Use of renewable or low impact energy sources.
- Setting up of ecological platforms for waste collection, for water treatment, etc.

The Regulation makes difference between new industrial areas, and restoration of existing ones and gives to decision making bodies (Region, Provinces and Municipalities) specific skills in APEA planning and management, including regional financings to promote APEA diffusion on Tuscany territory.

For existing area it's important reviews strategies that includes a baseline assessment for the area as a unit. The Regulation explores strategies and method through which managers of existing productive areas can gain the right to call their properties APEA. A complete vision of area and a strategic planning process, drive site managers and their tenants to evaluate the benefits of participating in a regional APEA network and by product exchange as well as other means of improving their performance.

The team have elaborated guidelines of these processes and resources to support new industrial areas and existing ones, improving the environmental, social and economic performance of companies at each scale, through new services offered by APEA management.

Moreover the document explains also procedures for checks and acceptance and for performance assessment.

This Regulation, in detail, offers a rich menu of individual facilities, and shared support services, design options, including ideas for site and infrastructure design; moreover also cover strategies for achieving environmental performance and management.

The companies in an APEA need a range of general services indirectly related to their production systems. These include governmental relations, dining facilities, purchasing of common supplies, information access, and many others. By acting in common to procure these services, they can reduce indirect operation costs (especially important for smaller companies). By coordinating satisfaction of these tenant needs, the APEA management company can increase its revenues. Sharing services will increase opportunities for communication among employees of different companies and build the community spirit of APEA.

4. Regional qualify of APEA: the criteria

A full evaluation framework for an ecologically equipped area combines economic, technical, social, and environmental objectives into a whole system. This means that APEA project can seek a design that optimizes objectives in these four domains as a whole, not separately.

The Tuscany Regulation establishes requirements to qualify Industrial Area Environmentally Equipped and foresee a score system points in order to evaluate them: each criteria have a specific score to add in order to reach the APEA qualify. There are two kinds of requirements:

1. Minimum requirements: their satisfaction is necessary to obtain APEA status;
2. Flexible requirements: it's possible to choice requirements functional and compatible with the territory, to obtain threshold necessary to obtain APEA status.

Several basic strategies are fundamental to developing an APEA; individually, each adds value and together they form a whole greater than the sum of its parts so, the criteria of Tuscany Regulation to satisfy in order to reach APEA status are articulated in:

- urban, about planning and design of Industrial Areas Ecologically Equipped
- infrastructural, about innovative technologies and services
- management, about organizational requirements.

In detail, urban and infrastructural criteria provides with technical requirements directed to diminish and to manage the pressures on environment in an integrated way, applied to buildings, industrial facilities and common areas, bought in, have the ambition and the aim of transforming the entire area in a body to serve its users. Infrastructures (for sustainable mobility, energy saving and production, for water management, lighting, waste management, access control, the web server, WiFi access points, video surveillance, irrigation, etc..) will be centralized, and they are characterized by simplicity available to all actors involved. The APEA planning aims that buildings and infrastructure are designed optimizing the efficient use of resources and minimizing pollution generation. It's essential to minimize ecosystem impacts by careful site preparation and environmentally sensitive construction practices. The whole area will be designed to be durable, maintainable, and readily reconfigured to adapt to change. The realization of Industrial Areas Ecologically Equipped will be a tool for local governments and for the entire areas to support the economic and social development, which, since the implementation phases will generate jobs, and opportunities for the construction industry, and support socio-economic area.

5. Regeneration project of Productive settlement San Zeno, Arezzo,

TAED Department have a collaboration with Arezzo Municipality for a participation to the 2010 Tuscan Region APEA Call, addressed to Public entities, to allocate funds to regeneration projects of industrial settlements located in Tuscany. Arezzo project is one of the winners. The project is about San Zeno Industrial Area: a settlement of industrial and craft activities, expecially of gold sectori. San Zeno Area presents a lack of environmental infrastructure, of system of pollution prevention, and problems about mobility and safety.

This settlement presents some criticalities as follows:

- environmental and landscape protection
- network shortages and obsolescence
- enterprises services deficiency
- security and health problems.

Figura 1 Layout of the project

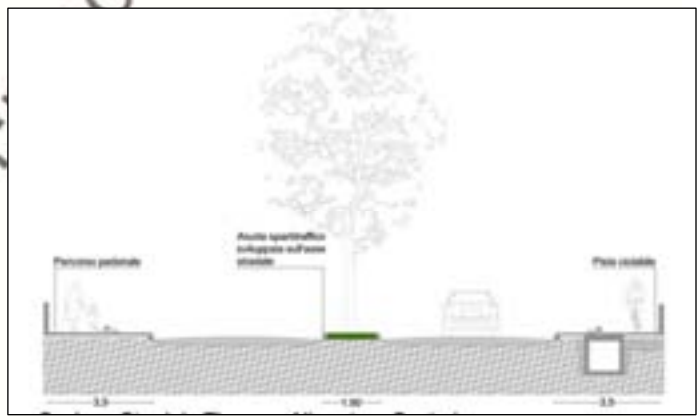

Figura 2 Road section type

The project is articulated around environment respect follows sustainable development, in accordance with the principles of pollution control and prevention, to reach high environmental quality. The project covered the following themes:

- sustainable mobility, limiting the flow driven, promoting public transport, and bicycle and pedestrian flows. Through a phisycal separation between access flow and penetration one. The two main street of San Zeno area, will have a speed limit of 50 km/h, while the other streets inside the settlement will foresee a speed limit of 30 km/h.. To complete the road safety plan, it will be created a velocity restraint device with a system of median strips planted with trees. This solution implement also environmental quality of the area. The project includes positioning of speed detection panels. Cycle network runs above the multipurpose tunnel, on the other side of the foot path. The requalification project foresees three new parking areas strategically located like saturation of the residual areas. The project foresees also fueling station for ecological vehicles.
- Ecology station to manage with ICT provision of waste separation collection in the area.
- habitat and landscape protection, increasing green areas, rows of trees along the roads, etc. All new parking areas in project will be realized with permeable and drainage paving, to better action of penetration of rain water.
- acoustic environmental through the use of sound-absorbing asphalt

- public illumination with remote control systems, and high efficiency lamps. The project foresees the substitution of actual lighting poles with new ones powered with led technology. This solution will allow a total energy absorbtion of 9 kw, with a energy safe of 54% compared to existing. To limit exercise and mainteinance costs of the settlement public lighting, it will be realized a remote control system to manage light intensity, lamps durability and substitution, failure analisys, etc. with a reduction of costs between 30% and 50%.
- realization of a multipurpose tunnel for networks allocation. The tunnel will allow:
    - a better hydrogen distribution (necessary for gold's productive cycle) for San Zeno enterprises.
    - The installation of cogenerator of hydrogen energy (of 5kw) armed with monitoring system to verify environmental and energy benefits derived from hydrogen introduction.

Figura 3 Multipurpose tunnel

Figura 4 Requalification of parking area

6. Conclusion

APEA model is compatible with Tuscan Region productive and industrial structure, characterized by local systems highly specialized in production sector (paper mills, tanneries, steel, textile) and by small and medium enterprises presence. In fact the model:

• facilitates sme to reach an improvement of their own environmental performance, through common infrastructural and services equipment, characterized by high quality, impossible to achieve and to manage individually

• allows control and reduction of cumulative environmental impact, generated by all the enterprises of the settlement

• facilitates and exempts enterprise by obtaining environmental permission when issuing and renewing

• applies postulate of pollution prevention, precaution and reduction

The direct beneficiaries of the activities are:

• Local Public Authorities, in order to innovate and experiment new urban planning rules, and to support competitiveness in the respect of International rules, about environment and resources saving.

• SMEs, to obtain simplification and facilities, thanks to coordination and cooperation management, and to better their repute in local and International contest.

• Communities involved in hearings conducted by planning agencies, to benefit by strengthening economic development planning, mobilizing educational resources to help the community's businesses and government operations increase energy efficiency and pollution prevention.

In any case, this new approach has the presumption of encourage productive areas managers to improve their economic performance, environmental quality and social development.

The Application of Arezzo Case Study, permits to verify APEA proceedings in relation to local context and territory's features, in fact the project was set up with the aim of creating proper infrastructure to supporting and promoting the development of companies and by offering new services and opportunities to the territory where they operate.

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Improving daylight quality in offices using fixed shading devices in hot climate region

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Abstract

Large windows and highly glazed façades have been increasingly used in new buildings, allowing access to daylight and external view. Large glazing areas have direct affects on thermal comfort, increase cooling load and become a source of glare that harms the visual environment. Generally, shading devices are used to protect inner spaces from direct solar gain through openings, windows and glazed surfaces. The current research investigated the effect of using shading devices on lighting quality and quantity in offices facing south-west façade at Jordan University of Science and Technology (JUST). Windows facing such orientation required especial considerations to improve daylight quality by eliminating glare, improving uniformity of daylight distribution throughout the day in addition to control daylight level to acceptable level. Two fix shading devices vertical fins and diagonal fins, were installed in two real identical offices. Thereafter, the light environments were monitored and daylight levels were measured. Moreover computer simulations using RADIANVE were conducted to study the effect of using shading devices around the year. The results showed that the daylight quality in terms of uniformity and glare level were significantly improved in offices with shading devices compared to offices without shading devices. It showed that shading devices could be excellent means of improving daylight quality in offices suffering from poor orientations in hot climate regions.

Keywords: shading devices, uniformity, glare, daylight, Radiance.

Introduction

Shading devices

Buildings lighting around the world consumed a large amount of energy especially in office buildings. Energy in offices building count up 30-60 % of energy used in the buildings. Well-building design requires integration of many factors, such orientation, solar control devices and building form, to compromise energy consumption through a building. In additions windows, glazed façades and openings have an important role in building energy consumption either for heating, cooling or lighting. Highly glazed façades and large windows have been increasingly used in new buildings, allowing access to daylight and external view. Therefore, the impact of that on cooling, heating and lighting quality and quantity in the building is required to be significantly considered. Appropriate shading devices design can contribute well to indoor illumination from daylight, improve thermal comfort, control solar heat gains, reduce glare and save energy. The current research investigated the effect of using shading devices on daylight quality and quantity in offices facing south-west façade at Jordan University of Science and Technology (JUST). Windows facing such orientation required

especial considerations to improve daylight quality by eliminating glare, improving uniformity of daylight distribution throughout the day in addition to control daylight level to acceptable level.

Daylighting, in buildings design, is always sacrificed because of associated problems such as heat gain especially in hot climate regions. Thus, shading devices and small openings are considered the main features of building design to control excessive penetration of direct sunlight so as to reduce heat gain and glare [1]. Edmonds and Greenup [1] suggested that the principal objective of windows design in subtropical regions is thermal comfort in summer. Therefore, daylight entering windows is severely reduced and internal daylight levels in shaded sub-tropical buildings are well below those achieved in buildings in more temperate climates [2]. In hot climate regions with clear sky most of the year, this is a contrasting situation because favourable natural lighting conditions are presented during working hours [3].

Freewan et al [4] studied the integration of louvers and ceiling geometry and it effects on daylight level in spaces in hot climate regions like Jordan. It illustrated how shading design could be integrated with other building elements to improve daylighting environment. Dubois [5] studied the impact of seven types of shading devices on daylight quality. The study used Radiance to study the absolute and relative work plane illuminance and surface luminance. It found that some shading devices could provide the offices with acceptable illuminance level suitable for tradition office work while other devices could be used for computer base work. Wong and Agustinus Djoko [6] investigated the daylight performance of shading devices. This study examined the simulation results of LIGHTSCAPE. It showed that shading devices can effectively reduce glare and allow for daylight to enter with illuminance level exceed the recommended level. Gugliermetti and Bisegna [7] devolved simplified algorithms to assess the indoor natural illuminance with external fixed shading devices to simplify calculations shading devices performance. Many researcher have studied the effect of using of shading devices on thermal comfort and energy consumptions of buildings[8-14].

The literature has shown the need for studying the effect of shading devices on daylight in real building in regions with hot summer and cold winter like Jordan. The current research investigated the effect of using of shading devices in south-west façade of offices in Jordan University of Science and Technology (JUST) on daylight quality.

Uniformity

The distribution of illuminance and luminance is a measure of how lighting varies from point-to-point across a plane or surface. For good visibility, some degree of uniformity across the task plane is desirable. Poor visibility and visual discomfort may result if the eye is forced to adapt too quickly to a wide range of light levels. CIBSE [15] defined two types of measurement to study the lighting variations: uniformity and diversity. The uniformity describes the evenness of illuminance distribution across a space, desk or working area. It is calculated as the ratio of the minimum illuminance to the average illuminance over the specified task areas. On the other hand, the diversity is the ratio of the minimum to the maximum illuminance over the core area of the working plane. Fontoynont [16] discussed the applicability of uniformity and glare standards on daylight. The uniformity ratio for daylight could be lower than that for artificial lighting. Occupants are more tolerant to glare and non-uniform distribution from daylight sources than that from artificial light sources. The recommended uniformity levels, minimum to average, by CIBSE and IES are within a range of 0.5-0.8. The CIBSE standard required a uniformity level over the task area of 0.8, while the overall uniformity could be less than 0.8.

The study case and current situation

Jordan is classified in a hot, dry, subtropical zone, which is characterized by high temperature in summer and cold temperature in winter. Clear sky conditions dominate around the year with medium to overcast sky and moderate rainfall in winter, which gives favorable natural daylighting conditions for working hours throughout the year. The average direct sun component is about eight hours a day. The country has a Mediterranean-style climate which characterized by hot summer and cold winter. It has a long summer with a peak in August while January is the coolest month.

Jordan University of Science and Technology (JUST) is in Irbid (latitude 31.9° North, longitude 35.9° East) around 80 km to the north of Amman, the campus was designed by the Japanese architect Kenzo Tange. Buildings were constructed using prefab concrete panels and blocks. Office wings located on second floors, while ground and first floors used for lectures halls and labs respectively. The plan of the office levels is double loaded corridor with offices at each side. The number of offices in wing A3 which face west south facade is 11 offices; each office is 3.5m width, 4.25m deep and 2.75m high figure 1. The façade height comprised three sections; 0.80m sills, 1m windows and 0.5m upper windows figure 2.

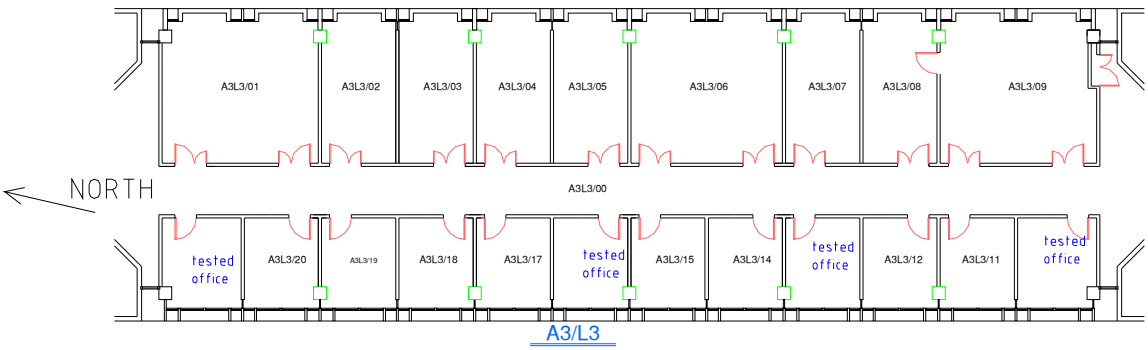

Fig. 1 plan of offices level 3, wing A3, at JUST

Building oriented toward south-west with large windows area such office spaces at JUST suffer from un-control visual environment throughout the year. In such orientation windows required especial considerations to control excessive daylight level and glare as well as solar gain. The offices expose to direct sunrays from noontime to sunset with total hours of disclosing more than seven hours in summer. Sunny area starts increasing gradually inside the offices from noon time to cover most of the office area hereafter as seen in figure 5.

Author noticed that offices oriented to south-west such as offices in wing A3 experiencing high air temperature, poor visual environment and high glare level. However, the artificial light is used most of the time even during sunny days.

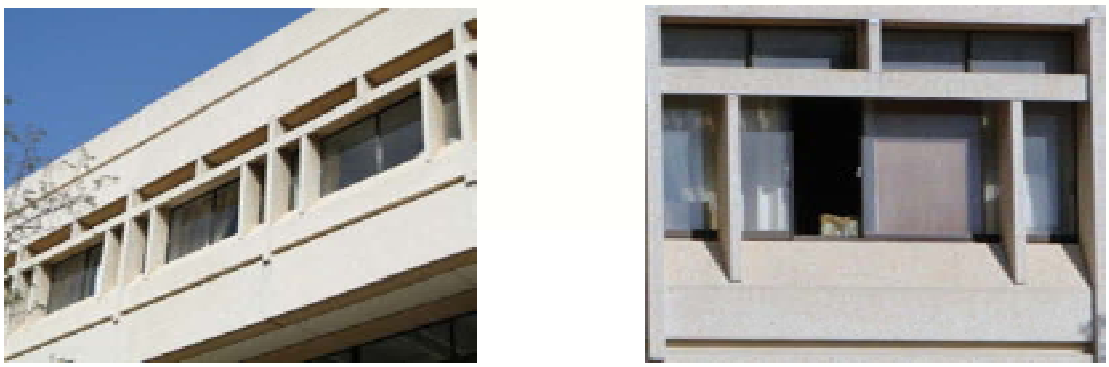

Fig.2 office façade (left)single office' windows details(right)

Occupants' reactions to discomfort situation almost have negative impact from energy point of view. Users spontaneously used curtains to overcome the problems shaped by large glazing area especially the increasing sunny area to block the direct sunrays and to avoid glare figure 5. Consequently, the daylight level inside the offices decreased that required an auxiliary artificial light to maintain the light level up to the required task level.

Research methodology

Experiment set up

Two fix temporary shading devices; vertical fins and diagonal fins, were installed in two offices. Thereafter, experimental measurements were conducted in two offices with different common shading devices, in addition to a base case office, an office without shading devices being installed. The offices are identical in all parameters like; area, geometry, orientation, windows design, glazing area and transmittance ratios, function, opening and surfaces material; colour and reflectance factors. The exposed façade of the tested offices is oriented to 12° south of the west. Measurements from tested offices fitted with the selected shading devices were compared to measurements from the base case office without shading devices. Experimental measurements were taken in offices spaces on fully sunny days. Data were collected using EXTECH light meter in additions to real documentation using photos every hour.

Radiance

The research used Radiance computer simulations to save time, to study the daylight environment round the year and to ease changing of design choices. Radiance uses ray-tracing method and can easily deal with complex building forms and geometries, diffuse, specular and semi-specular reflection, transmission functions. Mardaljevic's [17, 18] showed a good agreement between results from Radiance and actual results for; clear glazing, louvers and lightshelves as long as it uses identical sky conditions.

Results and discussion

Illuminance level

Figure 4 presents the experimental results of using fixed shading device in real building. The results show how vertical and diagonal fins could affect the illuminance environment. Even though shading devices reduced the illuminance level, in the morning, compared to the base case, but the illuminance still up to the required task level. Shading devices reduced the illuminance from 700 lx in the base case to around 300 and 400 lx for verticals and diagonal fins respectively. In the afternoon, shading devices were being more effective from daylight view. They helped control excessive daylight level to acceptable level. Vertical and diagonal fins helped reduce the illuminance level from more than 4000 lx in the base case to around 500 and 600 lx with vertical and diagonal fins respectively. Radiance simulation results show round the year daylight environment in the base case office and offices with different

shading devices figure 4. The illuminance level reach to unacceptable level afternoon in the period from March to September when. Therefore, shading devices help control the excessive illuminance level around the year especially in the afternoon. The illuminance level could reach more 4000 lx, but with shading devices it was reduces to around 500 and 600 lx in offices with vertical and diagonal shading devices respectively.

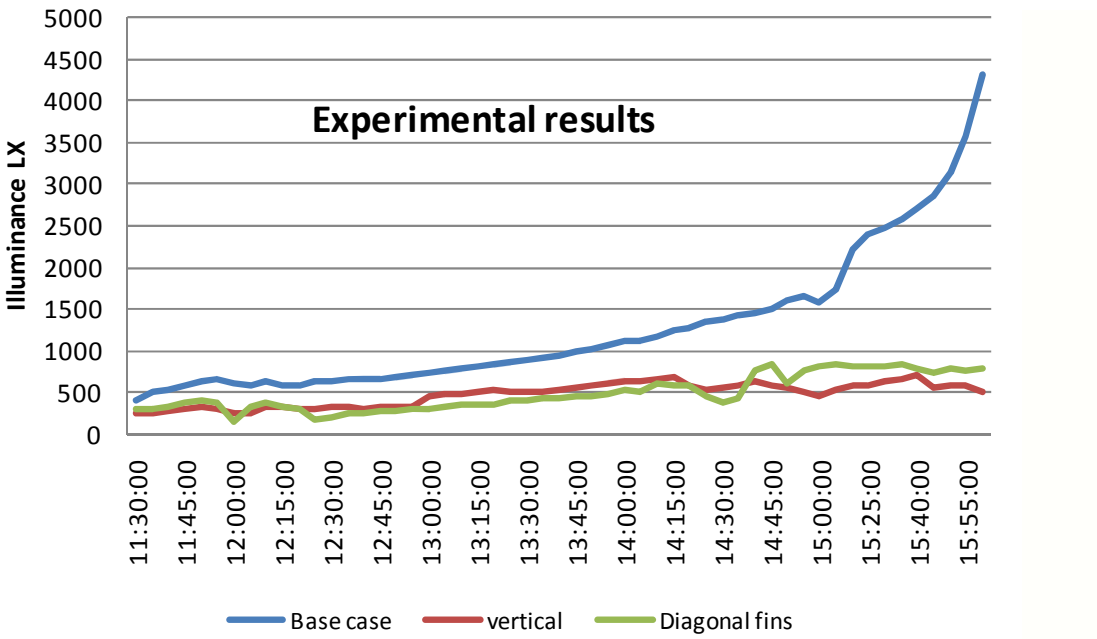

Fig. 3 illuminance level in office with vertical and diagonal fins compared to the base case

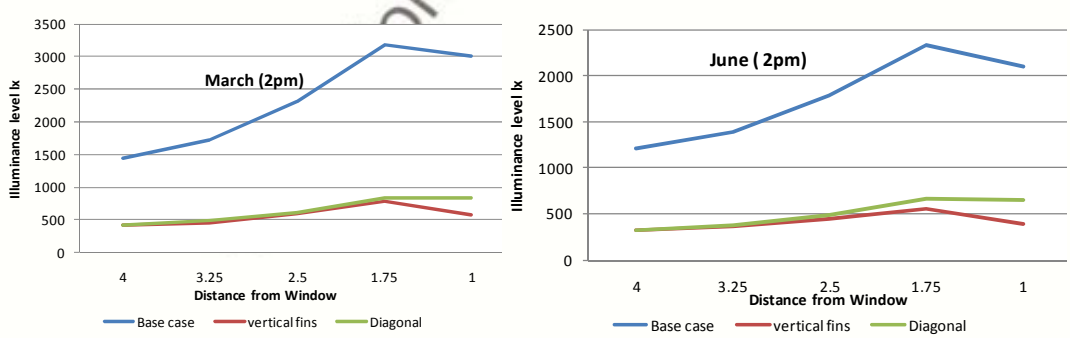

Fig.4 illuminance level in the offices with vertical and diagonal fins compared to the base case in March and June

Uniformity

The uniformity, the minimum illuminance level to the average, in base case office show poor illuminance evenness over the task level especially in the afternoon time. The uniformity ratio changed from 0.70 in the morning to less than 0.30 in the afternoon in March. On the other hand, the recorded uniformity level is less than 0.20 in June. Using shading devices improved the uniformity level close to the recommended level. Table 1 presents the uniformity level in offices with verticals and diagonal fins as well in the base case. The results are the minimum to average of 25

readings taking from Radiance simulation in March and June at 10am, 12pm, 2pm and 4pm. The best uniformity level achieved, as seen from table 1, is around 0.80 with verticals fins in March with minimum level more than 0.55 which within the recommended level. Figure 6 shows how clear that the shading improved the visual environment from the morning to afternoon time. Moreover, it shows how the sunny area create uncomfortable visual environment and cause glare. The sunny area is increasing from noon time to sunset to cover most of the office area which becomes a source of glare and harm the visual environment. Figure 6 and table 1 show how the uniformity level decreased in the base case as the sunny area increased in the afternoon. The uniformity level study approved that shading devices could improve the visual environment and daylight quality.

Fig. 5 pictures show the real visual environment in the base case office compare to office with vertical fins before and after noon time

Table 1 uniformity level, minimum to average, in offices with shading devices in addition to the base case

		10am	12pm	2pm	4pm
	base case	0.68	0.49	0.44	0.28
March	vertical	0.80	0.79	0.72	0.62
	diagonal	0.75	0.69	0.65	0.65
	base case	0.69	0.50	0.40	0.19
June	vertical	0.73	0.74	0.68	0.59
	diagonal	0.64	0.62	0.57	0.57

Glare

As seen in figure 5 shading devices helped control the glare from windows and direct sky. Windows, without shading devices being installed, become sources of glare which harm the visual environment and produce sun patch on the working plane. On the other hand, shading devices reduce the sun patches on the working plane and so eliminate the sources of glare and veiling reflections. Uniformity levels over the office area showed how shading devices control the excessive daylight and sunny area which means that it reduced the sources of glare. Occupants' interaction showed that shading devices controlled the glare and improved visual environment. Occupants in the base case office use curtain to block direct sunrays and eliminate the glare while occupants in offices with shading devices were being able to use the offices without curtains.

Air temperature and thermal comfort

Figure 6 (left) shows the results of air temperature in office with vertical fins compared to the base case. Clearly, using vertical fins help reduce the inner temperature compared to non shaded office. It helped reduce air temperature up 17% in the afternoon with an average of 9%. In the morning the air temperature almost closed in both offices, while the difference start to increase gradually as the sunrays start reaching the windows as seen in figure (5). Generally verticals fins reduce the air temperature in the period from 1pm to 4pm by an average of 4C° with maximum reduction by 7C°. On the other hand, diagonal fins as seen in figure 4 (right) reduced the air temperature by up to 21% compare to the base case with an average of 13%. The difference in the morning is neglected while it starts to increase dramatically from 12pm to 4pm. The maximum decrease occurred after 3pm by 8.5C°.

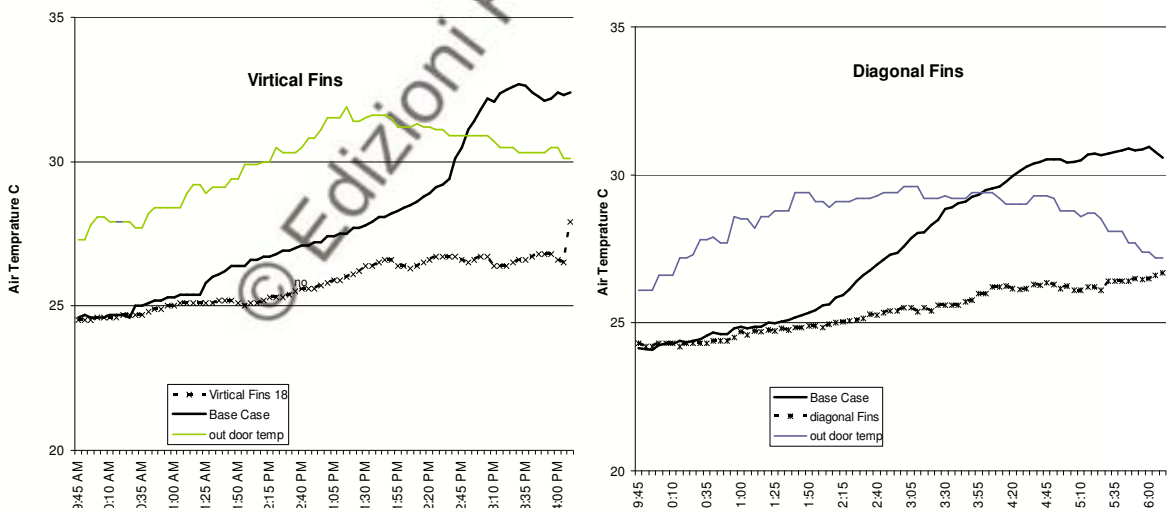

Figure 6 air temperature in office with vertical fins compared to the base case (left) air temperature in office with diagonal fins compared to base case.

Conclusion

The research investigated how the shading device could help improve the visual environment in offices facing west-south. Two fixed shading devices were installed in two identical offices. Simple indicators have been study, illuminance level, uniformity level and glare in office with shading devices and compared to the identical base case office. Both

experimental and simulation results showed that shading devices improved both daylight quantity and quality. Shading devices could play an essential role as a daylight devices as well as sun protection devices if both daylight and sun gain were taken into design considerations. Diagonal fins showed the best performance compared to verticals shading devices. On the other hand, vertical fins maintain the view out to acceptable limit while diagonal fins obstruct major part of the view out. Both types of shading devices improve the uniformity level, and so the daylight quality, to the recommended level. Moreover, shading devices control the excessive sun rays and protected the working plane from direct sun and eliminate the sources of glare. Therefore, occupants will not use any devices to interrupt sun rays, like curtains, which have poor impact on energy use and daylight quality and quantity. As a result, shading devices will help make occupants reaction to work well with energy-saving strategies and sustainable use of buildings. Fixed shading devices in real offices demonstrated good improvement in the visual environment in addition to reduce the use of curtains and artificial light. In addition, results indicated a major influence of shading on solar gains and thermal performance of offices. All shading devices helped improve the thermal environment in the offices in time of the experiments in September and October. It is clear that until 1pm all shading devices reduced the air temperature approximately with same rate. On the contrary, after 1pm the diagonal shading devices performed better as it helped block all the sunrays all the time. On the other side, vertical fins shading devices allowed some part of sun shine to enter the offices in the period 1pm-3pm.

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Interpretation of language decoded by pre-existing

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Abstract

This contribution investigates on a process detecting design instruments in a behavioral modality suitable to the localistic segment in which it is applied, assuring a logic sequence of recognition with the urban outlook in question.
The origin is inspired by the architectural undertones woven into the historical background of the Mediterranean cities and has to be seen just in the multiplicity from which is possible to gather an acceptable significance even in the minor building, the main responsibility of current urban building is designed to.
Nowadays the international architectural outlook is marked by the visibility primacy of architectural works, aside from the settlement places, and not so much by the innovative drive putting the emphasis on the executive reliability of design procedures, above all in interventions similar for historical-architectural continuity. Therefore, how can these imply considerations about figurative modalities transferable to a morpho-technological apparatus, and through an analysis of the linguistic repertoire, to serve as path to articulate a sustainable design, on a contextual scale? The topicality here implied is frequently cited by contemporary teachers and thinkers, emerges as essential to break down and evaluate influence that can result in the design process, certainly in relation to climatic conditions or use of local resources but also for interactions between aspects of perception and overall configuration of the manufactures, conducted primarily by the contribution of the technological sphere, called to assist *typicality and spontaneity* of Mediterranean tradition in a requirement- performance synthesis.

Keywords: Morphology, Technology, Sustainability, Language

1. Introduction

"(...) In the south, which belongs to the Mediterranean we see a town much more structured, much more complex, much more mobile, even crumbling, that's for sure, but rich of value. And we must work to remove the decay, but not to make them like Hanover or Coventry, not to make them become a plastic town....
Here is what I think about South: I think there are extraordinary wealth" (G. De Carlo)

The contemporary city has changed its appearance in less than a century, adapting historical sites to the new introduced language and generating other unexpected places, even to the suburban fraying tissue that becomes repetitive in configurative interventions of organisms, and in the alienation of the environment liveableness.
The question is why the design models used - in the process rather than in objectual outcomes - cannot take root in specific realities or do not support the production of a background worthy of the public scene and promoted elsewhere? We should consider, in particular, the south and the aspects concerning the Mediterranean and southern essence.
In the geographical interpretation of both terms can be found a socio-cultural distance even concerning the resources implying a change. This could mean looking and saving building consolidated systems, assured and transferred by the local tradition.

2. Mediterranean background

On the banks touched by the Mediterranean sea began the pre-modern civilization. The civilizations previous to the Greek and Roman that had reached a sufficient progress degree, they also were built over catchment area, though of different entities: this is the fixed point to keep in mind in order to understand certain thoughts Mediterranean peoples were able to develop: confrontation with water at the base is the foundation of a way to face life and our essence [1].
The relation with the sea is essential in determining the development of Mediterranean: "Not one sea, but a succession of seas. Not one civilization, but a series of layered civilizations. Traveling the Mediterranean is as much as meet Roman world in Lebanon, prehistory in Sardinia, Greek cities in Sicily, Arab presence in Spain, Turkish

Islam in Yugoslavia. It means sinking into the abyss of time, until the maltese megalithic buildings or the Egyptian pyramids". [2]
This multiplicity, described by Braudel, opposed to a substantial uniformity of the Mediterranean world, becomes the object of study on the inlay of relations between points in common, and steady and inter-current progress [3]; not only in a general history of ideas, but also and especially in the related disciplines material area.
It is a fact that Mediterranean landscapes are similar, from a geo-morphological and biotic point of view; as well as it is a fact that materials and structures have similarities; in fact it is not unusual to find the same types of buildings in various parts of the basin between Italy, Spain and Greece. For example the proximity to salt water, or the continuous lack of protection from wind power offer a very limited use of wood as building material, compared to the inland or mountain areas building.
On the other hand, "the use of stone is a hallmark of the Mediterranean architectural tradition" [4]. This is because the stone is more resistant to climate; because its availability and sustainability is more than that the wood had to offer. These all can be considered key factors in the dynamics of a locally appropriate design, easily deducible from the observation of the usage of building materials recurring in overall settlement buildings. We have to remember how is "(...) evident the influence of geographical factor in the building history, and the decisive role assumed in the past by the reaction to the climate and by the local resources usage" [5], talking about *topicality* as an essential factor, obeying to the Heidegger's concept, according to which man lives in the world.
In this sense, in this survey, it will be significant going beyond the mere language sign, to understand totally the reasons of a concrete entity, through a historical analysis of modern cities.
Beyond the non-homogeneous territorial distribution of human settlements, Mediterranean area deserves a deep interest starting by the building typology. Talking superficially about rationalization of a urban location could cause an erroneous connection with *modern time* and with modern town planning.
To give an example, Messina, after the earthquake in the 1908, according just to this idea was planned as a chessboard, and cultivated notwithstanding vocations or remote plans; although we know that "modern town planning was born in the Mediterranean Greece, in the V century, by Ippodamo from Mileto, inventor of the chessboard plans. It triumphed in every period of cultural standardization, in which the systematic reproduction of a set pattern, and considered higher, in a way takes revenge on the spontaneous development" [6]. A conflict, therefore, to be reviewed.
On this basis rests the ability to analyze the cities of the Straits, and Messina in particular, in the light of the reading key proposed by the Mediterranean general framework as a whole. Of course, "we should ask ourselves, with realism, if under present conditions there is an acceptable semantic, shared by different dealers: certainly the current use of a meaning, or its common interpretation, can't raise the different signs to proclaimed structure" [7]; in doing so we could answer automatically and naturally, watching with a critical and not so experienced eye, to several questions about this common semantic, that creates innovative and repetitive contact at the same time, passing through *matter* and *geometrization* that connote. Mediterranean is doubtless in these passages; and the Straits, where the new modernity takes place, was its precursor.

3. The Straits cities: structure and appearance

If we analyze the conformation features of Messina and Reggio Calabria, from the geographical and orographic point of view, we discover how they are similar, starting from the close relation with the sea. This, as mentioned, is essential for a deeper understanding of these places: it is a source of life, but also a way of thinking.
Sea and sea-related structures are the trait d'union between the two coasts for the uniqueness of places hardly admirable anywhere else in other parts of the world [8]. Unfortunately, as we know, the coastal factor is not the only one the two cities have in common. Two historical factors make them more similar and compatible: one is the Great War, however, a factor common to most of the Western world; the other, much more meaningful is the earthquake. Therefore, while the sea and the port can always be seen as positive elements of this twinning, the earthquake is certainly a sad aspect of this connection. After 1908 the cities faced with the mechanisms of major lend use schemes starting a new life on the dynamics of rebuilding, trying to reconcile tradition with modernity. In fact, the seism creates a rift in the continuity of architectural and urban design. Both the Borzì's and De Nava's plans wanted to remedy to the damages occurred to find an optimal reconciliation among all the needs of connection with the past [9]. But the vehemence of placing design principles did not give the time to stratify, to fulfill a superposition between mesh and tissue, but only to overlay and change to limit the damage achieved.
The analysis of the rebuilding essential core is focused on the conformation of the two cities blocks. There aren't sharp differences between the two projects: the blocks arise with the same philosophy, also because now it is clear that the creative freedom of movement was very limited by directives and legislation. A real Building Regulations decree, "constituted a fundamental instrument for the building control and design (...) especially the homogeneous design of elevations" [10]. In these circumstances there was a confirmation: without contextual references, the model - the modern one, in this case - fails and, unable to turn into the method, it loses much of its divisibility and doesn't advance a positive impact on the direct surroundings.

4. Relation between city-organism and waterfront in Messina

In particular, two are the aspects to be highlighted on the urban realities taken into consideration. The first is that according to the location of the city it has been a continuous succession of different ethnicities and cultures. Consequently it caused a jumble of heterogeneous structures deprived of a sufficiently organic form. The second aspect shows, instead, the difficulty to design a long-range accommodation allowing a greater unity of urban tissue. The result is limiting and limited; technical innovations that could have been used were underestimated: "denying any possibility of expression to a material that can be cast in any mold, the city of rebuilding will be characterized again by reinforced frames with eclectic decorations (...) and will be convinced to be able to apply the elements of the classical language of urban vocabulary according to the laws of the new materials imposed by seismic" [11]. The situation of the city related to modernity excepting Piacentini, Mazzoni or Libera can be summed up just like that: "in the rebuilding of Messina, the lack of historical stratifications (...) is compensated with a nostalgic but mechanical use of traditional, or rather academic languages (...) [12]. In these the city today places its value, pride and pleasure in entering the contemporary architectural debate. Even as those years saw the debate about the importance of the harbor and the *waterfront*. The most tangible criticalities are discovered in infrastructural lacks that deny the relationship between the sea and its facing.

With the passing of time we are witnessing the loss of such type-technological features of building tradition in the new achievements, in central areas next to historicized interventions. Indeed, at that very moment we can catch connection between environment-landscape and environment-built in the Strait landscape, it is not as much possible at building scale, without slide towards habitual generalizations.

Nevertheless, we can still consider the building scale derivation from the Roman domus, together with the typical Arabic house as we can deduce from little but recurring features, focused on the volumetric mass compactness; on the preferable openings towards the courts; on the indefinite relation between internal and external; on the brightness of the external surfaces; on the usage of chiaroscuro for the facade offset; on the rhythmic hierarchies of elevations, on the vertical progression signs to accentuate the extensions beyond the top; on the horizontal progression signs to suggest the continuity among adjacent fronts, or on the overlapping facing tripartite plans.

This framework sums up all the features related to the examined settlement systems.

In this is reflected the carried out interpretation process about a representative piece of the architectural evolution of the city, that still refers to Mediterranean modernity concept to which we refer and that, according to Losasso, "(...) reconnects with the building tradition, innovating and reinterpreting it, making the relationship between aesthetic of technique and architectural morphological aspects a new strength". [13]

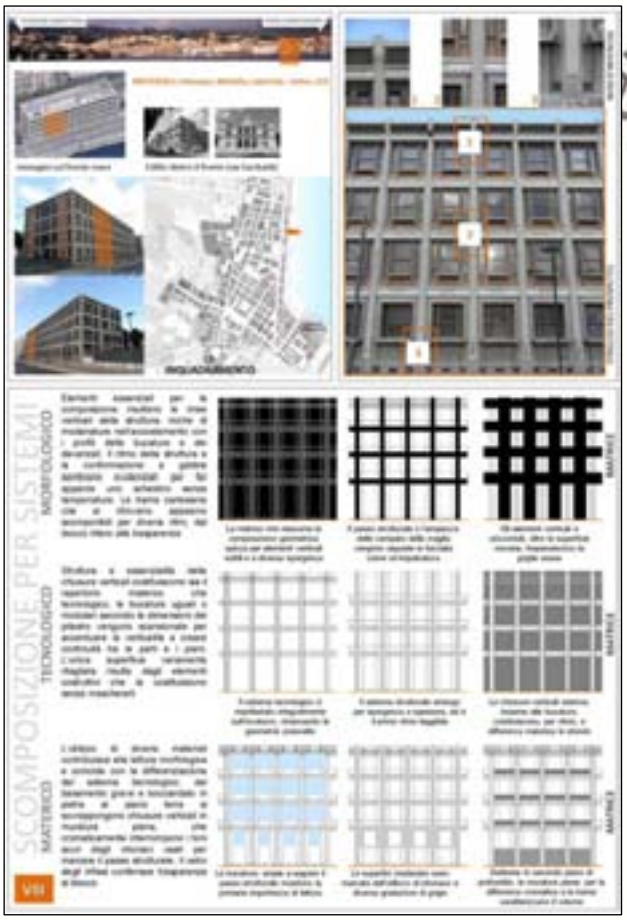
Figura 1. To the left a part of the Palazzata collapsed during the earthquake in 1908, to the right we can see a part of the Palazzata today.

5. The case study of Messina Palazzata

Whereas the great urban solutions show some limits of large-scale design not always proper to the features of the city, emerges the utility of a discrete approach in the technological configuration centered mainly on the volumetric and facing devices.

The specific morphological reinterpretation of *the Straits places, as well as for much of the Mediterranean building, is answered in the building* components: in their geometric precision and in the precise distribution of the technical elements in relation to the pace, modules and textures of fronts. These specifications stand out in the buildings placed on the old walls of Messina harbor, well known as Palazzata. The Palazzata has been chosen as a case study for the incisiveness on the historic city waterfront and not only for its close connection with the recovery plan of the pre-existing in the european cities in a Mediterranean field. A buildings complex arranged in a line overlooking directly the port that follows, at least in intention, transversal and renewal that distinguished at various times the image that Messina left in the Mediterranean. Rising where he was built, almost half a millennium before, the maritime setting, the Palazzata of 1957 shows not only the features of an urban city that is reflected in social and economic aspects since its pre-modern origins, but summarizes and spreads around the built tissue many of the principles translated from architectural realities of modern origins, serving as a model for design.

Clearly, vicissitudes articulating any construction phase for more than thirty years, led to a reinterpretation of design origins, but it is also evident that technical-building features improvement in that lapse of time had as result the rich assortment of techno-morphological solutions that are considered as repertoire of a careful study of variations on the theme. In all the manufactures we can find the will to approach the context permeating both formal and material choices. References to solutions similar for involved apparatus and technical elements are continuous, showing material specification to assist the geometric-formal scale of the whole manufacture. On the light of this we have to consider the attempt to mediate between the specific region devices persistence and the new technology (reinforced) through the traditional material significance, as a mass of refined structure of the Mediterranean objects of worship new at that time, nowadays examined to decode its language and to suggest a line of interpretation useful to design ex-novo in the context.
In this connection, have been prepared analytical cards of the Palazzata buildings, proposing a relative analysis to the tripartite fronts in morphological, technological and materal aspects. Highlighting the fragment of the elevation for each building the configurable aspects dictated by the three categories values can be described and emerge patterns and textures concerning technical elements tracing out signs on the facade that make it recognizable.
The aim is highlighting, in an overall framework, the peculiarities of each item of the breaking down in shaping the expressive pattern of the front, recurring and closely associated with the expressiveness of the employed materials. Therefore the synthesis of the, so carried out, evaluations follows two different interpretations: by one hand it highlights the crucial issues of the facade on the waterfront, in which is possible to see recurring aspects over the entire surface; on the other hand, it emphasizes *the role of materiality,* by means of dominant or subordinate relation that operates with morphology and technology [14].
The result reconciles a comprehensive analysis for the transfer of the extrapolated data to a reading system, interpretation and transfer of language - strictly related to the envelope surfaces – making us reflect on the dual relations between vertical Padding/Closures, Structure/Facade, Protrusions/Recess, Empties/Filled and Transparency/Opacity as primary factors on which developing the research of the prevailing linguistic connotations.



The synthesis data of technological units and technical elements resulting from the analysis on all the seafront blocks examined, are summarized as follows:

- Carrying skeleton structure, recurring materials: stone, plaster, concrete;
  - *vertical*, always in a prominent place and exposed (with several protrusions) in order to contribute to the front configuration, creating the grid.
  - *horizontal,* not always clearly expressed through the protrusions, it is sometimes delineated by a different covering or associated with other partition or closure elements conforming in material used therein.

- Closure (vertical), recurring materials: stone, brick, plaster, metal, glass;
  - *vertical walls*, serve as plane of geometric overlapping defined by the grid driven, almost always, by the structure.
  - *vertical frames*, of minor importance in the configuration, always follow the pace set by the verticality of the elements and the spans, although they move to highlight the overlapping, sliding and other signs of discontinuity and regularity.
  - *balconies and loggias*, in some cases crucial to determine the geometrical logic as well as the materic distribution between elements.

Figura 2. to the left you can see an analytic report of Palazzata buildings (Samonà and others, 1957); to the right, synthesis of the features concerning all the waterfront of the built, analyzed according to the detected technological units.

6. Conclusions

We refer to these features when through analysis we want underline - in the sequence of matrices modeled on the elevation excerpts - the importance assumed by an interpretation focusing specifities relating to each technical element, generating several reading levels all comparable and merging into the manufacture general configuration. Thus, on the wake of this breaking down it could be possible to rebuild accurately an evaluation and validation system of the built language, even for each examined theme, to confirm future design choices in line with the features concerning their own context.

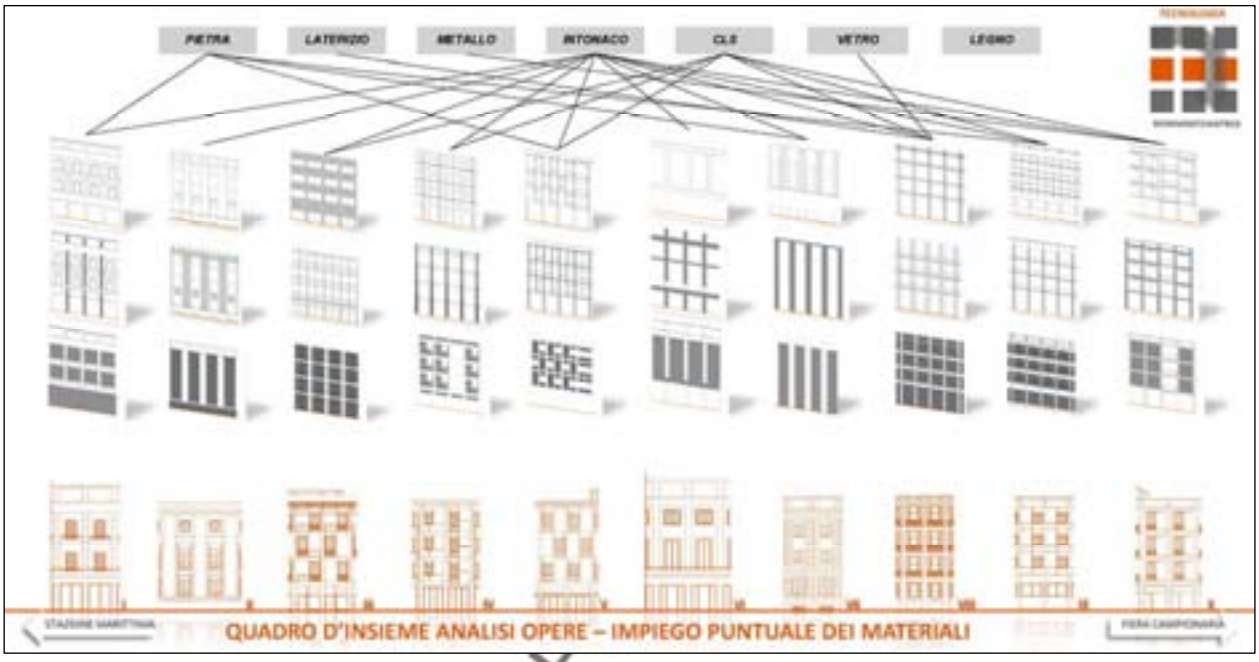


Figura 3. General framework on the results of Palazzata analysis (only technological reading and reccurring materials)

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COMPATIBLE USE AND ENVIRONMENTAL VIVIBILITY IN THE ACERRA CASTLE, NAPLES

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Keywords: sustainability, bioclimatic architecture, fortification housing

Abstract:

Within the Campania Region in southern Italy, a great number of Castles can be found, since, following the complex - and blended with the rest of European history - events, the medieval feudalism habits and the continuous battles and political and economic conditions have produced the need of fortifying the land, from the coasts, where a number of towers testify the defensive action against the Saracen incursions, till the big walling around the towns.

The major part of them are strongly damaged and very often abandoned, even if their historical, artistic and configurative values are unquestionable. Among them some example of fortification systems have nevertheless been restored and in few cases even re-employed for various destinations.

The paper we present will show the result of a research that the Cittam research centre and the IIC Institute have been carried out and that involves the study upon one of the aforesaid fortification, located near Naples in a Municipality called "Acerra", and very famous for the supposed birth of the traditional Neapolitan Mask of "Pulcinella".

The historic background, the architecture, the technology and the climatic behaviour of the case study have been described and a short draft for a possible rehabilitation design solution has been outlined.

1. Historical Context

Acerra, a town in the Neapolitan province, is settled in a flat area once called Campania Felix for the great earth fertility: the location in a depressed zone and thus the swamp formation followed the river Clanio's floods affected demographic and political dynamics[1].

Figura 1 - The circular tower, the most ancient architectural element

Figura 2 - The West wing (XVII - XVIII d.C.)

The castle, anciently built by Oscs and Etruscs, and quoted already by Livio, Virgilio and Strabone, has been reconstructed in the Roman era after Annibale's destruction during the second Punic war (216 a.C.)[2]; the peculiar elliptical shape of walls and moat have been connected by the archeologist Amedeo Maiuri with the existing amphitheatre, evidenced by an inscription in Domitiano's honour[3]. A number of archeological digs in the 1983 had brought to light some ruins of a theatre structure, upon which the defensive case study would have been built. [4]

The first news about the castle date 826 dc, year in which the Longobards had edified it following the whole deletion of a Bizantine complex there sited[5]; destroyed by Bono[6], Duke of Naples, it was again built and transferred to the Normans' dominium, and defined by various fonts as ‹‹Castrum vero fortissimum››[7], i.e. hardly conquerable. At the beginning of the XV century it was strongly rehabilitated by Guerrello Ortiglia, earl of Acerra and in the 1421 it resisted to the violent attacks of the

Alfonso Aragona's army; although reporting a number of damages, in 1481 the castle has been described as in good state: ‹‹castrum magnum (…) cum fossato magno fabricato pleno aqua cum turris forteliciis, cum diversis salis, cameris, cellario, stabulis et molendino, cappella santi njcolaj et diversis aliis membris ibidem existentibus››[9].
Recently it was mentioned that already at the end of the XV century the castle had clearly modified its original defensive connotations, by evolving instead as a housing system identified by a wide garden; a description, from the Rogeri de Pacienza di Nardò's poem "Lo Balzino" composed in 1498, should be taken as evidence of the indoor magnificence: ‹‹le stancie son sì belle che allogiare ben ce porïa/omne re pomposo; trovarole ben acconze e adubate, che a starce dentro él era deitate››[10].
A 1662 file presents the ‹‹castle of ancient structure watched by a number of towers and a lot of airy rooms which served security to Barons, who hardened against the popular insolence of this kingdom during the 1647 ››[11]; meaningful works had been launched in 1766, aimed ‹‹at creating a great fabric, stables, devices, plastered and beautiful outside and inside: at creating also the corridor over the Wall››[12]. Additional interventions were probably completed in 1793, in the occasion of the Countess Maria Giuseppa de Cardenas' wedding with the general Francesco Pignatelli: to this period the bridge over the access arches would be counted[13].

Figura 3 - The orginal nucleus of the Castle

The castle, thus, sets as a fortified control system for a land already protected from east by the Marigliano and Nola's castles and from west by the Caivano's one; the nearness of Acerra to the ancient Suessola had led a number of researchers to assign the circular tower at the main façade – in regular tufa stone bricks - to the same era of another tower existing on the destroyed city site: an almost cylinder structure with big tufa stone blocks with an irregular base: a "Dongione"[14]. The Norman era ownership would be additionally sustained by the presence of polychrome wad found in the castle east wing, for they appear as the oldest, and are documented by a number of Norman architecture peculiar decorations of the XI-XII centuries[15]. Nevertheless from the typological point of view a number of similarities can be compared with the Angioin towers which started to be diffused in the Campania region during the second half of the XIII century; this hypothesis is sustained by some typological characters, such as the light inferior base. This could actually be the structure described by Milanese Francesco Cassiano de Silva in the Acerra view of the Neapolitan Kingdom, who provided the image in the end of the XVII century: ‹‹A unique memorable tower arises, already recovery, habitation and grave of the valorous Scipion the Cartaginese››[16].

2. The Castle Nowadays

The castle system nowadays appears within the town as a complex constructed system embodying a number of interventions; although the fonts' scarcity does not allow precise date of the various stages, a building dynamic from east to west seems to stand as a possible hypothesis; thus, for example, the room core in the cylinder tower ("Dongione") sets against the tower on west, which is planted on a L shape body and defines an addition of modern era (XVI-XVIII centuries).
The two fabrics, four floored and shaping a body closed on the rear by a boundary wall, include a wide court yard and develops an almost semicircular planned space.
The peculiarity which creates the absolutely originality of the Acerra Castle is due to the fact that there is a continuous external wall, actually doubling the castle defences; the wall surrounds completely the core, by creating a boundary around the

intermediate wide band which strengthens and remarks the original plant. This more external zone, made up with a based tufa stone texture, is defined by a number of small semi-towers located on the back, while on the main façade the castle access can be found, sited in slightly asymmetrical position and preceded by a stone bridge with three arcades which overpasses the moat around the whole fortified complex.
The external castle wall could record an interesting example of defensive technique of Aragonese era, for it can be compared, for a number of items, with the false belts of the XV century which doubled the defences, act to face the new gun-powder weapons (the Bombards); not only the castles of Venosa, Gesualdo, Alfonsino di Gaeta's one and the Castel Nuovo in Naples testify this innovation, but also some castles in the Hyberic peninsula (Coca, Manzanares el Real, Monbeltran, Belmonte). The same strong base, which in the Acerra example defines the defensive shield along all the vertical development, defines a specific technical-militar device aimed at providing a tilted surface to the impact of stoned spherical shot of the bombards and thus reducing the destructive effect on walls.
Nevralgic spots of the caste were the semi-towers, all connected by a continuous chimney; at the wall base the cannons were sited, still visible in the moat. The successive residential and representative destination for the Acerra governing families provides a radically different aspect to the fabric. The far west wing in particular seems to be edified in 1776, between the preceding structure and the external walling; while radical interventions were completed in the XX century when the building had started to hold municipality offices and then cultural institutions.
Bought in 1925 by the Acerra Municipality, the castle had undergone to a number of rehabilitation so as to adequate it to an administrative office till the beginning of the 90s, then to cultural functions, such as a municipal Library, a folk and country society Museum, a "Pulcinella" mask Museum, a civic school of Music with band museum and the Archeological Museum.

3. Methodology of the research

The authors' research takes the start form the idea that a castle, a fortress or a more general fortification, being built so as to defend the internal inhabitants from the enemies, should have followed at the same time also the natural and traditional principles of the bioclimatic architecture, thus employing any possible strategy, device and technique which could have provided the inhabitants themselves with safe shelter from the external climatic and more generally environmental conditions.
Therefore the natural and existing thermal and windy conditions of the analyzed case study (the Acerra fortress) have been studied, so as to identify the energy and comfort behaviour of the traditional structure and its environmental potentiality: if and when the angular tower actually sheltered the indoor rooms from strong wind and low temperatures, when and if the big stoned walls protected the inhabitants from very hot conditions during summer, by acting as a thermal time delaying system, and how the whole configuration of the fortress itself have been able to provide great comfort inside the living spaces.
In fact being sustainable issue one of the principles, which nowadays can no longer be forgotten, any intervention of restoration and rehabilitation of the buildings, and thus also of the fortresses should take into account and safeguard the ecology and the vivibility of the final architecture configuration.

3.1 The climate

Acerra enjoys a Mediterranean climate, with mild and rainy winters, and warm and dry summers; the average sun shining is 250 days per year, as shown on the following table which provides the main useful data for the climatic analysis of the site.

	1	2	3	4	5	6	7	8	9	10	11	12	anno
T_{media} (°C)	9.7	10.2	12.3	15.1	19.1	23.0	25.5	25.7	22.9	18.9	14.6	11.2	17.4
T_{min} (°C)	6.8	7.0	8.7	11.2	14.8	18.5	21.1	21.2	18.8	15.2	11.5	8.4	13.6
T_{max} (°C)	12.6	13.4	15.9	19.1	23.4	27.4	29.9	30.1	27.0	22.5	17.6	14.0	21,1
Pioggia(mm)	94.1	76.6	67.3	67.7	46.4	32.0	16.7	27.0	71.0	120.0	126.6	120.2	865.6
Umidità relativa (%)	66.0	64.5	62.3	62.9	60.0	57.7	56.4	56.8	60.9	64.3	66.5	68.9	62.3
Pressione (atmosferica (hPa)	1012.0	1011.2	1010.3	1008.6	1010.1	1011.0	1010.7	1010.6	1012.1	1011.9	1011.3	1011.1	1010.9
Radiazione solare globale ($W/(m^2$ giorno)	80.8	92.0	153.2	210.2	270.4	293.4	298.7	255.5	196.9	133.1	85.0	61.6	177.6

Figura 4 - Climate Data for Acerra

The first analysis is the solar distribution on the castle, by processing the solar diagram, representing the sky vault projected on a plane: over that the solar paths can be traced in various Seasons so as to define the sun position in the sky in any moment[17].

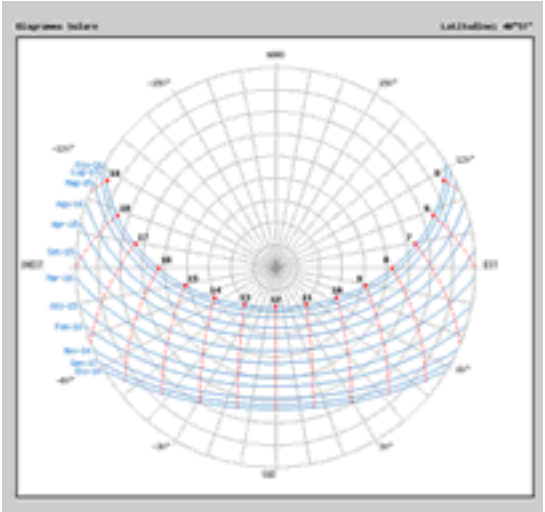

Figura 5 - The Solar Diagram for Acerra

Then a wind investigation has been processed which had defined as dominant winds in the site, the Grecian (N-E) during winter and the Libyan (SW) in summer and spring.

3.2 Mapping the comfort

Comparing and matching the output data coming from a number of climatic studies, a "mapping"[18] of the site has been possible, for the Hygro-thermal comfort of the castle room, which can be employed as determinant item for the future distribution of rooms during the castle design procedure.

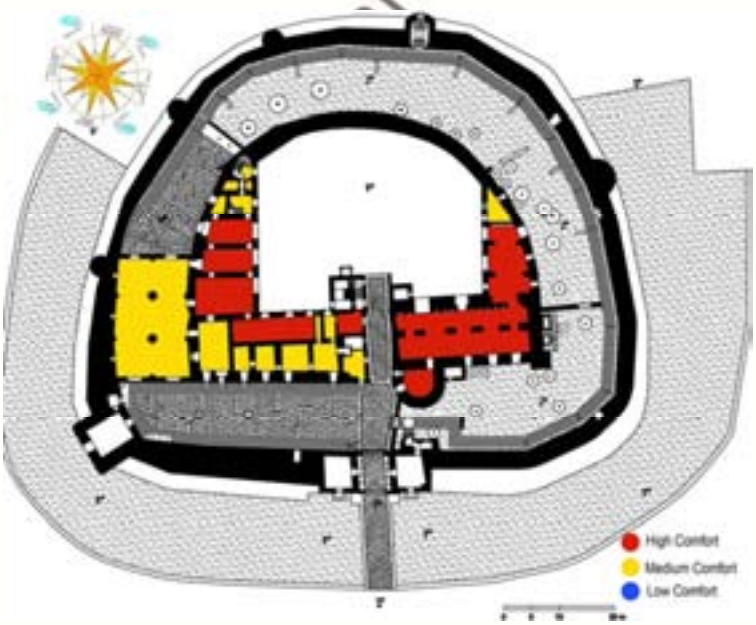

Figura 6 - Mapping the comfort: Summer

Following the ground floor "mapping" (figs 6 and 7) it can be shown that the massive wall structure of the castle, with thicknesses varying from a minimum of 60 cm till more than one metre, affects positively the thermal comfort of internal rooms, by guaranteeing a good protection from external heat in summer and an optimal insulation during winter. Moreover the tufa walls, thanks to an high thermal inertia, allow - during the sunny winter days - the heat storage, which will be lately released, slowly and passively, towards the internal spaces, with an high time lag between 8 and 12 hours.

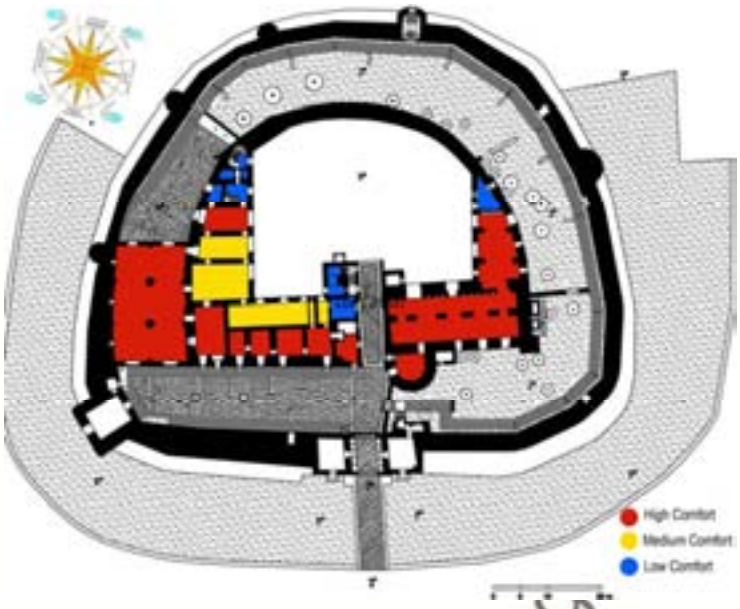

Figura 7 - Mapping the comfort: Winter

The only problem arising from the solar studies regards the humidity presence within the North rooms, which present few opening surfaces for air changes, and finally the internal courtyard which appears exstremely heated during summer and greatly cold in winter.

4. Design Hypothesis and conclusion

In conclusion, the Acerra castle presents an optimal orientation, along a good north-south axis, which together with the employment of enormously massive walls, creates an acceptable level of internal comfort which suggests the compatibility with museum destination and exposition activities, as the ones already inserted, mainly in the south front of the fortress, thanks also to a good natural lighting of rooms.

Greater attention should, on the other hand, be given to the lateral wings which would require non invasive interventions in order to solve the wetting problems, by locating inside them buffer spaces, such as deposits and offices.

A correct green design can be in the end suggested within the internal courtyard, by employing vegetal elements as tools for the microclimate regulation. Small trees or shrub Mediterranean essence with falling leaves can be located so as to favour shading and cooling during summer, without preventing the direct solar gain in the winter season. Thus the courtyard could again become a liveable and usable space, wholly inserted within an energy saving architectural organism.

So arranged a project, besides guaranteeing high levels of vivibility, presents a flexible and soft intervention, able to provide full respect for the historic, artistic and social values of the fortified complex.

Notes:

[1] M. G. BUONINCONTRO, Acerra e dintorni, Napoli 1998, p. 19.

[2] On Acerra see G. CAPORALE, *Memorie storico - diplomatiche della città di Acerra*, a cura di A. MANNA, Napoli 1975; and more: L. SANTORO, *Fortificazioni della Campania antica*, Salerno 1979; Archeoclub d'Italia, *Acerra, la città e la memoria*, Acerra 1994.

[3] A. MAIURI, *Prima delineazione topografica della città di Acerrae*, 1936, in: *Scritti su Acerra e Nola*, a cura di M. A. MONTANO, Napoli 1998, pp. 26-28. As far as the castle and its events, besides the quoted G. CAPORALE, see the format by A. SANTOMAURO for the "Soprintendenza per i Beni Ambientali e Architettonici di Napoli e Provincia" (13/05/1996); and more: A. MONTANO, C. ROBOTTI, *Il Castello Baronale di Acerra*, Napoli 1997; A. SANTORO, *Il Castello baronale dai Cardenas agli Spinelli alla città di Acerra*, 2007; F. CORDELLA, *A guardia del territorio, castelli ed opere fortificate dell'Ager Nolanus*, Nola 2007. The views of the castle are taken by: G. CAPORALE, *Notizie storiche sulla città di Acerra*, "Poliorama pittoresco", 5 marzo 1842, pp. 233-234; D. PARENTE, *Collezione di 90 vedute della città e Regno di Napoli*, Roma 1843. For a frame about the Norman fortifications of the case study, see: P. F. PISTILLI, *Castelli normanni e svevi in Terra di Lavoro*, San Casciano V. P. 2003.

[4] See D. GIAMPAOLA, *Acerra. La città antica e il suo teatro*, in: A. Montano, C. Robotti, *Il Castello…* cit., pp.171-184; ed and: A. M. CAPOFERRO CENCETTI, *Rocche e residenze fortificate impostate su antiche strutture*, in: L. QUILICI, S. QUILICI GIGLI, *Città e monumenti nell'Italia antica*, Roma 1999, qui p. 235.

[5] Archeoclub d'Italia, Acerra… cit.

[6] G. CAPORALE, *Memorie…* cit., p. 50; A. Montano, quoting Celano - Chiarini (1692), stops on the acrostic inscription existing in the Neapolitan church of Santa Maria a Piazza which testify the event (*Aspetti delle vicende storiche e della vita civile nel castello baronale di Acerra tra XII e XV secolo*, in: A. MONTANO, C. ROBOTTI, *Il Castello…* cit., pp. 27-54, and p. 30-34).
[7] D. DE GRAVINA, *Cronicon*, p. 359, in: G. Caporale, *Memorie…* cit., pp. 227-228.
[8] About Guerrello Origlia, see: G. CAPORALE, *Memorie…* cit., p. 284; R. MANNA, *Ricordi storici e archeologici della Campania: Acerra e Suessola*, Acerra 1987, p.180. About the Aragonese siege see : G. CAPORALE, *Memorie…* cit., pp. 309-310. A. MONTANO, *Aspetti delle vicende…* cit., pp. 43-45.
[9] "A big camping zone with a great moat full of water and with fortified towers, with a number of rooms, spaces, wine zones, stables and mills, with the chapel dedicated to Saint Nichol and various other extensions" from G. CAPORALE, *Memorie…* cit., p. 91.
[10] "The rooms are so beautiful that it is possible to well inhabit them/ for a pompous king; they are so well arranged and decorated, that it is divine to stay inside them" from C. Robotti, *Il castello come luogo di diporto*, in A. MONTANO, C. ROBOTTI, *Il Castello…* cit., p. 139; see also: Rogeri de Pacienza, *Opere*, edited by M. MARTI, Lecce 1977.
[11] *Ivi*, p. 557.
[12] *Ivi*, p. 511.
[13] *Ivi*, pp. 521-522.
[14] P. PEDUTO, P. NATELLA, *Il problema dell'insediamento e il sistema castellare altomedievale*, in AA.VV., Archeologia e arte in Campania, "I Quaderni", Salerno 1993, pp. 83-101.
[15] A. MONTANO, *Aspetti delle vicende…* cit., pp. 34-36.
[16] As far as the Neapolitan kingdom is concerned, see*: Franc.co Cassiano de Silva Nobile milanese*, Vienna, Österreichische Nationalbibliothek, On Alb 161 a., f. 284; the view is at f. 185. The work is pictured in : G. AMIRANTE, M. R. PESSOLANO, *Immagini di Napoli e del Regno*, Napoli 2005.
17 V. OLGYAY, *Progettare con il clima*, Padova 1990
18 D. FRANCESE, Il benessere negli interventi di recupero edilizio, Milano 2002

CITY AS LEAF NERVATION

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Abstract

The subject of the proposed paper deals with topics such as "Innovation within sustainable housing in the Mediterranean culture" and "Sustainable urban design for the Mediterranean city" and presents considerations and outcomes of a research line, tackled by the Dep. AACM, which starting from the interest about projects and processes of governance aimed at increasing urban quality has then investigated the planning standards for a sustainable city intended as a friendly, healthy and ethically beautiful city.
The contribution intends to tackle some aspects considering that the sustainability requires a systemic approach as it has been demonstrated by the main measures adopted for choosing the settlement sites which produced an optimal connection between urban body and environmental characteristics related to settlement strategies in the Mediterranean regions with the intention of recollecting those planning "learning" which created amazing cities destined to last thousand of years.

Another aspect is related to the most advanced and creative experimentations in the field of the urban project as useful tool for the regeneration or the building up of sustainable city on the environmental, economic and social level both with reference to Mediterranean cities and to the examples, for these most significant aspects, of Middle-European cities which have tackled urban sustainability issues including public mobility and green infrastructure. Finally some considerations about the design standards that can be considered as optimal because they tackle the environmental and eco-efficiency issue in the urban transformations for *cities as leaf nervation* which is able to live fully respecting ecosystem resources and balance, about the valorization of the relationships *device/nature*, about the relationships *places/identity* connections and the right relation between *public/private*.

Keywords: urban heritage, mobility, quality, efficiency

1. Introduction

The interest of the Department of Architecture and Analysis of the Mediterranean City within the University of Reggio Calabria for the issue of built environment in the Mediterranean area has been going through a logic process of approach, to research the future profile of sustainable development in this specific cultural basin.
The *fil rouge* is represented by the systemic and territorial approach which has driven the research toward the perception and the realization of actions aimed at enhancing the urban quality, the contiguity among ecological networks both territorial and urban ones, the valorization of the settlement environment within sensitive areas, the redrawing of coastal *promenade*. In particular, this paper is intended to present the assumptions and measures just started for developing the *CityMob* research in the two-year period 2011-2013: *The valorisation of urban heritage through innovative models of sustainable urban mobility*, selected, approved and financed by the Department for Culture, Education, High Education, Research of the Calabria Region.
The specific themes tackled by this reasearch are relevant to the investigation of innovative models of sustainable mobility, that can be focused in the wider definition of soft mobility and coherent with settlement and urban with which they are compared, and suitable to favour and encourage the use of local public transportation.
Besides representing a factor of social qualification, a sustainable model of mobility at the same time produces several processes relevant to a better efficiency of economic and social transportation costs that especially emerge from the reduction of traffic congestion and land occupation by private vehicles.
In order to optimize the economic efficiency and effectiveness it is aimed at reducing the record of accidents as well as pulluting and acoustic emissions, in terms of road safety and to raise the conditions of urban salubrity.
From the combination and sinergy of these processes, even though referred only to the segment of mobility and transportations, it derives wide effect in urban contexts in terms of a better environmental and spaces quality (fruition, accessibility, safety, air quality). The will to enhance the urban heritage by implementing the principles of sustainable development has favoured, in the territorial governance management, the dissemination of practices and tools targeted to implement measures which are consistent with the environment and among them, those concerning the trasport sector are particularly interesting. These, in fact, are closely connected to urban heritage valorisation in terms of accessibility and urban mobility, but they also join broader considerations about the city project (as project of new settlement as well as regeneration of the existing ones), and in particular about the issues relevant to urban quality and sustainable urban development. Really, the use of private transportation, the very expensive costs

generated by private traffic (environmental impact and citizens' health), the lack of resources to fight private trasportation with an offer of public services being appropriate at quantitative and qualitative level, are issues which the most part of the Mediterranean urban context are interested in by now more or less consistently and they negatively interfere on the fruition of services and more in general on life quality.
Moreover, the mixture vehicles-pedestrian cause conditions of conflict in the fruition of streets and squares, which are convulsive in cities like Cairo, Instambul and Amman by making more and more difficult not only the coexistence between pedestrian and vehicle flows but also the carrying out of the numerous activities connected to leisure and social aggregation (shopping, meeting, enjoying the beauty of a manufacture or a landscape).
Streets and squares are so surely intended for mobility but they are, above all, urban places having multi-faceted uses and can usefully concur to encourage social relations or the other way around, if they are not usable at all, they can contribute to improve the perception of unsafety and exclision in the urban context.
For the complexity of values and roles that these kind of spaces can have in the urban contexts, it seems that, in order to promote sustainable mobility systems, it is necessary to look at streets and squares not only as elements supporting mobility, but especially as urban places which are already central places or are the spaces where morphological and functional centralities are attested and therefore they need to be enhanced in terms of attractiveness and fruition.
It is on the basis of such considerations that *CityMob* research, with the recourse to the definition of a soft mobility system to be experimented in a precise urban context, and aims to outline guidelines and method elements to build up a project for the fruition of urban spaces, aimed not only to ensure a better coexistence among the different activities and different users (drivers – pedestrian), but also to improve the respondance between envisaged uses and spatial characteristics of places.
Specifically the research aims at defining a model of urban management which focuses on the system of connections or rather the whole measures on mobility, (intended as a sum of vehicle, pedestrian and cycle paths having a naturalistic/landscape value, of rest areas as well as of the multimodal exchange nodes) aimed at favouring the accessibility to the sites and urban polarities, to services system and facilities (museums, theatres, libraries, schools, services) and more in general to the numerous ones characterizing the urban contexts.
Investigating these systems can enable the realization of real corridors of connection which are buildworthy for the connective framework on which the valorization of the urban heritage is structured through its fruition.
These depend on the existing road system as well as on the environmental network intended as parks, rivers, ditches, worth green areas, urban ecological network (a very widespread concept in the European, National and Regional planning policies) taking on the polarities as focus and main dissemination points, as above mentioned.

2. Sustainability is a systemic concept

The objectives of sustainability clearly need a systemic approach, that so has to be directed especially to the connective urban tissue rather than intvesting on the experimentation on single parts or districts y taking into account the *organic* functioning both of the city and its inner relations. For implementing what is wished for as *sustainable revolution* [1] it is needed as pre-condition for its development a deep modification of lifestyles in the European and Mediterranean world, towards choices of quality which tend to go beyond environmental waste such as the common disposable actions, practiced in all the fields of daily life, or the famous trend to serial that has spread the urban scene standardizing the street furniture to a levelling of identity with flower boxes, litterbins, benches, games in the garders, and lighting which are all the same everywhere.
The language of the urban components should be able to get back its traditionally innate complexity, in order to define cities which can be experienced both in the closed-in, under cover and *en plain air* places, arranged with the difference of in-between spaces in the transition between public and private.
This articulation which is more complex than the contemporary city currently offers, requires the ability to plan the urban fabric also for the peculiar climatic characteristics in order to improve the relations encouraged by an optimization of the feasibility of spaces for a contemporary intention for wellbeing and salubrity.
One of the most basic aspects for a successful urban project, even in terms of lively public spaces, lies on the closeness between volumetric plan development and climatic characteristics of the settlement. For a lot of time Middle-European planning signs and forms which badly adjusted to cultural and climatic characteristics of the Mediterranean environment have been uncritically imported. There are a lot of examples of architectonic and urban conditions which created urban fragments being unfriendly with daily life so much as to consider useful to get back devices and original settlement strategies which are typical of the Mediterranean regions, in order to take on a path leading to a new way to build up and live in a territory, as recognized "planning knowledge", starting from the position, urban organization, methods and constructive materials, urban culture all elements which have created amazing cities destined to last over centuries.
As we know everywhere in the Mediterranean, archaic societies developed in poor economies have based their survival on the accurate and sparing managementof natural resources. The building tradition in the rural areas has often used building materials which are more easily found locally, according to ancient building tecniques and

typological models fully integrated in the environment, connoted by an high grade of compatibility and and integration with the landscape and natural ecosystem, characterized by a rational use if environmental resources as well as by an high grade of functionality and with sustainable building processes [2].
The climatic conditions of the territorial sphere and the needs to create spaces and facilties with dimensional and use characteristics related to the type of management of agricultural or rural activity, have produced urban bodies implented with bioclimatic standards having good performance characteristics as to the aspect of fruition, durability, environmental wellbeing and safety. In particular the building units of these urban-rural structures are realized to offer optimal conditions of functionality, passive protection and good liveability conditions inside. But especially in order to be used and mantained over the time with limited and cheap maintenance operations. Despite poor materials and simple spatial organizations, a particular attention is given to reach good conditions of environmental wellbeing inside the spatial units composing the structure related to climatic factors and geomorphology of the area but also and especially efficiency of the shape and urban layout of settlement's volumetries. In the airiest places, on rises or along depressions where the wind flows, this solid shape with little openings creates conditions for a better protection. The other way around in level ground areas protected by ridges, the planimetric shape as well as the building characteristics must ensure the best conditions of ventilation in the summer. So there is the intention to create shady areas by recurring also to the vegetation in order to realize natural refreshing situations. In the hottest and less windy areas the volumetries disposition is organized according to more open schemes with parts which are differently exposed to sun irradiation in order to favour the formation of breezes, or situations of natural air-heating due to the difference of temperature created between sun and shady zones. Devices aimed at using the environmental resources at their best in order to achieve the best house comfort, besides those of safety and functionality already highlighted, define the different planimetric aggregations. Those forms of attention have been neglected for a long time and created soulless house systems so implementing marginal areas of bad quality in every great city of the Mediterranean, from Marrakech to Tunis, Algiers and Istanbul where there is the phenomenon of *gecekondu* that in Turkish means houses built during the night. Even if starting from some extreme experiences new skylines have been created, we begin to see a new attention for urban sustainability in the project for the realization of new neighbourhoods and in some actions of settlements regeneration.
The same Mediterranean settlement space demands for a systemic interpretation, and it is more and more characterized by an intense and stratified anthropization since no parts of environment are completely natural but they form a complex cultural landscape where historical centres and medinas can represent the cores of the knowledge for a correct management, use and mantainance of the envirnmental heritage, starting from the bioclimatic notions which have regulated the urban settlement logic in the ancient times.

3. The profile of the future sustainable city

If "the sustainable development is a change process for whom the exploitment of resources, the direction of investments, the orientation of the technological development and the institutional changes should be coherent with the future needs besides the current ones"[3], it is the time everyone asks how the issue of urban sustainability in the Mediterranean is tackled today. Of course we cannot recognize it as a matter of priority because maybe the Southern Mediterranean has to achieve a path for development expectations which still seems to have quantitative rather than qualitative expectations.
The susbstantial problems concern the myth of a development targeted to tourism, for example the Adriatic areas such as Croatia and Dalmatia that even though have a real disposition to create sustainable settlements and solid urban culture in the last decade have created *volumetry* with no quality and identity, exclusively aimed at improving the offer of tourist residences. Issues like energy, urban and interregional transport and governance are still far from being tackled organically, however the same Millennium Developmen goals, - reducing the number of people who haven't the access to water safe to drink and to sanitation, obtaining a significant improvement of life for at least 100 million inhabitants of shantytown within 2020 – let us to understand how a long path is needed in order to solve those preconditions for development which can open a new shared awareness of sustainability's goals, starting from the analysis of strenght and weakness points in the strategies for urban sustainable development within the strandards of Mediterranean and European world. Many Mediterranean cities, mainly the metropoles having million inhabitants such as Cairo, Istanbul, Amman today tackle difficult urban mobility conditions for the congestion and paralysis due to the very high number of private vehicles which are highly polluting and make the air unbreathable not only in the rush hours.

Very often in these cities there isn't a system of public mobility, the distances are not enough for their extension as well as for connections and frequencies. In some cases the lack in intermodal exchanges makes even the whole distance which could be functional not much efficient.
And once again in order to make use of the most advanced and creative experimentation in the field of the urban project as useful tool for regeneration or building up of a sustainable city on the environmental, economic and social level it is necessary to refer to Middle-European cities that have tackled the issues of urban sustainability with significant outcomes starting from an efficient public mobility provided with green infrastructure.
The regeneration of entire urban segments, especially starting from the planning/optimization of new systems of urban public transport and oriented to sustainable mobility, is going to be more and more successful as experimental field of innovation in the transformation of the city and in the regeneration of marginal urban parts through public actions improving urban liveability and aiming at a better accessibility, at strenghtening urban centralities and polarities, at the regeneration of the public (open) space, at the use of interstitial spaces, all elements of an experimental field which has deep repercussions on an existing liveable city. Urban development, cities liveability and their environmental and social sustainability decisively depend on quantity and quality of mobility. The demand for mobility reflects a plurality in the use of territory as well as a new distribution of urban functions: the spaces where to live, to work, to study, take care of one's health, to have fun, to learn. These spaces that are the places where every citizen lives have gone away losing step by step their characteristics of proximity; there are a new demand for mobility, an higher availability to mobility and an higher indifference for proximity. All this has happened for different reasons: the economic development, the research of a renovate living quality, the definition of new spaces for goods commerce, the emerging of new forms of cultural consumption [4].
The urban regeneration practices promoted during these years represent, from the one hand, the result of change dynamics in the society and in the city and the most evident effect of the deep modifications have interested the urban development, on the other hand, the starting point of the processes of structural change in the city and territory governance as well as one of the main driving force of a comprehensive process of urban and territorial renovation. Implementing projects of regeneration has required a deeper and deeper knowledge of social, economic, and cultural phenomena; an awareness – public and shared – of those processes modifying the relations space-society. A significative example of integrated approach (social and urban) in the policies of urban regeneration is represented by French and German models that, since its early experimentations have invested on the urban degraded spaces, where "difficult" social sectors and marginalized classes live, with the aim to mantain the identity of the city and enhancing the urban shape through the connection between urban tissue and open spaces (squares, gardens, etc.), by recognizing at the same time the urban cultural heritage.
In this sense, the requalification of entire urban segments has been increasingly successful as experimental field of innovation, transformation of the city and regeneration of urban marginal parts through public actions increasing the urban liveability and aiming at a better accessibility, at strenghtening urban centralities and polarities, at the requalification of the public (open) space, at the use of interstitial spaces, all elements of a experimentation able to deeply affect an existing livable city.
One of the best models of urban requalification that could represent a valid example especially because is absolutely replicable, for the typology of Mediterranean port cities, it is the project of Hafencity, one the seven neighbourhoods in Hamburg, which with nearly 2 million inhabitants (the metropolitan area reaches 4,3 million people) is the second most populated city in Germany and its port, located along the Elbe river at roughly 100 km from the Northern Sea mouth, is after Rotterdam the second European port for its dimensions. The urban planning in the city of Hamburg is shrewdly oriented to the mantainance of woodland surfaces, greeen spaces and existing recreational areas, and the new interventions have ensured the rehabilitation of dismantled and underused areas in the city centre, with the realization of high density neighbourhoods and the realization of new suburban ones at low density connected to the centre through efficient public transport systems. The basic idea is that of making fully usable the docks of the river port, re-thinking the way of living and working on the water and giving identity to the skyline of the other side of the river thanks to innovative buildings of high architectonic quality.
Even the system of the whole mobility contributes to make Hafencity one of the most sustainable neighbourhood in the world, organic part of one of the city which is notable for smart choices, it is enough to quote the large cycle network having 1700 km of tracks, all nearly separated by the road site so ensuring an high safety.

4. Conclusions: city nervatıons

Finally some considerations on the planning standards pertaining to the mobility system which can be considered as optimal ones since they tackle the environmental and eco-efficiency issues in the urban transformation for *cities as leaf nervation* able to live in the full respect of resources and ecosysyem balances, of the valorization of relationship *device/nature*, about the relationships *places/identity* connections and the right relation between *public/private.*
The general aim of the *CityMob* research, as already explained, is that of conceiving a methodological and analytical framework for a first implementation of possible dynamics of transformation of the urban space following specific hypoteses of innovative policies in the field of urban mobility. In particular the reserach intends to define and

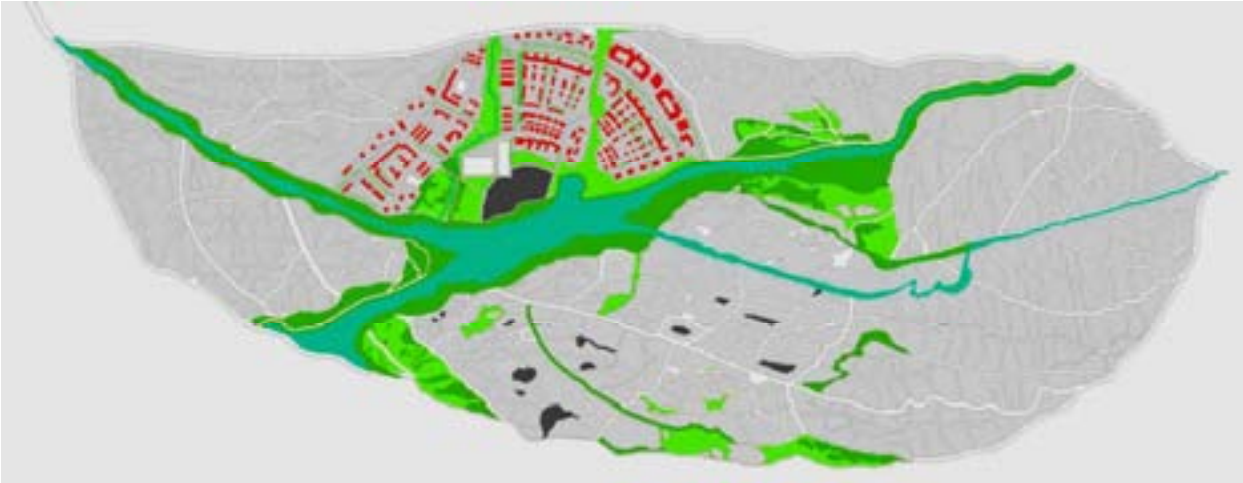

Figure 1. City as leaf nervation

implement at urban scale a model of planning and management aimed at more effective fruition and use of central urban spaces (polarities, services, etc.), starting from the current situation and working out the possible and different future uses of the connectng areas and spaces for relations, through a light and sustainable planning in the logic of the optimization of the already existing networks.

Therefore we can conclude affirming that through a *soft mobility* system enabling to re-think and re-organize of some urban places both of the historic and suburban areas, it is possible to reach some specific aims such as:

- the reappropriation of urban public spaces (streets, squares) by the inhabitants with the creation of public multifunctional spaces (exemplifying case in this sense is a street in Munich and long over 1 km, trasformed in a game-street);
- a peaceful coexistence among the various street users (low vehiche speed) and pedestrian islands;
- the guarantee continous and safe pedestrian path for all the categories of users with particular regard to week users and to the paths for reaching school and social services;
- a better quality of the services offered and the perfomances (travels speed average, efficiency of the network of preferential lanes);
- an higher flexibility of the services offered (so as to be able to compete with the most increasing single transportation);
- building up of an interdisciplinary language among sectors dealing with the issue with different methods and approaches but united by the scientific method (urban economics, urban mobility economy, town planning, urban sociology, demos and ethno-antropological disciplines).

The research prospects, in terms of expected results and scientific and methodological contributions which it is intention to provide are pertaining to:

- the development of technical tools to support the working out, implementation and evaluation of urban policies dealing with the sector of mobility and the introduction of the concept of "transport quality";
- the definition of criteria and guidelines to build up models of urban management which can respond to the needs of "urban mobility quality" also with reference to the *Greening Transport Package* (an European Commission document aimed at reforming the trasport sector in a mainly eco-sustainable direction).
- the investigation of "best practices" which are useful to stimulate policies strenghtening sustainable mobility, through the widening of thematic infrastructure (pedestrian areas, sidewalks, cycle tracks), and the improvement of the conditions of protection and safety for whom using bicycle or pedestrian path;
- new awareness having partecipative forms envisaged by the project.

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Local identity and sustainability of Middle Ages Italian towns

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Abstract

The analysis of tangible and intangible characters in Middle Ages Italian towns unveils the discernment with which all resources were used at building, urban and territorial scale. The paper presents a survey methodology for investigation of technical factors playing a key role in local identity. This approach has shown to provide relevant outputs for sustainable management and rehabilitation practices based on the understanding of several transversal aspects of built environment, taking into account ethnic complexity, natural significance, functional layout, places fruition and people behaviors over the time within a technical framework. The paper discusses results of a practical application of the proposed methodology in a case study, that evidenced a sort of "implicit sustainable working" of the Orvieto town (Italy). The case study highlighted some characteristics in buildings and urban fabric that constitute local identity being, at the same time, a direct consequence of constraints and characteristics of the settlement site. Those characters represent significant sustainability aspects, worthy to be kept and taken into account for today built environment management and use. Furthermore, the respect of so relevant factors for local identity has also shown to be a driver for the full application of social and intangible components of sustainability.

Keywords: local identity, built environment, technical factors, analysis methodology

1. Introduction

The need for reducing resource wasting, and then the goal to optimize the use of any kind of resources in built environment, can be considered one of the main characters of vernacular or, more in general, traditional architecture. Under this perspective, it can be often observed that sites with very strong identity, generally characterized by an image or a physical structure persisting over the time, are very good example of built environments fitting characteristics of natural environment in a given site. This means that construction masters or so-called "empirical builders" from the past have produced a sustainable combination of human-built-natural environment, that needs to be preserved in order to implement today sustainable policies for use, management and rehabilitation of built heritage.
On the other hand, rehabilitation of built environment is considered a sustainable practice as itself [1], but success factors of renewal interventions on traditional settlements cannot neglect the consideration of all tangible and intangible factors that constitute local identity, being the mere achievement of new performance/functional requirements insufficient under the contemporary, broader, sustainability approach [2].

2. A technical approach to built environment identity

2.1 Identity understanding and preservation for sustainability

Identity can be defined as something making an entity definable and recognizable, thanks to the whole of characteristics determining that item as distinguished from any other entity.
Applied to built environment, the concept of identity recalls [3] the set of qualities and characteristics that we can consider as permanent features in buildings or places, since it is able to resist to changes during the passing of time. Also, identity is the sensations aroused by places in people of more generations [4] keeping or enhancing the space-inhabitants linkage or, under a more technical perspective, it can be meant as a, "total phenomenon, which we cannot reduce to any of its properties, such as spatial relationships, without losing its concrete nature" [5].
Focusing on traditional settlements, this concrete reality is constituted by a special combination of constructive, environmental, physical factors that, in their whole, form the identity of built environment. There, a set of technical features is the tangible framework where the sense of identity can rise, as it is easily understandable from typical vernacular contexts. An example is given by the case of agricultural court houses in Figure 1, that are a sample of implicit sustainability of traditional settlement identity, since similar needs have been fulfilled with different technical solutions, strongly linked to local climate and resources.

Figure 1. Italian rural court houses: a) Valtellina, b) Campania region.

On the other hand, it has to be considered that built environment rehabilitation is a really wide field of action, since rehabilitation is applicable at any scale, with a broad range of scopes, in every site human inhabited. For that reason, acting on traditional settlements or buildings may easily bring to unwished sustainability implications due to inappropriate transformations of built environment, that can lead to a loss of local identity and alienation of local cultures [6] with the consequent disruption in the continuity of places experience. All that will finally impede future generations experiencing local identity, as the past generations did, depriving them of the availability of both tangible and intangible resources they have right.
Therefore, traditional settlements are a sensitive context, where rehabilitation design implies that any technical choice can represent a potential trigger for the loss of local identity comprehension or preservation. Under this perspective, a sustainable approach to built environment management and rehabilitation is given by the understanding of tangible and intangible components of local identity.

2.2. Technical aspects in built environment identity

Built environment policies for traditional settlements must be provided with adequate data, suitable to feed a decision making process resulting in conservation/transformation choices that are able to preserve tangible and intangible factors constituting the place identity.
Technical factors concerned with the material culture can be either technical elements, either functioning mechanisms and can be considered as "stand alone" and in their whole.
A possible, practical, approach for unveiling technical factors significant for identity comprehension and preservation should be addressed to many heterogeneous aspects of built environment, considering ethnic complexity, historical architectural and natural significance, space functions, places fruition and people behaviors over the time. Technical factors relevant to those issues can convey built environment values under cultural-perceptive, morpho-dimensional and constructive perspective. Moreover, those factors play a key role in identity comprehension and preservation, due to the fact that they can be paradigmatic or originally manufactured in a context. For instance, technical elements that may be significant as local identity drivers are elements evidencing a) original function; b) modifications, substitutions, extensions and any other transformation; c) features or constructive techniques typical in a place; d) features or constructive techniques outstanding from the traditional context because of their originality or particularity; e) features or constructive techniques still unchanged from the past; f) features having aesthetic value [7].

3. The Orvieto case study

3.1 The town of Orvieto

The analysis approach here proposed was applied to the case study of the town of Orvieto. More in detail, investigation was addressed to the physical structure of the urban fabric and its evolution over the time, the representations of urban features over the time and, finally, the link between local identity characters and environment.

Orvieto is an Etruscan settlement (the ancient Velzna) on a tuff rock, that reached its maximum development as commercial and religious centre during VI century b.C. After the destruction by Romans in 264 b.C., the rock was abandoned and settlement was rebuilt as Volsinii Novi (Bolsena). In the Middle Age, inhabitants came back to the tuff rock and established the new town that today we know. Still today, this town is a sort of tuff and basalt stronghold, made up with (and upon) a network of underground caves and tunnels.
The town is built over a tuff table, with precipitous cliff faces, outstanding from the mild valley of the Paglia river. The physical limit of the tuff table has never allowed the urban growth with a simple expansion of the built area on the rock, but space need was fulfilled, over the time, producing a high density, stratified, urban fabric.

Figure 2. The Orvieto tuff rock, representing a physical boundary to resources purchasing and urban development.

3.2 Technical factors constituting Orvieto local idenity

In any medieval town, urban space is limited by defense needs, so that surfaces available for buildings were very valuable. In the case of Orvieto [8], this limitation has persisted over the time, since physical limit is given by the tuff table rather than by man artifacts, like town walls. The great attention paid to the optimal use of the space produced buildings quite tall for the age, with narrow fronts on the street and organized in long, continuous, street fronts. This narrow and deep lots, that combined together constitute big urban blocks, derive from the rather standardized length of nearest available tree trunks, from which resulted the regular pace of wood beams and then the regular width of dwelling units. Such as technical module allowed to set-up the sinuous streets and the characteristic pattern in Orvieto urban fabric and fronts [9].

Figure 3. Street fronts and internal layout of dwelling units in San Giovenale quarter.

Another aspect of the built environment identity is the internal layout of urban blocks, characterized by a number of internal courts. In fact, block morphology and width require a layout arrangement suitable to provide with sufficient air and light the rooms that do not look onto the main street front.
On the other hand, the isolation and distance from fertile ground as well as the use of the settlement as a "natural" walled town by popes raised the need to make the town self-sufficient for food production; for that reason all internal courts were used as vegetable gardens.
A further technical element of Orvieto local identity is given by the major building material and its origin. In fact, the rock inaccessibility and the unavailability of suitable rough materials in the surrounding valley constituted an ineluctable drive for using at the best the material constituting the rock table itself: the tuff stone. Therefore since

ancient ages, building material was extracted from the tuff bed, realizing a wide network of underground passages and spaces, characterized by the constant temperature of 16°C. Since the rock has not water springs, this complex system of underground spaces performs the key function of draining and collecting water in a great number of wells. In this way, water did not need to be carried out from the outside of tuff table and town would have been self-sufficient in case of siege. Second use is very relevant from an economic and cultural point of view, since vineyard is the main cultivation in the area and temperature of underground environments is particularly suitable for cellar use. At the end, this technical aspect has produced a relevant aspects of the territorial identity, the Orvieto wine "brand", that is known all over the world.

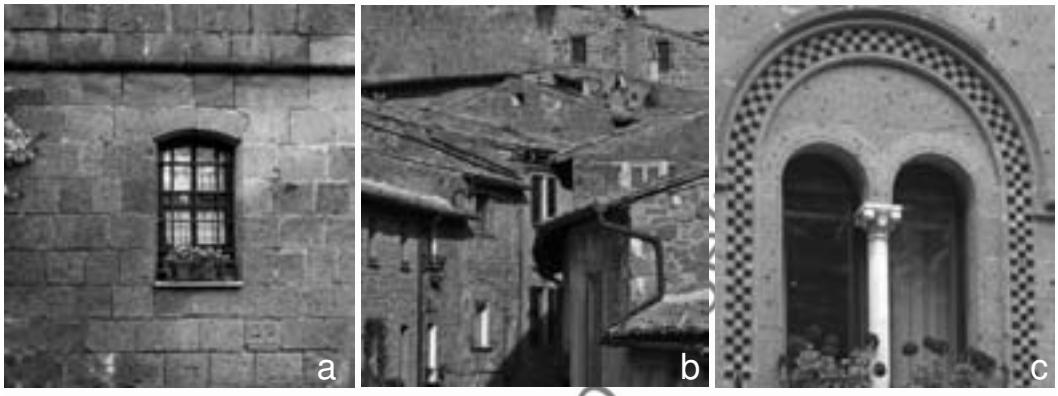

Figure 4. The use of tuff in local identity: a) wall texture; b) protruding roofs; c) tuff decoration.

Under the perspective of construction techniques [10], it has to be noticed that tuff walls are characterized by a bricklaying technique showing a reduced use of mortar and plaster (due to the unavailability of needed materials and water shortage on the rock) and well squared tuff blocks. Over the time, blocks dimension became standardized on the basis of maximum dimension allowed for quarries and caves, that was under regulations since Mddle Ages in order to preserve tuff rock stability. On the other hand, non-use of plaster determined other technical elements relevant for the local identity point of view, such the need for an alternative protection of the tuff walls by roofs more protruding than usual and façade decoration made mainly in carved tuff rather in stucco, plaster or finer materials to be transported from rock outside.
Last point concerns the image and perception of the town over the time, by both visitors and inhabitants [11], [12]. On one hand, the relationship of the built rock outstanding from the valley and the wide surrounding landscape creates a unique skyline, whose pattern allows Orvieto to represent Italian imaginary in people from every part of the world. At the same time, it can be considered that the overall working of the urban settlement is perceived as a nature-humans combined organism and this, together with the landscape relevance, makes arise a strong sense of ownership in inhabitants.

4. Conclusion

4.1. The implicit sustainability of a medieval town

The focus on technical elements playing a role in built environment identity allows the comprehension of how resources use was optimized in the past in terms of urban layout, construction mastery and traditions as well as social and economic organization.
The specific case of Orvieto shows that technical aspects of local identity bring multifaceted sustainability implications. At urban scale, it can be observed that the whole pattern of irregular and wide urban blocks assures a minimum of fresh air and daylight for all buildings, shields the settlement from strong winds, produces shadowed street lengths alternating with sunny ones. The presence of many small vegetable gardens provides all the hygiene and psychological benefits linked with green areas in a compact urban fabric, bringing also thermal benefits during hot periods. Furthermore the green use of the soil is strategically helpful in water drainage with consequent hydrogeological benefits for rock stability.
Under the point of view of resource saving, it can be observed that many dwelling units are joined together in large fronts, and this brings a considerable reduction of used materials, since adjacent built units share a common wall. On the other side, indoor comfort for building units is assured by the so-called "courtyard effect": during summer period lower parts of the inner court are almost always shadowed, so that tuff walls basement keeps a temperature lower

than the upper part. During the day, this difference of temperature causes refreshing flows or air masses whilst, in the nigh, the heath accumulated by the soil is released, mitigating the night fresh.
Finally, the system of cellars and caves represents a valuable, tangible, heritage to be recalled in territorial marketing, that gives a strong impulse to wine industry and care of landscape.
In the whole, Orvieto technical and socio-economical organization shows a general optimization in use of resources, having created a system that saves materials, reduces transportation, assigns a key role to territory maintenance activities.
Thus, all described technical factors represent significant sustainability aspects, worthy to be kept and taken into account for today built environment management and rehabilitation. Finally, the respect of so relevant factors for local identity supports the fully application of social and intangible components of sustainability [13].

4.2. Potentialities for sustainability from a technical approach to built environment identity

The paper has presented a survey methodology for investigation of technical factors in local identity. The case study has evidenced that understanding of perceptual, emotional or functional interaction of people with built environment needs to take into account any type of technical feature, as single component or in its wider context. In fact it can be observed how some simple technical factors concerned with the material culture play a key role in identity comprehension and preservation, being particularly significant for a socio-culture and its related built environment.
This approach is able to provide useful inputs for sustainable management and rehabilitation practices, since awareness about technical elements constituting the built environment identity supports the understanding of the extent on which built environment is able to provide expected performances within the main goal to assure the handover of built environment identity from today to future users. This approach can also support all involved stakeholders in recognizing technical factors making up place's identity so that use and management of built environment is based on a sustainable preservation/transformation balance [14].

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FROM HISTORICAL RURAL LANDSCAPE TO NEW URBANITY IN SARDINIA

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Abstract

This inquiry relates to the lively debate within the Regional Landscape Plan for Sardinia and the legislation to extend its so-called "internal areas". This reaffirmed the centrality of the Rural landscape policies aimed at safeguarding and developing the Region's history, but it also defined the models for urban sustainable growth and balancing the qualities of the historical relationship between man and territory.

Keywords: Landscape, settlement, landscape urbanism, historian rural landscapes

"…il contadino (…) nel delimitare l'area, si assenterà per un momento dal suo lavoro rimirando con l'occhio socchiuso (gesto indicativo col quale dà significato culturale alla sua azione) l'allineamento del bordo di quello che sarà il suo nuovo campo".

"… The farmer (...) in defining his area, will go away for a moment from his work while gazing with his half-closed eye (with this indicative gesture he gives cultural significance to his action) at the alignment of the boundary of what will be his new field. "
. "

Eugenio Turri, *Antropologia del paesaggio - Anthropology of landscape*

Figure 1. "Potatore" of A. Borgonzoni, 1954, taken from "Storia del paesaggio agrario italiano"of EmilioSereni

1. Introduction

The strong rural dimension of the historical landscape in Sardinia and its contemporary imperfect variations give us an image of a region whose settlement sees a stark division today in the historic direct relationship between residential areas and the transformations in daily activities required to make them productive. The relationship between settlement and rural areas - in more formal terms between urban and agrarian fabric - which has determined the structure and peculiarities of the Sardinian countryside, especially in such a historically fragmented and unproductive land, has such an impact on the changes in these two ways that the same experience occurs in the contemporary landscape.
However, within the primordial forms of urban sprawl in Sardinian villages, but also in advanced peri-urban fringes of major cities, you can still find significant remains of the historic rural structures, which may have a conditioning effect on the new platforms and new forms of urban factors of cohesion between the need for urban growth and rediscovery of the countryside, within an alternative framework whose primary goal is the sustainable development of the surrounding areas.

From this theoretical assumption, the research can be guided by using a methodological analysis phase for the recognition and classification of the main historical forms in the Sardinian countryside, exploring the potential design of these historicized structures and determining new forms of settlement particularly within the periurban fringes, where the urban forms have often lost logical settlement and quality.
In this way, for example, the *"long field"* found within the medieval fieldwork matrix, an uncultivated residue of the *openfield* landscape and now in widespread use in periurban areas, still now structures the landscape of urban expansion. Similarly, the rural "enclose" or historic pastoral *tancas* or the agricultural *lottus* in the states of the peri-urban agricultural bocages and properties, provide a strong hierarchical system which promotes new housing arrangements based on balance between closed and open horizons. The logic of the old terraced especially peri-urban, finally, is considered as a synthesis between the tectonic morphology of the natural soil and its capacity to be inhabited.

2. Rural Landscape classification.
2.1 Methodology.

This typological methodology approach of identifying the historic rural landscape by following the exploration within the research project - *"The project of sustainable rural landscape"* - under the direction of MIBAC and conducted by the Department of Architecture, University of Cagliari in 2006 and the collaboration between the same Department and the Autonomous Region of Sardinia in 2008 for extending the content and applications offered by the Regional Landscape Plan to inland areas – a project called *"Rural Landscapes"*.
The author of this research has taken part in in-depth scientific and regulatory projects.
The awareness of the concept of landscape evolution as a conformation that expresses the sense of form and structure of a territory or of a portion of it, led us to make a classification of landscapes solely based on morphological macro-invariants and to highlight the hallmarks of different forms of rural landscape by reading their structural and architectural characters.
These inner structures within the Sardinian countryside are analyzed based on qualitative criteria directly derived from observation of the same properties in rural landscapes, or from their formal structures, expression of the relationships that are established between the natural substrate, soil and human characterization, in its physical and architectural sense. It was noted that the architecture of the Sardinian rural landscape is based on the relationship between several factors:
- The form and function of agricultural boundaries: limits, fences, border plants or administrative borders - it is essential to understand the shape of the plots, the transition between the dense forests of scrub and the grassy pastures or soil;
- The degree of modeling of the soil: the conditioning that human activity has applied to the soil for production purposes: it is essential to understand the relationship between culture, shape and topography of the settlement.
- The fragmentation of agricultural density - the degree of fragmentation of the rural landscape: the effects and new forms that the rural landscape takes on when it is subject to the same processes typical of the city subdivision owner.
- The density and distribution logics of the built-up environment: it is the measure of the relationship between the density of urban and rural areas - it is an indicator of the so-called "residential expansion" of the rural landscape.
- Sorting fieldwork: This is the type of crop, method of use, size and density of crops in agricultural fields.
These describe the types of landscape as a result and they are more or less similar throughout the region but with varied degrees of permanence of the structures. Within these "families" it is still possible to identify different degrees of permanence and quality and effective representation of the different forms of landscape in the same categories expressed by the European Convention (of excellence, base, degraded).

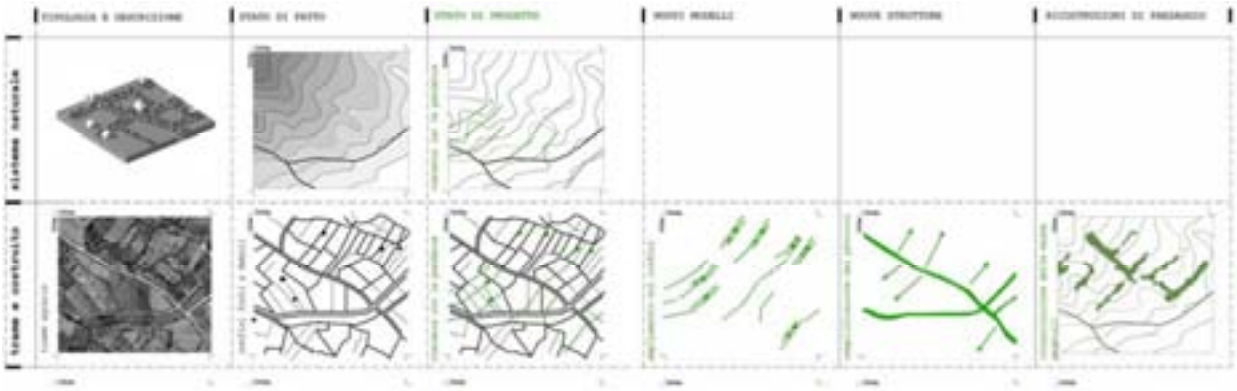

Figure 2. Rural landscape classification and project - methodology

2.2. Rural landscape types in Sardinia.

Sardinia is one of the most interesting regions within the European area regarding the great division between the *openfield* landscape and the closed and specialized crops commonly found in the Mediterranean landscape. As stated in Le Lannou, both forms of landscape in Sardinia, are enriched and made more complex by the historical "competition" for land management between farmers and herders which is projected in the precise rules and landscape morphologies.

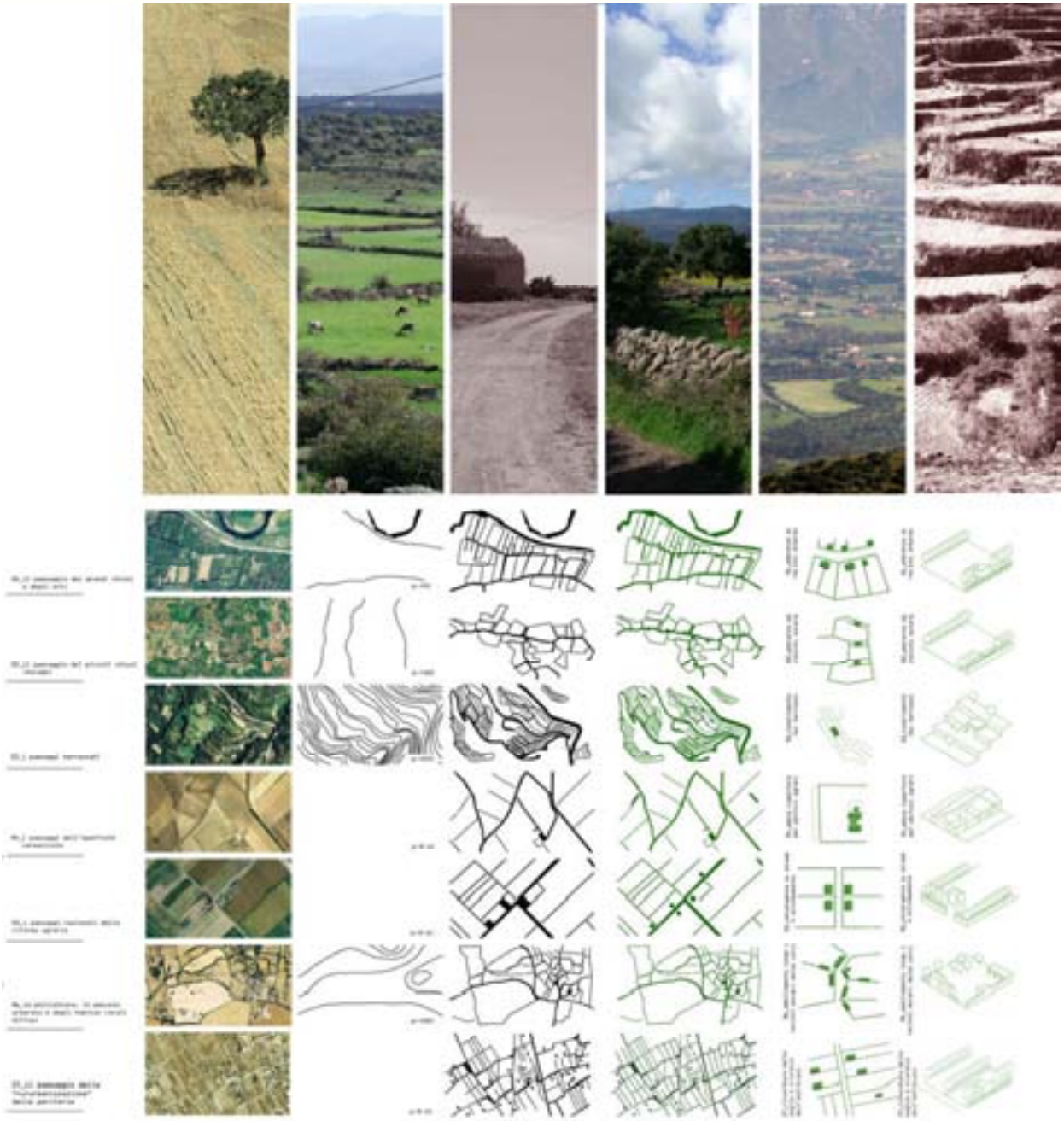

Figure 3. Rural landscape types – benchmarking schedule

The classification method used for *local samples* (**fig.2**), is based precisely on the analysis of some recognizable formal categories of the rural landscape, which allows us to evaluate the relationship between a strong historical dimension and the evolution of these landscapes in urban areas of crisis and hybridization. The overall shape of the Sardinian landscape in this classification attempts to see a strong continuity in the historical landscape of *viddazzone* openfield, cereal-crop plains in the southern and central hills, consisting of a cyclic management system of combined

agro-pastoral seasonal uses; the landscape of small and large encloses (of bocage and pastoral *tancas*) systems is a closing net system support to private properties and it is a clear distinction between land for grazing and for specific crops; also the landscape of rational meshed land reclamations of the twentieth century, and natural terraces of specialized crops in the valleys of south-eastern areas; the landscape of *diffuse habitats*, result of summer pastoral transhumance through a process of gradual territorial organization causes more complex permanent settlements diffuse in rural areas.
Within this research path, the historical landscape of orchards and periurban specialist crops is very important because the developing and increasingly fragmented forms create a puzzle with pieces that alternate between the urban and rural areas within the peri-urban production crowns, that are so disjointed.
These *rururban* landscapes, which neatly distinguish the history of the counties of Cagliari and Sassari, now appear to be a more common expression in Sardinia, of the strong hybridisation between the urban and rural structures and represent the most critical form of simultaneous transformations of that rural landscape of the historic "urban countryside" that balanced the agricultural and urban systems in the historical evolution in the relationship between man and natural resources.

3. From land scale design to new settlement concept.

It is realistic to think that this historically established close relationship between agricultural and urban center fabrics, can also lead to new forms of settlement in these small Sardinian towns.
The large structures of land that are reflected in the forms of rural landscapes in Sardinia are effective design tools for articulating the development of new settlements in the same direction of change and evolution of landscapes.

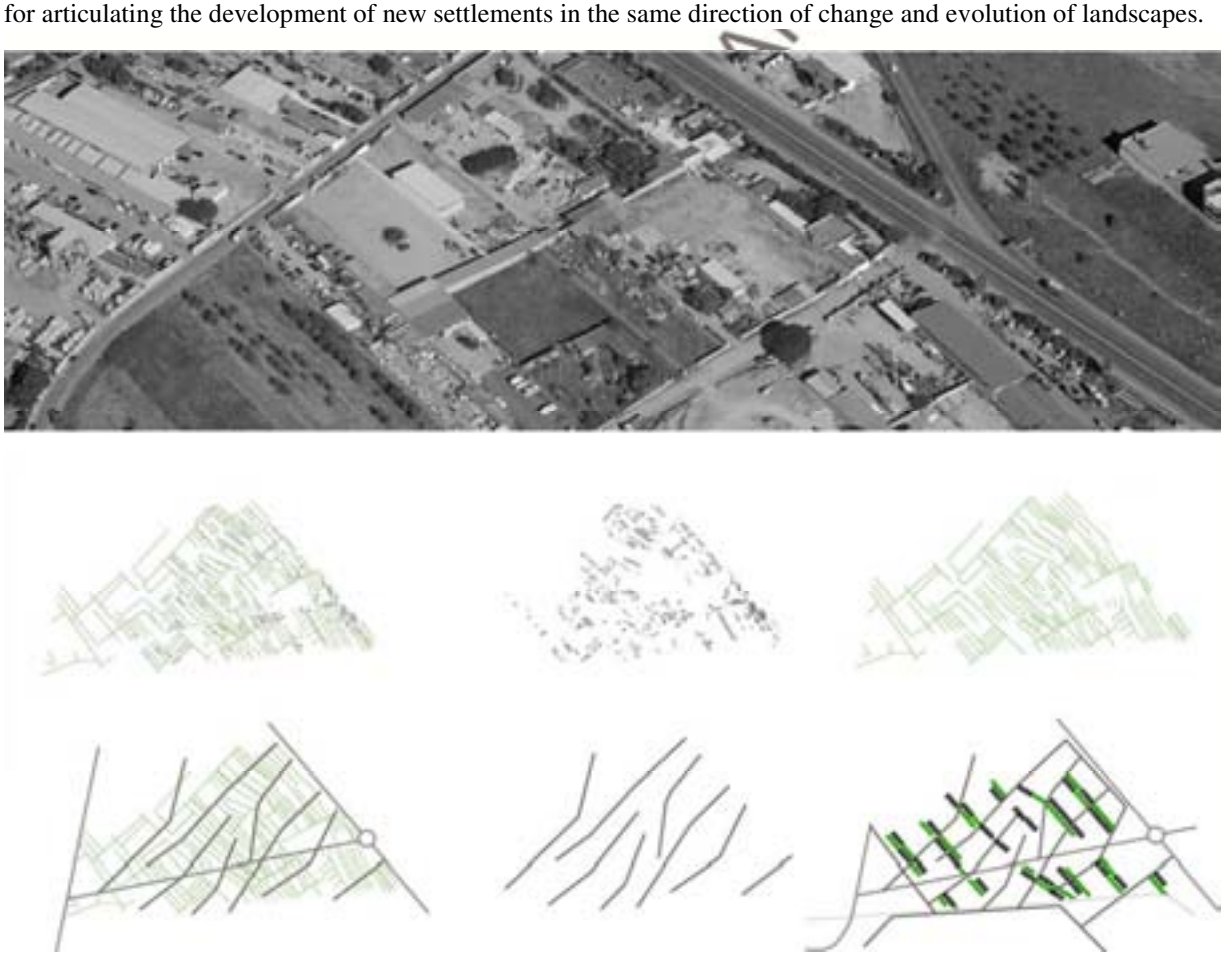

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Figure 4. New urban form organization from existent rural structure in Quartu S. Elena

The enclosures of bocages that contain the gardens and the wooded areas in hill-region towns can also make an organized plot for housing functions, as with the dense peri-urban fringe-land fragmentation, a left-over from the historic openfield landscape, which appears suited to the formation of a nucleus for craft production, or for

exchanges between agricultural and urban production. The network of regular and controlled drainage, which evolved throughout the twentieth century into more structured systems, is now configured as an effective tool of organization of the habitat and controlled growth of settlements, enhancing the landscape of modern "rationalization" land. The old terraces of the peri-urban areas, which characterized the hills towards the southern basins of the Campidano, have structured the major urban centers during the transition from the medieval to the modern landscapes and now represent residual fragments but still have the ability to give quality and structure to residential interurban expansion.
The built dispersion of rural areas, which occurred historically in a manner consistent with the existing plots, still sees, in the residual pre-modern historical nucleus, the most organized and structured system which ensures the production units related to land and places to live.
The research in this direction has produced summaries and classifications of rural historic landscapes (**fig.3**), merely from reading its critical structural plots, and tries to put together the constituent factors and signs of them to understand how they design new settlement patterns and urban forms and how its take shape from these landscape structures. As a result of this, three project workshop experiences derived from the project leading to the creation of a common agricultural school, a residential area on the edge of a small town in central Sardinia, and a residential neighborhood in a peri-urban foreign trade zone into the Cagliari hinterland area (**fig.4**).

4. Conclusions

The contemporary culture on the landscape is also strongly expressed by the European Landscape Convention of 2000, considering landscape as the expression which is "extended to" and "totalizing" the daily relationship between man and land in its various forms and not confining it merely to so-called places of "excellence". It tends to reverse the positions that were held throughout most of the 1900s, starting from the countryside as a place of values and formal structures that can offer new perspectives for the construction of the landscape in the third millennium.
The most sensitive result of that research, however, is that where the historic structures remain, the changing social conditions, economic and productive potential of the same soil and the new needs of the contemporary world seem to adapt to these structures, yet emptying them of their old meanings.
This is especially true in places of periurbanity where, in a logic of individualism, the maintenance of the countryside landscape is passing by the opportunity for transformation of it in a multi-functional landscape. The residential expansion, the production of agricultural residual, the formation of rough green, the persistence of small fragments of specialized crops, seem to constitute a new landscape imagine on which you can recognize an alternative model of sustainable development of the city, in the direction of change but the general continuation of the rural landscape as biggest value to the housing quality.

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ADAPTIVE THERMAL COMFORT IN MEDITERRANEAN BUILDINGS

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Abstract

This paper extends the first results of the research "Bioclimatic models for high energy efficiency architecture in Sardinia" to the whole Mediterranean basin. The work firstly aims to calculate the comfort summer conditions in Mediterranean climate, according to the adaptive comfort indexes of ASHARAE 55 and EN 15251 standards. These standards better define the acceptability of thermal conditions inside naturally ventilated or free running buildings. By the use of a climatic database, thermal neutrality temperature is calculated according to both standards for 26 coastal localities in Mediterranean basin. The different climatic conditions between northern and southern Mediterranean lead to different thermal neutrality temperatures up to 1.6 °C. The comfort limits are then compared with mean monthly hourly temperature and humidity profiles of each locality in order to evaluate how much and how often the external conditions overstep internal comfort boundaries. The results show that three different period occurs during a year in the whole Mediterranean basin: an under-heating period, a neutral and an overheating one. Thus, even if climatic conditions are not severe, Mediterranean buildings should be extremely dynamic in order to avoid the use of HVAC systems with consequent energy savings.

Keywords: Mediterranean climate, Buildings bioclimatic design, Adaptive thermal comfort.

1. Introduction

The Mediterranean climate is generally hot temperate with mild winters and hot, calm summers with few rainfalls and high relative humidity. There are generally two seasons: the warm one and the wet one. The former denotes the months from June to September, the latter the months from October to May, although these can be considered transitional months [1].

These general characters however can significantly vary from region to region, due to several reasons. The presence of high mountains that enclose the basin especially on the northern side is one of them. Few gaps in this enclosure permit the inflow of air masses from north. The zones where it happens, for example the north Adriatic region, are more influenced by cold temperate climate. The Sahara region instead influences the southern Mediterranean basin that can have features similar to sub-tropical climate.

Even if the Mediterranean one is not an extreme climate, the correct bioclimatic design of buildings is not easy. There are always at least three different periods as shown in the following: an under-heating one during winter months, a period of neutrality and an overheating one in summer. Thus buildings should be extremely dynamic to deal with outside conditions that can be alternatively within and beyond comfort limits.

The first phase of the research is aimed to analyze in detail the different climatic conditions of Mediterranean basin. According to Santamouris [1] the Mediterranean region can be divided in fourteen sectors by the 37°, 40° and 43° N parallels and the 0°, 10°, 20° and 30° E meridians (Figure 1).

For each sector one or two localities have been chosen from the sites available on Meteonorm database [2]. For each locality the following climatic parameters have been extrapolated: mean hourly air temperature (T_{ah}), mean hourly relative humidity (RH_h) and mean hourly atmospheric pressure (P_{ah}). The mean hourly data refer to the last ten years and are calculated by Meteonorm database according to [3]. The position of the localities is shown in Figure 1.

2. Thermal neutrality temperature

According to the most recent studies on thermal comfort in naturally ventilated and free running buildings, the thermal neutrality of occupants depends significantly from outside conditions. In past years several attempts to define a function that links thermal neutrality temperature to the external one were made. Two most important researches have been carried out until now.

The former was led by R. J. de Dear and G. S. Brager [4], [5] and was integrated in 2004 in ASHRAE 55 standard [6]. The latter was led by F. Nicol and K. J. McCartney [7-9] and has recently been integrated in EN 15251 standard [10]. De Dear's work took into account field studies in 160 buildings located in four continents while Nicol's one dealt with surveys carried out in 26 European offices in France, Greece Portugal, Sweden and UK.

According to [4] and [6] the thermal neutrality temperature is given by (1).

Figure 1. Subdivision of Mediterranean basin in sectors and position of climatic stations.

$$T_n = 0.31 \cdot T_o + 17.8\ [°C] \qquad (1)$$

where T_n is the thermal neutrality temperature and T_o is the mean outdoor monthly air temperature.
According to [9] the thermal neutrality temperature is given by (2).

$$T_n = 0.33 \cdot T_{rm80} + 18.8\ [°C] \qquad (2)$$

where T_n is thermal neutrality temperature and T_{rm80} is the daily running mean outside temperature, as defined in [8]. T_n should be considered as the operative temperature that guarantees thermal comfort to occupants inside a naturally ventilated building.
To evaluate the different thermal neutrality sensations throughout Mediterranean basin, T_n has been calculated according both methods, starting from the data collected for the 26 stations taken into account.
According to [6] and [10] also the range of neutrality temperature acceptability has been evaluated. The ASHRAE standard [6] prescribes ± 2.5°C difference from T_n with an unsatisfied occupants percentage equal to 10%. EN 15251 [10] instead introduces three categories of building. For a normal level of expectation that should be used for new buildings and renovations, the acceptability limits from T_n are ± 3°C. These limits are called T_l and T_u in the following.
In Table 1 the results of calculations for the hottest month (generally August) are shown. T_o ranges from 22.6 (Sector III: Barcellona - Ajaccio) to 28°C (Sector XII: Gabes - Sirte). Thus T_n (according to ASHRAE standard) ranges from 24.6 to 26.3°C. According to EN standard mean daily T_{mr80} ranges from 22.3 to 27.3°C while T_n ranges from 26.2 to 27.8 °C.
This first analysis shows that the different climatic conditions of Mediterranean basin lead to a different perception of thermal comfort of about 1.6 °C from northern to southern sectors. Considerations about the comparison between ASHRAE 55 and EN 15251 can also be made. Adopting the former standard the thermal neutrality temperature in summer is lower, thus more conservative. The EN index instead is from 1.5 to 1.7 °C higher thus moves the comfort limits towards more sever conditions. The spread between upper limits T_u is even higher (about 2 °C). This can lead to underestimating the overheating period as shown later. Since mean T_{mr80} and T_0 are very near, the difference is mainly given by the relationships (1) and (2) between external condition and internal neutrality temperature.
As reported in [9] the two methods are not directly comparable since the starting hypothesis of calculations are different. However this paper aims to highlights the different results that can be reached adopting one standard or the other, that should be always very clear to buildings and HVAC systems designers.

3. Comfort zones compared with temperature and humidity hourly profiles

The comparison between outside climatic conditions and internal comfort limits can give important information about the design of passive buildings. Thermal neutrality temperature however is not sufficient to find out if comfort sensation is felt by occupants. Humidity also plays a fundamental role in human perception.
For this reason comfort zones have been drawn on psychrometric chart for each locality. These are trapeziums whose sloping sides are the Standard Effective Temperatures (SET) relative to T_l and T_u. SET is the dry bulb temperature of a uniform enclosure at 50% RH in which occupants would have the same net heat exchange by radiation, convection and evaporation as they have in the varying test environment [11].

Table 1. Thermal neutrality temperatures and acceptability limits according to ASHRAE 55 and EN 15251. The data refer to the hottest month (generally August).

Sector	De Dear et al - ASRAEE 55				Nicol et al - EN 15251				Difference		
	T_o	T_l	T_n	T_u	Mean T_{mr80}	T_l	T_n	T_u	T_o-Mean T_{mr80}	ΔTn	ΔTu
I	24,1	22,6	25,1	27,6	23,6	23,6	26,6	29,6	-0,5	1,5	2,0
II	23,8	22,5	25,0	27,5	23,6	23,6	26,6	29,6	-0,2	1,6	2,1
III	22,6	22,1	24,6	27,1	22,3	23,2	26,2	29,2	-0,3	1,5	2,0
IV	25,3	22,9	25,4	27,9	25,1	24,1	27,1	30,1	-0,2	1,6	2,1
V	26,0	23,2	25,7	28,2	25,7	24,3	27,3	30,3	-0,3	1,6	2,1
VI	26,8	23,4	25,9	28,4	26,1	24,4	27,4	30,4	-0,6	1,5	2,0
VII	24,8	22,8	25,3	27,8	24,2	23,8	26,8	29,8	-0,6	1,5	2,0
VIII	25,5	23,0	25,5	28,0	25,1	24,1	27,1	30,1	-0,5	1,5	2,0
IX	26,4	23,3	25,8	28,3	25,9	24,4	27,4	30,4	-0,5	1,6	2,1
X	26,2	23,2	25,7	28,2	25,6	24,2	27,2	30,2	-0,6	1,5	2,0
XI	26,4	23,3	25,8	28,3	25,6	24,3	27,3	30,3	-0,8	1,5	2,0
XII	28,0	23,8	26,3	28,8	27,3	24,8	27,8	30,8	-0,7	1,5	2,0
XIII	26,7	23,4	25,9	28,4	26,5	24,5	27,5	30,5	-0,3	1,7	2,2
XIV	27,2	23,5	26,0	28,5	26,7	24,6	27,6	30,6	-0,5	1,6	2,1

On psychrometric chart the SET curves are lines whose equation is (3).

$$SET(T_{ul}, x) = T_{ul} + 0.023 \cdot (T_{ul} - 14) \cdot (x_{ul} - x) \quad (3)$$

Where T_u (or T_l) is the upper (or lower) acceptability limit of temperature and x_u (or x_l) is the specific humidity relative to T_u (or T_l) and RH equal to 50%.
The upper limit of comfort zone is the maximum specific humidity acceptable for indoor ambient (12 g/kg) [6], [10], while the lower one is the minimum one (4 g/kg) [6].
An example of comfort zones for the hottest and coolest month of one of the 26 localities analysed is shown in Figure 2. The mean hourly profiles of air temperature and humidity are also reported. The hourly values of specific humidity x_h are calculated starting from T_{ah}, RH_h and Pa_h values.
From the comparison between mean hourly profiles of all 26 stations and the corresponding comfort zones four different relations can be drawn:

$$T_{ah} < SET(T_l, x_h) \quad (4)$$

$$SET(T_l, x_h) \leq T_{ah} \leq SET(T_{ul}, x_h) \quad and \quad x_h \leq 12 \frac{g}{kg} \quad (5)$$

$$SET(T_l, x_h) \leq T_{ah} \leq SET(T_{ul}, x_h) \quad and \quad x_h > 12 \frac{g}{kg} \quad (6)$$

$$T_{ah} > SET(T_{ul}, x_h) \quad (7)$$

When (5) is true the outside conditions are within internal comfort limits, so passive strategies should attempt to reproduce inside what is outside, for example by the use of natural ventilation. When (6) occurs outside temperature is within the comfort limits but humidity is excessive. The introduction of external air inside can cause discomfort unless strategies to lessen humidity effect are adopted.
When (4) or (7) occur, the external conditions are over the comfort limits. In these cases the energy and material exchanges between inside and outside should be reduced as much as possible.
As shown in Figure 3 a matrix to evaluate for each locality the occurrence of relations from (4) to (7) has been drawn. For each month mean hourly profiles are compared with comfort limits. If (4), (5) or (7) occur, respectively a "C" (cold), a "W" (wet) or a "H" (hot) are reported in the matrix. If (6) is true the cell is left blank.
These matrixes have been calculated twice for the 26 localities of Mediterranean basin. Once starting from T_n according to [6], and then starting from T_n according to [10]. The results are summarized in Tables 3 and 4.

4. Conclusion

In the whole Mediterranean basin there are always three distinct periods if comfort limits are calculated according to [6]. The under-heating one lasts from October (coldest sectors) or December (hottest sectors) till May or March respectively. The overheating period is limited to just two months (July and August) in northern Mediterranean or is extended to September-October in the southern areas.

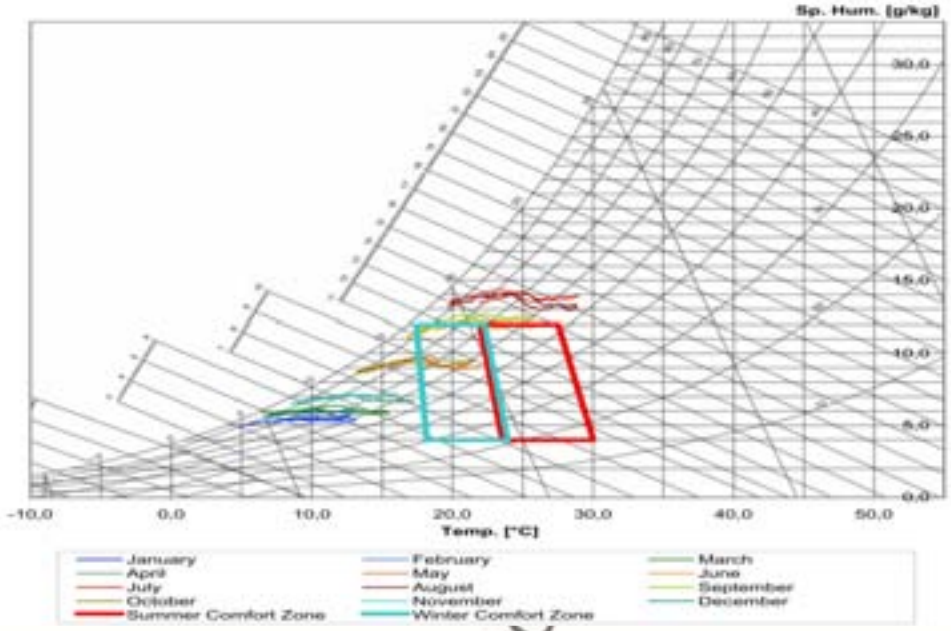

Figure 2. Psychrometric chart with winter (January) and summer (August) comfort zones and mean hourly temperature and humidity profiles calculated for Naples.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
J	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
F	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
M	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
A	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
M	C	C	C	C	C	C	C	C	C	C	C								C	C	C	C	C	C
J	C	C	C	C	C	C	C	C	W									W			W	C	C	C
J	C	C	C	C	C	C	C	W	W	W	W	H	H	H	H	H	H	H	H	W	W	W	W	W
A	C	C	C	C	C	C	C	W	W	W	W	H	H	H	H	H	H	H	W	W	W	W	W	W
S	C	C	C	C	C	C	C	C	C	W	W	W	W	W	W	W	W	W	W	W	W	C	C	C
O	C	C	C	C	C	C	C	C	C	C	C						C	C	C	C	C	C	C	C
N	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
D	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

H=outside temperature above inside comfort limits (overheating)
C=outside temperature below inside comfort limits (under-heating)
W= within thermal limits but excess of humidity

Figure 3. Comparison matrix of climatic data with comfort limits for Naples. In July and August comfort limits are overstepped from 12 to 19. Humidity excess occurs in July, August and September. In May, June and October morning outside condition can be reproduced inside to achieve comfort. Under-heating occurs the whole day from November to April and in night hours from May to October.

The humidity is a well known issue and can create discomfort conditions all over the entire summer. The overheating period however is not extended to the whole day but in average summer nights are in "neutral" if not even "cold" conditions.

If the use of HVAC systems has to be limited the presence of three different conditions makes necessary to foresee dynamic buildings. Material and energy exchange should be reduced as much as possible in under-heating period, except for solar gains. In neutral period the buildings should be opened to reproduce the outside conditions inside. In summer the daily change from "hot" to "cold" conditions suggests that the buildings should be as hermetic as possible during the day, while during the night the inlet of external cool air is required to dissipate the heat stored. In this case the high air humidity effect should be answered at least with adequate air movement.

The European Standard EN 15251 introduces less strict limits. In particular T_u is clearly higher than ASHRAE limits with a consequent reduction of overheating period. This one is present only in southern Mediterranean climate and even here it is cut down to July and August. This result could not accord to common experience by which in average summer outside conditions are clearly over comfort limits even above 40° N latitude.
It is important to highlights that the field surveys that led to (1) and (2) seldom referred to Mediterranean buildings, except for few study cases in Greece. The research conducted by R. J. de Dear and G. S. Brager however dealt also with areas whose climate is similar to the Mediterranean one, as California and South-Eastern Australia. This could explain the better suitability of ASHRAE indexes to our climate. It is author's opinion that more studies however should be conducted on the relationship of Mediterranean conditions with comfort perception of buildings occupant.

Table 3. Results summary of overheating, under-heating and humidity excess periods. (According to ASHRAE 55).

Sector	Overheating period	Under-heating period	Humidity excess
I÷II (lat. > 43°)	Afternoon and evening in July and August.	Most of the day from October to May and in summer nights.	In July and August.
III÷V (40° ≤ lat. < 43°)	Afternoon and evening in July and August.	Most of the day from October to April and in summer nights.	From July to September.
VI÷IX (37° ≤ lat. < 40°)	Afternoon and evening from July to August plus few hours in September.	Most of the day from November to April and in summer nights.	From July to September.
X÷XIV (lat. < 37°)	Afternoon and evening from July to September plus few hours in October.	Most of the day from December to March. No under-heating in summer nights in hottest localities.	From June to September.

Table 4. Results summary of overheating, under-heating and humidity excess periods. (According to EN 15251).

Sector	Overheating period	Under-heating period	Humidity excess
I÷II (lat. > 43°)	Not present	Most of the day from October to May and in summer nights.	In July and August.
III÷V (40° ≤ lat. < 43°)	Not present	Most of the day from October to April and in summer nights.	From July to September.
VI÷IX (37° ≤ lat. < 40°)	Afternoon hours in August.	Most of the day from November to April and in summer nights.	From June to September.
X÷XIV (lat. < 37°)	Afternoon and evening in July and August.	Most of the day from November to April. Possible under-heating in summer nights.	From June to September.

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IDENTITY OF RURAL LANDSCAPE. TRADITIONAL CONSTRUCTIONS AND HYDRAULIC WORKS IN CILENTO AREA

topic: Mediterranean Landscape: Paths,Works and Water Management

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Abstract

The configuration of the rural landscape of the Cilento area reflects the state of crisis in agriculture in the industrialized countries which is, in these years, to face the negative phase derived from the growing increase in labour costs and declining consumer prices, and the introduction of products imported from developing countries. To meet this contingency there is a tendency to widespread outsourcing and the industrialization of agriculture that led to an upheaval in many parts of the traditional aspect of the agricultural landscape.

The natural configuration of the land has been shaped by man for thousands of years with moderate or, sometimes, complex works of adaptation.

Was fulfilled, thus, a balanced process of composition of the functional aspects that returned an harmonic configuration of the territory.

The specialized production that is related to criteria for company management and forced by the market logic, the tendency to shorter rotations of crop plants, the increase in the average size of the plots worked, necessarily require a production efficiency through mechanization and a different logistic for the plants. In addition, the plant of greenhouses and protected crops in general, the replacement of the surface drainage network with underground systems, the water collection tanks for irrigation and all the appropriate facilities to new cropping systems specialist, as well as having changed the functional structure of the territory, assume great importance and impact in the usual scenarios.

The exploitation of water resources in rural purposes is one of the most ancient activities, the management of water resources has always been a work of vital importance for the survival and development of rural life, by developing and by perfecting techniques it has left a sign in the way of raising, in the type of crops and in the organization of rural settlements.

In order to envisage the monitoring tools to effect a rehabilitation of degraded agricultural landscape, we assume an integrated view of environmental protection, planning and enhancement of the landscape that is geared towards a specialized ownership of the territory, closer to the recognition of the natural elements and of all phenomena, generated by the interaction between man and environment, which are why the current configuration.

Keywords: Landscape, cultural heritage, hydraulic, information system

1. Pre-eminence and identity of the rural landscape of Cilento

Within a broader framework on the sustainable development project for the Parco del Cilento e Vallo di Diano, there are many initiatives and rehabilitation projects in rural areas.

These actions are grafted on a renewed interest in the recovery of material culture on the agro-forestry-pastoral (however recognized as the most suitable in some environmental situations), and in many singular testimonies related to it. In recent years considerable economic resources, public and private, have been used in recovery and rehabilitation of degraded areas and buildings within this region. The results are too often disappointing, if not reprehensible.

Interventions managed by local authorities without the necessary control of the agencies in charge to verify the adequacy of the design choices, in many cases proved to disregard every minimum requirement.

Despite the Cilento area is listed as a UNESCO[1] protected landscapes, its urban and landscapes realities have a high level of degradation and neglect that betrays the lack of a coordinated systematic action and, above all, the lack of awareness among the local population that the territorial identities are potential resource and need to be protected.

[1] The Parco Nazionale del Cilento e Vallo di Diano and archaeological sites of Paestum and Velia and the Certosa di Padula are entered in the UNESCO list of protected cultural landscapes on 5/12/1998 on the basis of the selection criteria *iii* and *iv* with the following reasons:

Criterion iii (to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared): *During the prehistoric period, and again in the Middle Ages, the Cilento region served as a key route for*

The Cilento is a geographic area with a discontinuous morphology that is characterized along the coasts, from flat bays closed with low hills covered with olive trees or from cliffs overlooking small harbours, while the hinterland has a rugged terrain, cutted by river valleys that isolate limestone nucleus where towns are often located.
The Geo-morphological profile is very rich: in the hinterland, for the most part, a limestone formation dominates with significant karst phenomena, which has varied layers from very different and specific colour, while, along the coast, a geological formation prevails consisting a sedimentary brown rock (sediments, from the erosion of the reliefs are transported to the sea by rivers, and deposited in adjacent marine basins, these form what, in the geological literature, are indicated by the name of flysch) [2]; in both areas the natural morphology is strongly marked by an hydro-geological matrix, characterized by deep valleys incisions, rather wild-looking, with gullies and river beds where the runoff is highly conditioned by regular rainfall, with an inhomogeneous flow in winter and completely absent in summer months.
The few rivers flowing abundant especially in the vast plains between mountains that separate the sections of the Apennines; nevertheless they remain almost torrential character. Some, intercept the river basins to the north and flow into the Sele, and other major waterways (Bussento, Mingardo, Lambro and Alento) mark the coast up to the sea.
The worldwide recognition of the heritage landscape values that characterize Cilento is reflected in the planning objectives for the recently approved Piano del Parco[3]; it replaces the previous planning instruments. Behind the study of the elements that compose the landscape of Cilento has the identification of "landscape units" (LU - landscape unit) and their evolutionary trends. The landscape units represent homogeneous fragments of the landscape system where local identities are recognizable and constitute the frame of reference for land management policies[4]. The UP recognition needs a common frame of criteria and categories for the representation of the structural system of the territory, which would identify representative areas and value factors[5].
Overall, the area of the park includes nine large visual basins, of which five (Vallo di Diano, valli del Calore, dell'Alento, del Mingardo, del Lambro) are perceived as large unitary landscapes structures, the other four (the two valleys Bussento, the coastal systems of Monte Stella, Bulgheria, and Policastro-Sapri) are fragmented into

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cultural, political, and commercial communications in an exceptional manner, utilizing the crests of the mountain chains running east-west and thereby creating a cultural landscape of outstanding significance and quality.
Criterion iv (to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history): *In two key episodes in the development of human societies in the Mediterranean region, the Cilento area provided the only viable means of communications between the Adriatic and the Tyrrhenian Seas, in the central Mediterranean region, and this is vividly illustrated by the relict cultural landscape of today.*
The evaluations that have supported the inclusion of the Cilento region between UNESCO protected landscapes are given by the ICOMOS expert mission (February 1998) which found in it an exemplary synthesis of biological and geological characteristics of extinct elsewhere (Operational Guidelines for the Implementation of the World Heritage Convention).

[2] The Cilento area described in the Carta Geologica d'Italia (Istituto Poligrafico dello Stato e Zecca dello Stato) sheets: 198 and 209 Eboli Vallo della Lucania, classifies many geological formations, in particular, the most common that characterize the landscape are:
- ...
- Flysch of Cilento, quartz sandstone and quartz-mica gray and ocher.

[3] Report to the Plan by the Parco Nazionale del Cilento e Vallo di Diano (approved by the Regional Council of Campania and published on the 24/12/2009 BURC of 01/27/2010):
2.2.1. .- The goals ... the preservation and enrichment of the wealth of historical, anthropological, social and cultural landscape and the significance of local cultures;
2.2.2. The functions - These objectives will inevitably give the Piano del Parco - the largest and most complex of instruments to be processed - a role quite broad enough to allow him to "replace" any other type of plan, including landscape plans. ... Are now on the Cilento area different types of planning tools and programmers supra, with uneven flow and operational capacity:
1. Territorial Coordination Plan of the Province of Salerno (PTCP), still in draft form.
2. Plans Coastal and interior landscape of the Cilento, only recently approved after a long series of procedural
3. Plans of the mountain communities, adopted in the early '80s and updated a decade later, but is largely obsolete in the reduced capacity in strategic and operational equipment taken.

[4] Hydro-geo-morphological units, - environmental units, - historical and cultural contexts - settlement systems or contexts, - areas landscape and visual perceptual and districts, - local socio-economic systems.

[5] within the Parco Nazionale del Cilento e Vallo di Diano, there are:
Thematic areas - 1. physical environment (geological, geomorphological, climatic, hydrogeological, soil), 2. biological environment (flora and vegetation, wildlife, ecology, agro-forestry activities), 3. cultural-historical framework (history and geography of the area, cultural heritage), 4. settlement patterns (urban and regional planning, settlement systems), 5. landscape-anthropological (landscapes and sign systems, visual systems of relations).
Factors - structuring, characterizing, qualifying critical.
(Report by the Piano del Parco Nazionale del Cilento e Vallo di Diano.)

heterogeneous districts[6]. The identity of the landscape of Cilento is given, rather than a unified framework, from a collection of separate images, but their sequences share a perspective matrix of hills that stretch to infinity.

2. Agriculture and landscape. The landscape size of rural between permanence and evolution

The descriptions of the peaceful Roman countryside, the rolling hills of Chianti or the wild cliffs that rise from the Tyrrhenian Sea to the Sila, written by all who, engaged in the Grand Tour[7] and in drafting picturesque Travel [8], travelled in Italy within the past centuries, belong perhaps a fact lost forever. A reality that was outlined in a conceptual construction closed in on itself and finished in a static image contradicts the logic of the evolutionary processes of adaptation and transformation that her generated.

Excluding the few areas that, to date, can be considered completely natural, the current layout of the area is not the result of a spontaneous evolution, but the result, in the long centuries of history, of a slow and gradual process of adaptation to an economy and agricultural production. The agricultural colonization of the hilly areas and plains has distorted their original and natural appearance; at first these areas were cleared, then, with wise adaptation works, were rendered to the productive activity that during the time has more and more specialized, however retaining a close and intimate bond with the land and its constraints. The organization of cultivation, generated by the need to adapt to the morphology of the soil, by the destination to several varieties of crops, by the exposure and fractionation of land, has resulted, over time, a form of land characterized by a rich and varied plot where an apparent disorder is indeed a unique synthesis of rules and balances that the human work has developed over time.

The natural configuration, wherever possible, has been shaped by man for millennia, as evidenced by the network of hedgerows in low-lying areas, by dry stone walls and windbreaks, while in mountainous and piedmont hilly, complex works of embankments and terracing[9] allowed the realization among the rocky slopes of specialized crops[10]. This scenario is complemented and enhanced with a rich variety of settlement types on dominant positions or buried in the vegetation. Villages, villas, castles, isolated towers, rural buildings and equipment made with very simple techniques, but composed from various elements and original solutions due to the traditional knowledge and the use of local materials, seem to be generated from the same land.

Until a few decades ago, this occupation of the territory was carried out through a slow process, the use of limited technical resources and the adoption of proven solutions; thus natural systems endured to adapt to new conditions without the strong tensions. By this way was performed a balanced process of composition of the functional aspects that returned an harmonic configuration of the territory. The landscape slowly passed from anecumenical[11] areas, characterized by geomorphological, hydrological and phytogeographical[12] elements, to populated areas to end up in urban areas. Between these two extremes, the landscape, dominated in the past by different icons of the local culture, acquired identity and recognition, not simply as a physical and historical reality but as a complex system of signs and forms that evolved over time.

The current rural landscape reflects the state of crisis of agriculture in industrialized countries that, in recent years, faced with a negative phase because of the growing increase of the labor costs and the general decline in consumer

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[6] Within the variety and richness of the landscape are recognized eight types of landscape:
- Sand dunes and beaches of the equipment;
- The coastal slopes and cliffs;
- Karst mountains;
- Wooded mountains;
- Inter-montains basin;
- Mixture of wetlands;
- Wooded hills;
- Cilento hills.

[7] The Grand Tour, a literary and artistic traveling since the middle of half of the 700 to 800, every man of European culture must have done in Italy in search of Greek and Roman classical memories often included in wild rural landscapes..

[8] The pictorial journey or picturesque voyage is a type of publication that is especially developed in the early nineteenth century and lies midway between the tour guide and art book. Volumes were made up of a number of engraved plates, accompanied by a descriptive comment more or less wide; engravings could be colored, at the request of the purchasers of the work. This production was addressing an audience of elite, composed of nobles and intellectuals, the same public that were part of the travelers at that time.

[9] The difference between terraces and embankments is that, in the first case, the support function of the shelf is carried out by dry stone walls; in the second case, by the outer wall of the embankment suitably turf to make it stable and compact.

[10] The terracing of steep rocky slopes is the testimony of the arduous and tenacious work of man who, with the construction of dry stone walls, behind which you collected the soil run-off, or whatever it was transported from a distance, drew from the slopes arable areas of the mountains. The plants were mostly vines and olives, while on the ground were carried out alternated crops (cereals and pulses) according to the canons of traditional mixed cultivation.

[11] *Anecumene* - ... part of the land uninhabitable by man because of physical or climatic conditions. From: Italian Dictionary Sabatini Coletti (DISC). Giunti Ed., Firenze, 1997

[12] *Phytogeography* - ... the relationship between plants and the environment in which they live, with particular reference to their distribution on the surface. From: Italian Dictionary Sabatini Coletti.

prices due to the introduction in the market of imported products. Obviously the farmers of the hillside land (already largely abandoned and uncultivated because of the conversion of the farmers to workers in heavy industry in the boom years) are those who mostly suffer the inconvenience of this situation; they were in fact forced to face the difficult morphology of the area which only allows a specialized production[13] and hampers modernization and mechanized management, making thus their products uncompetitive. This situation is common in many mountain regions of our country, excluding the few areas where it is implemented for years the production of high quality agricultural products, particularly wine, which, associated with the offering of complementary services such as rural tourism, provides a supplementary income to employees.
The territories of the slope[14], therefore, lay into a total neglect and abandonment or are cultivated by improper techniques not compatible with the delicate balance that regulated this area. The stone clearance and levelling of land to allow the use of mechanical means, the plowing of deep furrows that go through the humus layer and bring on the infertile ground and large quantities of stones and clay, have made the land vulnerable to the action of rain. Often to implement questionable greening policies, non-native tree species have been planted, both on public lands and in private funds, with government funding at a subsidized rate, even if completely inappropriate to the local climatic profile.
Different albeit similar fate has befallen the plain areas where, due to the technical requirements of an increasingly mechanized agriculture and to the gradual acquisition of agricultural land by multinational companies, the old fields were combined and made more extensive and more squared. In particular, this phenomenon occurs for arable crops, where the constraints are lower and the degree of mechanization is higher, but it is increasingly affecting the cultivation of trees and shrubs, where specialized cultivation replaces the traditional promiscuous one. The specialized production as related to company management criteria and forced by the market logic, the tendency to shorter rotations of crop plants, the increase in the average size of parcels processed require necessarily to implement the production efficiency through mechanization and other logistics facilities, often much more monotonous and certainly devoid of all the traditional features.
The greenhouses and protected crops in general, the replacement of the surface drainage network with underground systems, the collection tanks for irrigation water in the new specialist farming systems, have produced, in addition to the functional change of the territory, a strong impact in the usual scenarios. The traditional rural buildings is also compromised by heavy building renovations and extensions (for example, the stone walls with multiple textures and colour varieties have been covered, in the renovation of the old rural buildings, with anonymous plaster) that distort the typical features, while new buildings are characterised by extraneous typological solutions, the excessive use of reinforced concrete instead of materials and techniques traditionally used, have impoverished and homogenized the building language.

3. The relationship between water resources and agricultural landscape of Cilento

The topography, the climate and an economy of scale have influenced, in the past, the choices of crop land along the hillside mainly intended for trees and seed.
The farming systems found in the analysed territory are essentially of two types: those that affect the land of plains and those affecting the hilly terrain and foothills; the element that most characterizes the differences between the various systems is the hydraulic work to control the water regime in excess or in defect, surface and deep, according to the need to capture water or lifting or regimentation, depending on whether it's rain water, spring water or subsoil. The rural landscape is enhanced by single elements such as wells, tanks, cisterns, fountains, drinking troughs (Fig. 2-3-4) or continuous elements (canals, ditches, irrigation systems, ...) that not only contribute to the design of the landscape but also to the understanding of the hydrogeological characteristics and climate and of the over time refined techniques that have resulted in a consolidated image.
In the flat land, the soil frame is characterized by a regular subdivision of plots, mainly corresponding to the different estates, which overlaps the interstate tracks and the canals system. The sloping land are marked by a terrace works to correct or compensate the inconveniences due to the slope of the ground. Finally, among the cultivation of hilly lands, distinctive features can be considered[15]:

[13] The use of these soils is medium to low profitability, especially for fodder, small orchards, vineyards, etc
[14] The extreme fragmentation of landholdings, not allowing a planned and assisted agricultural activity, led to a fall in income of workers and the consequent gradual abandonment of the funds.
[15] We consider as structuring image all the elements of recognition and orientation within the park such as:
- The peaks of Mount Soprano and the mountain below;
- The crest of Vesole-Chianello;
- The slopes, the crest and north-western cliffs Alburni;
- The summit of Mount Stella;
- The ridge and the summit of Monte Sacro-Gelbison (a real focal point of the park, as it is visible from the street or from the centers of 6 pools of 8);
- The promontory of Capo Palinuro;

- The almost constant presence of the vineyard (as a boundary between different cultures);
- The organization of space in order to optimize the availability of water;
- The size of the field commensurate with the available family forces;
- The definition of the funds with dry stone walls and mixed hedges;
- The careful arrangement of the ground for the regime of surface runoff of rainwater tended to minimize the effects of erosion on agricultural land and for the water storage in tanks.

4. The traditional buildings and hidraulic for the management of water resources in rural areas of Cilento

The water resource is regulator in the dynamics of land use; the water use for the increase of agricultural production is one of the most ancient work and it has always been of vital importance for the survival and development of rural. The techniques of water supply and control marked the Cilento area conditioning both the types of crops and the organization of rural settlements.

In hydraulic it is necessary to distinguish works aiming at the use and works of defence and protection from possible damage to crops and rural settlements[16]. These are a function of many factors linked to other local resources as well as to the structural features of the technical elements necessary for adaptation to local resources and their exploitation.

The variety of solutions over time characterizes the landscape, sometimes very significantly, it represents the junction between the different forms of presence of water in nature and work of adaptation that man has made for purposes of settlement and productive.

Works for the control and exploitation of water resources are influenced not only by the morphology of the territory but also and mainly by the availability of the resource in relation to its location: surface, underground flow, underground water table.

The elements will be identified that contribute to determine the configuration of the rural landscape of Cilento and their integration due to the use of local materials and techniques of natural and man-made landscape.

Those elements can be distinguished and classified according to their function; therefore we can operates a distinction between the engineering work carried out for reasons of: collection and extraction, transportation and storage, use and disposal. Among the works for the collection and extraction, according with the needs of lifting, diversion and containment, we recognize wells, springs, dams, dikes and works by drawing water; works such as artificial ponds, tanks and peaches are also aimed at conveying and collecting of water resources to maximize the availability and exploitation. Particular attention should be given to the hydraulic that meet the many different uses that, in the Cilento area, characterize the rural landscape. Single elements, such as fountains, troughs, or sinks typically associated with domestic uses, and elements that mark a continuous segments of landscape, as irrigation systems and drainage works for irrigation purposes, can be identified.

Among the works for collection and extraction, those appointed to the containment and regimentation of water (dams and levees) are without doubt those of greatest environmental impact both for the changes in the aspect of the sites and for changes in the organic equilibrium of local flora and fauna. We are accustomed to the presence of these elements in the landscape that we perceive as "domesticated" and justify on the basis of basic needs for survival of the settlements and productive; anyway the growing focus on the environmental impact of these works is directed not only to protection of hydrological conditions of risk or of the habitat, but also to minimize the landscape alteration.

Similarly, works by drawing water, as from source or river or lake[17], although if they involve less extensive areas of the above, are the hydraulic where the choices for the technic requirements prevail on the landscape protection, and they impoverish the local values.

- The ridge and the summit of Mount Bulgheria.

(Report by the Piano del Parco Nazionale del Cilento e Vallo di Diano.)

[16] The use of water resources in agriculture activities is aimed at:
• drinking water,
• watering,
• Irrigation,
• energy production.

The activities for the promotion and protection are mainly aimed at the creation of works:
• regimentation of stormwater;
• land reclamation, drainage and disposal of surface water (open ditches or underground);
• removal / disposal of sewage.
• works for the prevention of flooding or runoff.

[17] The intake works for the uptake of water from rivers or streams can be achieved by: lifting systems, siphons straddle beams and towers of bank or collection. The lifting systems are generally composed of a pump (dry or submerged) and pipelines to transport water. The siphon of a knight instead of a particular bank is required to overcome the trap of the bank of the river and requires the installation of a hydraulic pump, otherwise the uptake by a stream of water can also be achieved by creating an opening along the river wanted to deflect part of the flow. In the case of stagnant surface water the uptake occurs through placement at different

The presence of wells[18] and springs[19] is related to the exploitation of minor water resources, and it therefore affects the agricultural landscape in a isolated manner, sometimes it is closely linked to land ownership and the type of crops and livestock in it. At present, the abandonment of many cultivated areas or focus on new and different forms of water supply has resulted in the sale and the consequent destruction of the springs due to natural vegetation; in the same way the need to protect the cavities of wells requires today concrete superstructure that, though temporary works, are a sign of obsolescence and neglect places. Fig.

In this discussion, the reclamation[20] and irrigation[21] systems deserve special attention; they draw in the agricultural landscape a grid that underlines all gutter lines of farm plots or limits in a very fragmented frame of the territorial extension.

We still include, among the works of the rural landscape, the elements of the agricultural tradition which implicitly recognized the role of housing values and memories of the rural culture and the genius loci: those little architectural episodes are distributed across the territory and built to enslave settlement activities related to agriculture. It refers to the variety of fountains, troughs, sinks, and collection tanks that in every place develop new forms and different features to suit the availability of local materials and functional requirements of the context to which they belong. These works from the technical point of view and constructive, both with a surprising bill or low importance, summarize the expression of an experience and a wisdom that for centuries has combined the natural resources with human activities.

The construction of hydropower for exploitation of watercourses play a special role. In going up the most of beds of streams and rivers of Cilento is often see abandoned buildings where it is possible to identify the remains or traces of hydraulic machines, which for centuries have marked the economic and social life of these areas. You can find these buildings, after a long and narrow paths, crumbling and covered with vegetation, often, it is also difficult to determine the work that these structures were designed; it is possible to recognize the nature of factories or water mill because it is, usually implanted on the side of a stream and trapped in a natural slope steep enough. We are speaking about construction difficult to date, carried out until the late nineteenth century, where the building types follow ancient models, when men discovered the possibility of use the hydraulic power as a replacement of muscle power of humans or yoked animals[22].

5. The Historical Information System (georeferenced information system historically logged) for the protection of the rural landscape of the Parco del Cilento e Vallo di Diano

The analysis and study of structures related to the rural culture, expressions of the production cycles and of the working and processing of agro-forestry-pastoral products, require to analyze the individual elements and how these in the past were a reference to contextual reality.

The rich heritage of event and elements, related to water resources in rural areas, must be preserved, protected and valued as evidence of a civilization that disappeared, but, most importantly, as a background of experience in managing the hydro-geological layout, which after recent catastrophic events, identifies the primary function of prevention in the knowledge and management of the territory by farmers. The simplicity of rural artifacts is associated with a complex working, that is possible only thanks to the management known only to those who supervised the conduct. The identification of the traditional hydraulic works and construction is aimed at the

levels of depth of gate towers with windows that can trap the water at different levels depending on seasonal variations in the level of the basin.

[18] The well may be of groundwater, when the cavity is generated by natural vertical development that intercept the waters of the aquifer naturally or can be an artesian well if it is made by drilling and insertion of the soil pipe.

[19] The springs are made of a resurgence of the plain where the water gushes from the ground (the head of a source can have varying depths from 1 to 5 m) and a channel flow of water. The head of the source can be formed by dry-stone walls that allow water to flow to ground water from tanks placed in the bottom of the head of the source up to 2.5m or from tubes with windows that intercept the water to a depth of 10m and forces towards the head of the source.

[20] The works of hydraulic interventions are aimed at the recovery of vast tracts of land flooded with stagnant water to make them suitable for use and urban agriculture. The drainage works require the construction of a network of channels for the collection and removal of water.

[21] The choice of method for irrigation depends on factors such as water availability, type of crops, the type of soil, climate, etc.. The main methods currently in use are: flooding, to scroll, or by sprinkling rain, drip, for sub-irrigation; these differ in the volume of water distributed on the crop, for the method of distribution and for the duration and frequency of watering cycles.

[22] The use of hydropower in the milling of cereal grains, to obtain flour for food, replaces the first rudimentary tools (simple flat surface and a stone roller, hold with one or two hands, to rub on the first or the simple mortars) and roundabouts biconical millstones used in Roman times (found in archaeological excavations of Pompeii and Ostia, they are made from a base, blunt cone grinding wheel, which rotates on a cylindrical grinding wheel biconical hollow inside: the surfaces are juxtaposed grooved the upper cavity acts as a hopper, and both wheels are tough and the upper stone was rotated under the pressure of a slave or a beast of burden. These mills, despite significant improvements, were used to sec. XI, vintage where they spread the water mills).

interpretation of the phenomena that led to the historical configuration of the area to define new functions appropriate and consistent strategies.
In view of the protection requirements laid down by national legislation for protected areas and, in particular, in relation to UNESCO guidelines for the protection of the heritage landscape of the Cilento you configure the need to improve tools for control and monitoring on the territory under study. The computer tools for management of the information in the Parco Nazionale del Cilento e Vallo di Diano [23] provide for the implementation of a data structure that allows to acquire, catalogue, analyze and return geo-related information also. For a more and more careful control of the territory, the increase of information is not enough such as the methods and procedures to be used in data processing. The enhancement of the tools through the mapping of traditional hydraulic engineering, overlapping the actual hydraulic configuration of territory, may permit an historicized reading towards the construction of a virtual image of the past rural landscape, thus, when the historical stratification of the landscape is known, new diachronic integrations are possible. Such an operation is currently in correspondence with the rural censuses sanctioned by DPR 154, 2010[24], in adaptation to the European Directive Regulation (EC) nr. 1166/2008, which are planned for the years in 2010 (to be completed in June 2012), 2013 and 2016.
The network of hydraulic works in the traditional territory of the Cilento's Park may therefore constitute the reference indicator for returning information about the culture previous system and the way of exploiting the land in the local agricultural economy. Often the transformation of the production system dictated by obsolescence of equipment or new production requirements have resulted in neglect and abandonment and the consequent re-appropriation of places by natural vegetation. In this sense, there has been a blurring of the structure and image of the pre-industrial area era that has gradually given way to new textures and new colors.
The development of a georeferenced information system historically logged (GISHL) entails the creation of an image consisting of several layers composed of groups of raster data and vector data stored in different formats[25].
The individual layers can be viewed individually or as a group to form a theme. The groups of layers and layers can be placed in a tree structure expanded at will. In the consultation, therefore, you can search, view and capture data, by using the tools of graphic layers active, the data available.
The GISHL is structured through a comparative study, divided into successive levels relative to the amount and quality of information to be managed, including information derived from analytical data compared and integrated with the technical survey and interviews conducted with different methods and aims.
Since there is no census of hydraulic works, in drafting of a GISHL, the working hypothesis starts from the acquisition of historical tables[26] and maps of the Military Geographic Institute[27], with which to draw layers, one for each type of element, where you can identify the location of hydraulic engineering as reported.
This first structure is then implemented with data from interviews to residents and technicians of the study area, in order to find additional elements not contained in the acquired documentation. The latter is crucial as it is still possible today (as was the case for the discovery of a mill in ruins in the municipality of Giungano so overgrown that it was difficult to distinguish the nature of factory) to document through memory or oral transmission those elements whose tracks were lost.
After the first mapping of hydraulic and historical works comes the inspection of the building in which you perform surveys and compilations of default tabs:
• interview with the owner of the land or building in order to obtain general information;
• detection of geographical coordinates with Global Positioning System instrument;
• Metric survey performed according to a programmed protocol;
•geo-referenced and photographic survey and photos-survey;
• samples of materials for examination and for laboratory tests;
• filling sheet about degradation state and, where evident, the causes of any structural failures.
Particularly important is the preparation of a survey able to provide all the information useful in assessing the situation, by identifying fully the physical, identifying, quantifying and cataloging the materials, the conditions in place, the causes of deterioration and the boundary conditions. The collection of survey data should include metric data and construction and material data, and should explain the relationship of the different parts of the building and functional joints related to the different uses.

[23] *La Costa del Cilento: analisi multicriteri per un modello di gestione*, Quaderni - Ambiente e Società 2/2010 - ISPRA – Istituto Superiore per la protezione e la ricerca ambientale.
[24] Decreto del Presidente Della Repubblica 23 luglio 2010, n. 154 *Regolamento di esecuzione del sesto censimento generale dell'agricoltura*, a norma dell'articolo 17, comma 2, del decreto-legge 25 settembre 2009, n. 135. (10G0168) (GU n. 214 del 13-9-2010).
[25] Vector data formats: PostGIS, ESRI Shapefile, ESRI ArcSDE, etc.. and raster data in: TIFF / GeoTIFF, GIF, PNG, ERDAS, JPEG and EPPL7, etc...
[26] Carta Idrografica del Regno D'Italia, Minute Originali Di Campagna delle Levate …. Della Carta Del Reame Di Napoli, tablets on scale 1:20.000.
[27] tablets series 25v.

The registry card, both for a simple work (ditch guard) or a complex one (mill with a bath and drop tower), is structured so as to provide, in addition to data concerning the geographical and administrative identification and any constraints on the building or on its area (geological, historical, environmental, floor, etc..), also information about the current and past use destinations, quantitative data, the time of the first plant, if possible, and any subsequent interventions of structural integration and functional.
Subject of the census are rural and productive systems and all infrastructure, equipment and services related to them. The hydraulic works will be catalogued on the basis of the various goals to they are made:
• capture and retrieval
• transport and storage
• use
• disposal
The collected data are classified according to the structural layout, functional and morphological and to the type and location on the considered area (punctual or continuous). The mapping of all the engineering work so identifies a network represented by the coordinates of vector graphics (form, intensity and direction); for each one must be identified the territorial area served, its land area used and its catchment area.
In order to grasp the integrity of the landscape dimension of these works, or how their presence influenced the dynamics of landscape change, all information on areas served by the network must be associated with the data of plants in the pre-industrial system of rural economy. The rendering tool lets to view the mosaic returned from all areas under cultivation or spontaneous vegetation and to appreciate, where the water regime has been modified, the resulting transformations of the visual catchment. The rendering tool lets to view the mosaic returned from all areas under cultivation or spontaneous vegetation and to appreciate, where the water regime has been modified, the resulting transformations of the visual catchment.
The picture of these censuses, implemented in an information system, outlines the development trend of the park and, when superimposed on the pre-industrial system, can reveal areas of detachment from the traditional model or conversion (for instance: some sites excluded from the rural production system manifest a tendency to be reabsorbed by the tourism production system).
The purpose of a geographic information system, integrated with the data on the traditional production technologies and with data from the current censuses, is to highlight and represent the development trends in relation to planning instruments adopted within the park and in relation to voluntary initiatives.
In this sense, we can gain control capability on the lines of development, adaptation and monitoring in compliance with the objectives of protection of local cultural heritage. The difficulty in developing the described system is due, rather than to the sophisticated technology used, to the data processing and recording and their relevant associated costs. Therefore it also may be suggested the use of an open source software that should gather all the information voluntarily submitted by the individual actors involved. These can be identified in any type of entity, when an hierarchic coordination has been planned to verify the consistency of the information. The advance notification and the subsequent joint analysis of the information would lead to integrated validation.

A NEW ECO-DISTRICT IN BARCELONA

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Abstract

The project presented proposes an eco district that develops in an area of Barcelona's future transformation from municipality.
The proposal is an eco-sustainable neighborhood that hosts tertiary ,commercial and tourism activities integrated with spaces for self-sufficiency in energy, water and own consumption.
Geographically the district is located at east of Barcelona, close to the river park's river *Besos*, an area where industrial and residential zones to high density still co-exist.
About mobility the area is strongly influenced both the presence of the new internodal high speed trains station "*Sagrera*" which allows access to the Barcelona's city center and main tourist destinations on the coast and the new metro's line 9, which will allow connection to the tram network and the rest of the city: downtown, airport and university area.
These are the strategies of this new tourist area:

- Creation of a new equilibrium among the built up and the free areas
- Intensive net occupation of the buildings
- Vegetable Gardens use in public spaces
- Reducing the mobility
- High quality of the public spaces
- Use sustainable materials

From the perspective of land use decisions, the new district has a significant density (equivalent to the values of Barcelona) to avoid urban sprawl and reduce the distance to the main axis of mobility and also balancing the relationship between the constructed surface, the area used for vegetable gardens to public open space.
Mobility within the eco-district made exclusively by tram, metro, and possibily by bicycle and walking routes.
Lots are organized by means of square blocks ,reproducing a new approach of manzana's Cerdá concept. In each built at the bottom are located commercial,administrative, and services spaces while the upper floors for the residences.

Keywords: Eco district, Sustanaible environment

1. Introduction

According to XIXth Century's experience, we know the following: the new connectivity forms (such as railway networks, at that time) do not always suit in an appropriate way inside the urban tissue. The XXth Century leads the earlier dirtier means of transport to converse into cleaner forms (coal into electricity). This makes it easier for the railway network and the city to live together in a cleaner and perfectly respectous way.
However, this Century will witness the blossom of massive private motorization, which establishes a new conception regarding urban connections. This new standard rapidly became predominant. It also became the most extensive one (private transport would potentially occupy every public space available). This would eventually put an end to the commonly used base-network. Not only that but also it appears as of being one of the main indicators of our nowadays society.

2.Functions

Urban expansion should emphasize proximity as a value. This purpose is to take into account both distribution of built areas (residence, industry, services, facilities, and so on) and available urban spaces (streets, squares, green areas, vegetable gardens, forests, and so forth). It is time to consider all their possibilities and functions. This would lead to a reassessment of the base network as a keystone in citizen's day-to-day life.

3.The Blocks

In comparison with other morphology of districts in Barcelona, this eco-district will be organized by means of square blocks, where a high building is often planned. The blocks will be set to suggest again a new Cerdá's *eixample* . In each block will be a court, a semi public space with public equipments.

3.1The buildings

Each block is an architecture thought to reduce energy consumption. Therefore passive systems are planned. It means a building highly isolated air circulation in the atrium, photovoltaic catchments on the south façade, use of geothermic and waste reconversion.The blocks are various and different levels high. Shops and offices at the bottom and housing to accommodate people (hotels, aparthotels, youth hostels and elderly people residences) on the upper floors with terraces at the top. In addition each block will have a high building on the northern side to densify the districts and to create landmarks in the city. This building will have more levels than the others. Greenhouses are planned at the bottom, and the last floor of towers where trees like poplar will grow, in order to offer gardens for the inhabitants, and capture CO2 in the day. The atrium allows air circulation. So in the night the methane of CO2 gases rejected by trees will be reused to create new energy.

3.2Residences

The residential packages can be disposed nearby the business areas because nearly 80% of the population in the finished society is working in services sector. Such a distribution will allow the perfect combination of residence and business cohabiting in the same area as well as the access to equipments and services. This would lead to the development of a fully joyful urban life.
The allocation of all kind of residential buildings above the service layer basement will make posible the successful mixture of the downtown services with the suburb's life quality. The aim to reach a new expansion with a healthy urban dynamic –in combination with a sustainable city- regards the underground level as the most crucial urban place in order to achieve our main objectives, both in the private and public area.

4.Mobility

By moving away the private transport from the street level to a lower level the pedestrians are allowed to recover the most important public space in safety and comfort, while private transport is ruled in a smaller area without crossroads, providing safer and efficient trips.

Figure 1. Seccion with proposed mobility

4.1 Public transport

The Public Transport can be distributed along levels which are created for the functional requirements of every place. This system require that the underground level turns into the main modal exchanger where the pedestrian and private net-system transport converge into a space that allows a clear and efficient organization of the main building's adjacent services: like parking areas, taxi platforms, selective withdrawal of all kind of washes, technical spaces and gallery of some services.

5.Conclusions

In conclusion this new touristic eco- district will be an exemplar of sustainability, which aims to change people's habits and propose new ways of living in the city.

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MEMORY OF AN EPHEMERAL ARCHITECTURE

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Abstract

In the present work it is intended to expose and characterize some of the traditional constructions made of wood that exist in the Luso territories mainly in the dwellings of inhabitants of Vieira de Leiria (Avieiros), a people who have migrated within the Portuguese territory and brought with them their rich cultural heritage. In the past, traditional buildings in Portugal were strongly characterized by primitive techniques using existing raw materials in the various regions throughout the territory, such as stone and adobe in the interior areas and the vegetal materials for the milder solutions along the cost. The last emerged by the combination of several factors, such as the unavailability of heavy and durable materials in the local, the need to raise buildings from floodings, the domain of the shipbuilding technology and the seasonal use.
Understanding how the architecture was designed, planned, executed and enjoyed help us to understand its potential in solving the problems associated with the current and future technological, social and economic changes.
Keywords: Construction, flexibility, traditions, sustainability

1. Introduction

Any human activity requires the use of materials and energy to develop. According to the World Watch Institute, the construction of buildings and infrastructure consumes between 45% and 60% of materials extracted from the lithosphere [1]. Through the research of regional technologies, the resources such as manual labour, raw materials, energy and the local economy were enhanced, putting the material culture sustained in the relationship Man-Technique-Object. The traditional architecture is based on the use of local raw material, which facilitated the construction process. This usually happened in a rural context, where the workforce was not specialized. As examples: clay and conglomerates in the cities of Pombal and Santarém and schist and marble in Penafiel (Figure 1). Along the coast, where there was no access to materials for building in stone, wood and natural fibers were chosen as the main product for the traditional constructions.

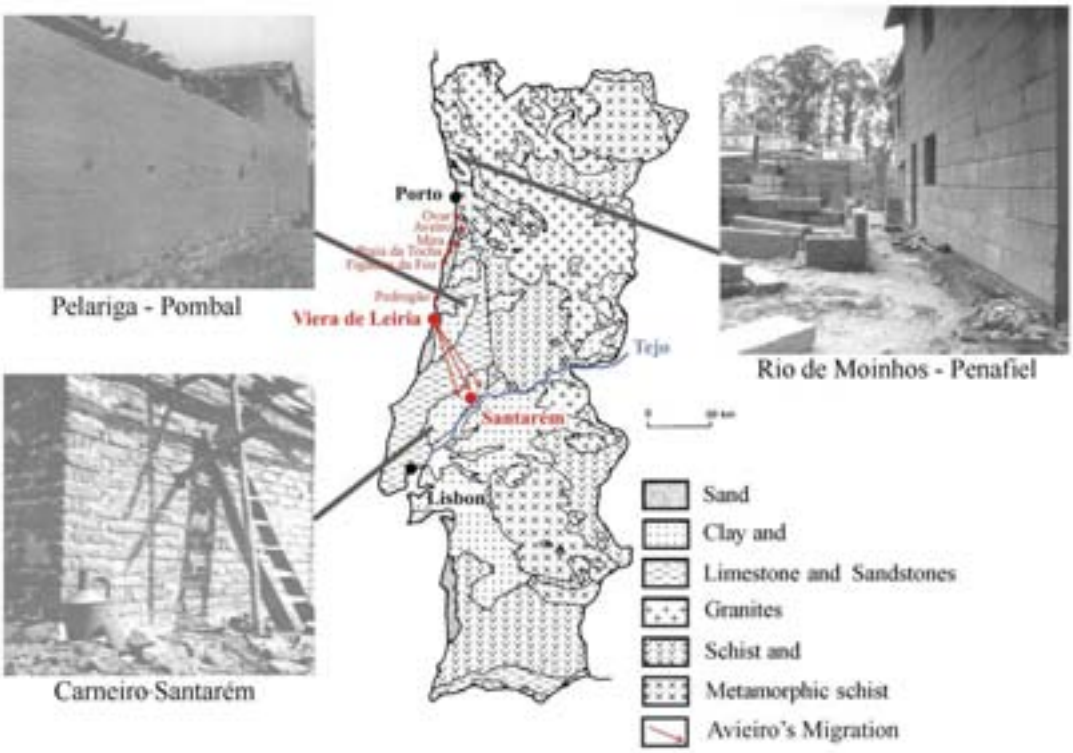

Figure 1. Geological map of Portugal and migration of the "Avieiros" [9].

The migration of fisherman from Vieira de Leiria Beach to the Tejo River occurred mainly in the first half of the twentieth century. Like all the internal migration movements, it was firstly seasonal, leading subsequently to the establishment of populations in various parts of Tejo River basin areas (Figure 1). Many of the migrant fisherman of Vieira de Leiria Beach, which would participate in the seasonal shad fishing, were setting up in various areas of the River margins, were they have built stilt "Palheiros" [2].

2. The houses of Avieiros

The area that represents the more traditional wooden construction, finds its southern limit in clusters of Pedrógão coast and Vieira de Leiria Beach (Figure 1). From those fishery villages in the south of Vouga River, a periodic migratory current was created from the "Caramelos" of Mondego and "Avieiros" of Vieira de Leiria. They were engaged in fishing of shad on the banks of the Tejo River, from Alhambra to Santarém and, in the meantime, they used to dedicate to the rice plantation in Sado River [3] and to the practice of "Xávega" fishing at the sea. This migratory movement was later followed by others from the area of Aveiro (known as "Murtoseiros") and in mid-nineteenth century, from the native of Vieira de Leiria (thereof the reference to "Avieiros") [4].

Figure 2. "Palheiros" in Vieira de Leiria [5]

The houses and the boats had a common link in the wood and its assembly technique. For the "Xávega" fishing , which use to be done at 2 miles from the coast by trawling nets, the Avieiros use to built large and high resistance boats, a characteristic that was also applied in coastal homes. There are, however, important differences between the "Avieira" culture and others that preceded it. Initially, Avieiros, who migrated to the Tejo River, were installed in the boats on Water's-Edge. Later, punctually and to improve living conditions, they began to erect permanent buildings (though of a very precarious and unstable conditions), usually in the distant parts of the river margins, under the periodic flooding of Tejo. Those spaces served both as a storage location of fishing nets and tools, and as a more qualified solution as a shelter for the family, in whole or in part (for example, only children), where a matrix or common core existed,, that related them with the barns and the maritime buildings from the western cost of the Portuguese territory from Gândara (Ílhavo, Ria de Aveiro, Mira Beach, Tocha) to Vieira de Leiria [6]. In many cases, however, the desire of a more secure roof, and protection from the fire, led them to build permanent houses, rising picturesque clusters of stilt dwellings. Sometimes those houses appeared scattered, rough and small, with only one door and only one window that illuminated the interior.

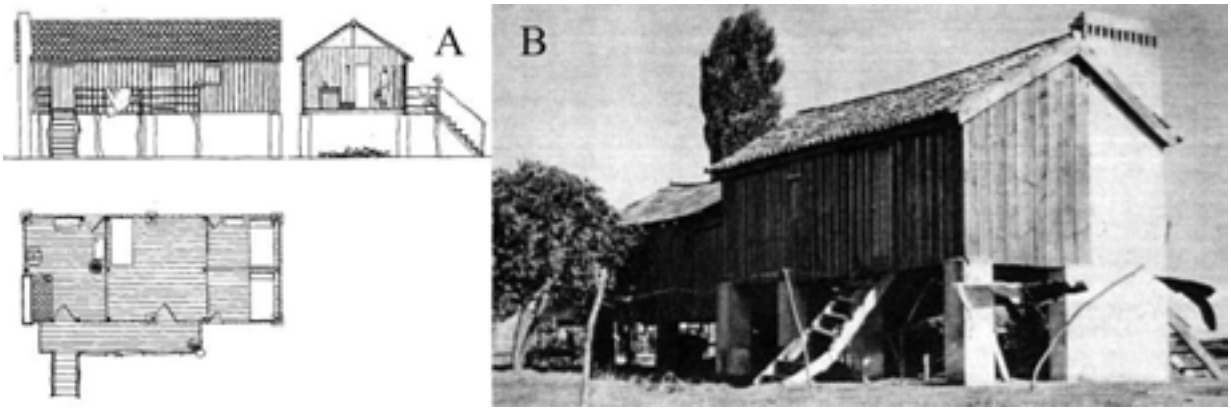

Figure 3. Plan, section, elevation (**A**) and exterior view of an Avieiros house located in the Tejo basin (**B**)

Sometimes the houses were grouped into well-ordered settlement: two rows of houses parallel to the shore, remembering clearly the same stilt system that once seems to have been used in Vieira de Leiria Beach, with the spaced uprights that rose from the floor to the roof, with the ground floor 2m taller and with the plank vertically positioned in as called "*shirt and skirt"* [7]. As demonstrated in the example given in Figure 3A,B, tThe only elements that were not made of wood are the chimney and the pillars, which lift the house from the land, protecting it from humidity and flooding of the Tejo River.

3. Flexibility in the traditional wooden house in the Portuguese coast

The history of flexibility in architecture is dotted, with isolated experiences that weave a direct dialogue with what is the rhetoric of flexibility and that have never succeeded in the complex world of construction. As noted by Alan Colquhoun, *"the literal concept of adaptability has problems when it is translated from the ideal world to the real world"* [8].
In the case of traditional Portuguese architecture, concepts of flexibility and adaptability are very visible and present in the examples made from wood and natural fibres. There is no alternative to wood structural materials that may present a better compromise between the environmental, mechanical and functional performance, so its use has always to be considered, especially in single-family housing or small height buildings. The presence of wood in structural applications of construction in Portugal was common until the late XIXth and early XXth centuries. Appeals to the use of wood started in the first buildings, when the available resources were scarce and continues to be present in vernacular buildings and areas which require asset value for their preservation. Nowadays, the structural use of wood in housing is rare in Portugal.

3.1. Origin and evolution of the Palheiros

The oldest settlement of wooden traditional houses, started in around 1600s, in "Furadouro" which use to serve the fishermen of "Ovar". In this area, the Forestplantation on the dunes, to hold the sands, had then begun. Until the mid-nineteenth century roads were scarce and the roads weconsisted of sand tracks which were often soaked, so transports were expensive and difficult.
In the mid-nineteenth century, the opening of a road to "Furadouro", increased the construction of Palheiros, but already with some developments such as the introduction of two or more floors and replacing the original wooden or thatched roof by tiles [9]. However, the influx of people to this area in the late nineteenth century, as seaside resort of the inhabitants of Aveiro, caused a gradual replacement of the wooden buildings by brick or adobe houses, making the decay of the Palheiros neighborhood. Presently, examples of Palheiros arise mainly in the villages of Mira (Figure 4).

Figure 4. "Palheiro" still existing in the fishing village of Mira

The area of traditional wooden building of the type Palheiros have extended along the coast north of the Douro, from "Caminha" to "Póvoa de Varzim" [10]. Walking along the coast of the north of Portugal, one can still find rare examples of traditional wooden architecture. The first contact that one can still witness is with the fishermen of "Castelo de Neiva", who continue the daily trips to the sea, but abandoned the traditional houses for forty years. In the case of coastal beach Mira, lied, closely to the sea, a cluster of fishermen, set out from the nineteenth century;

firstly temporary ended by settling with the increased exploitation of fisheries. The major originality of this cluster of fishermen-farmers from Mira beach was its wooden architecture, which not being unique of this region deprived of stone and with plenty of pine trees, purchased here its purest expression: the houses reached two and even three-story, had dimensions never found before in other beaches in the country and formed the entirety of the village until 1948 [11].
The Palheiros located in the coast of Mira beach had ingenious constructive solutions, effective and with great flexibility: they were based on stakes so that the sands and the water tides could circulate freely under them; they had a wooden exterior staircase that led to a landing where the door opened (Figure 5A,B). Access to the upper floor could be done via an abrupt and long wooden staircase. As a rule, the boards that formed them were arranged horizontally, overlapping each other to better protect themselves from wind, sand and rain. Initially the chimneys, which formed a ledge in the facade, were also of wood covered with sheet zinc, but the frequent fires caused their extinction and led to replacing them to chimneys made entirely in zinc or cement blocks.

Figure 5. Models exposed at the tourism of Praia de Mira (**A, B**). Mats woven in vegetal material unrolled on the floor at a bedtime (**C**).

The gable roofs were originally in straw, which originated the common designations of the village: the word "Palheiros" had origin in the word "Palha" (Straw). The various building typologies allowed to be adapted over the years and accompanied the growth of families, with a wooden structure to which was easy to add an annex. The houses on stilts had often a warehouse or a barn under the same [12].
The houses of the poorest households had very spartan interiors and in most of the cases, organized into multifunctional spaces between uses of the day and night. As in traditional houses in tropical areas, the beds were made with plant material woven mats, which were rolled out at bedtime and kept the morning (Figure 6C).

4. Wood as a structural material

The advantages in the use of structural wood are huge: its immediate capacity to be put under load, good flexing behaviour, the facility that offers to absorb defects in execution, low self-weight, in addition to the environmental aspect. The embodied energy is very low, besides of being a recyclable and biodegradable material when using local woods and little worked. The structural use of wood has however some disadvantages, such as problems of durability, being inappropriate for tall buildings, presenting some distortion over time, being combustible and with need of periodic maintenance. There are however treatments and even wood products that have mechanical properties and durability much higher than natural wood. (LVL: Laminated Veneer Lumber). Such is the case of PSL (Parallel Strand Licking) and LVL (Laminated Veneer Lumber).
There is no structural materials alternative to wood that may present a better compromise between the environmental performance, mechanical and functional, so its use will always be considered, especially in single-family housing or buildings of small height.

5. Constructive system of traditional solutions

The walls in wooden rulers, resting on a wooden structure, are characteristic of some coastal areas of Portugal, representing an evolution of reed walls. In this building, in some cases the coverage has however continued to be of reed, or, in other cases, evolved for tile. The primitive shacks beach (Figure 6A) and "palheiros" (Figure 6B) more or less evolved, which could reach two or more floors, were always fully of wood, from the foundation piling up to the coverage of planking, straw or reed.

Figure 6. Shacks of Mira Beach (**A**). Yellow Palheiro Esmoriz Beach, Ovar (**B**).

Beginning in the late nineteenth century, the wooden structures gave way to steel structures and of reinforced concrete, although in the case of housing, the wood continued to be the most widely used. Usually the wood structure locates inside of two clenching materials that form the inner and the outer face of the wall, respectively. Currently, the air-box between these two panels is almost always filled with insulation materials, though that in buildings prior to the nineteenth century was often filled with heavy materials such as clay or brick, in mixed systems, such as in the half timbered solution used in the rebuild of Lisbon after the great 1755 earthquake.

6. Conclusion

The important presence of the fishing culture in Portugal should be preserved for its architectural heritage beginning in the culture of fishermen of Tejo from Vieira de Leiria Beach, which represents one of the latest manifestations of stilts occupations still existing in Western Europe. It is worth to mention that, from the northern limit to the last beach of the Algarve, there are still many small traditional villages that are slowly disappearing into the "jungles" of brick and cement that are examples Apúlia, Mira and Tocha Beach.
A habitação tradicional representa uma busca de um espaço que é memória do seu utilizador, um espaço que não se limita a conter elementos de uma vida, mas um espaço que reconhece e permite fixar no presente uma imagem de muitas lembranças do passado. The traditional housing represents a search for a space that is memory of its user, a space that does not merely contain elements of everyday life, but a place that recognizes and allows us to set out in the present an image of many past memories.

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SOFT MOBILITY IN THE CONSOLIDATED CITY[1]

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Abstract

The quality of life in an urban environment is everyday more characterized by factors strongly depending on the mode of urban planning and management of the town, and on the urban and territorial mobility systems. The functional and settlement imbalance makes more critical the impacts of vehicular traffic on the urban environment, therefore the traffic planning necessarily involves a critical reflection on the settlements assets in order to link the needs related to the urban functionality and to the objectives of urban travel system sustainability. In this sense there is even more attention to the so-called issues of mobility management and in particular on the possibility to extend soft modes to the urban mobility, management that is able to change structurally the consolidated urban environment, in particular through encouraging pedestrian and cycling movement (the so-called "soft" mobility) at neighborhood level, historic downtown and, more generally, in the entire urban context, identifying project types aimed at limiting the negative externalities produced by mobility in function of the city urban micro-characters, the localization of functions, the relationship between public and private spaces, the choice of the types of street furniture, etc.;. Based on these considerations, the proposed paper aims to outline the main elements of the method for developing a plan on how to use the urban spaces, designed not only to ensure better co-existence between different activities and different users (motorists - pedestrians), but also to increase the compliance between intended uses and unique characteristics of urban spaces.

Keywords: Consolidated City; Urban mobility, Soft mobility

1. Introduction[2]

The city is a place of exchange and the way of traveling is the fundamental prerogative of life in an urban environment. Ensuring sustainable accessibility and mobility is, more and more, the main objective of the city government actions: mobility and government of urban transformations must be considered as reference points for innovative policies and good practices of development policies of sustainable urban environments in a integrated system.

Some years ago, Kevin Lynch, in a fascinating essay, warned European architects and urban planners on the fact that "*cities are accessible systems that pass through a mosaic of spaces, it is precisely because of urban spaces accessibility that people take the opportunity to implement what they have planned. Only when people feel comfortable in a place so they can act spontaneously, that place can be defined as accessible*".

Thus, the contemporary city, dispersing the places identities and increasing enormously the natural environment and landscape fragmentation, makes "inaccessible" the spaces functional to life and behavior of its inhabitants. The paradox that we face, inside contemporary city, is the fact that the increase of infrastructure and technological networks in urban space, does not improve the accessibility of the city, but does exactly the opposite. From this fact it follows that a city "inaccessible" to citizens, is a non-city, a city of unsustainable development, both from the ecological, socially and culturally points of view.

In literature we unanimously believe on the beginning of effective solutions to the "management" of mobility needs to research the feasibility of initiatives at operational level, in coordination with the specific problems of parking, of suburban-urban areas of trade, of solutions effectiveness, of possible alternatives and interventions and of their funding.

In this sense is always more alive the attention to the so-called issues of mobility management and in particular to the possibility of extend, with interventions that support the use of public transportation, soft modes to urban mobility. Soft tools are generally characterized by a strong relational component both to users, nor the institutional actors involved in different ways, and a high degree of flexibility as well as a greater agility and executive speed derived from the "soft" characteristic of the interventions.

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[1] The Paper is a first search result of the research: "The urban heritage through innovative models of sustainable urban mobility - **CITYMOB**" selected and funded by the Calabria region in the 'sphere of the public notice "for the funding of research projects in the field of sciences human, social and economic "(LR 22 September 1998, No. 10, Art. 37-quarter). Research Manager: **Concetta Fallanca**

[2] Paragraphs 1 and 4 are written by Antonio Taccone. Paragraphs 2 and 3 are written by Giuseppe Critelli.

In this sense in many urban realities the integration between the government of the urban and territorial transformations and the government of mobility with tools defined as "soft" is now recognized as a priority factor in order to mitigate the negative impacts of private transportation on the environment.
Based on these considerations in the proposed paper will be outlined the main elements of the method for developing a plan of use of urban spaces. In particular, high-profile cases will be examined, in the varied and articulated picture of soft interventions, oriented to the development of the bicycles use in urban areas especially activated in European cities in consideration that, in general these regulatory measures of mobility are aimed mobility to discourage car use, with specific car free oriented policies , and to make public transport more efficient.

2. The *"soft mobility"* in the urban issue

The question of urban mobility pervasively affects economic efficiency and quality of life for a large part of the Italian and European populations and for these reasons it is now faced with a large size scale, national and European.
Among the largest strategies to promote sustainable mobility, a significant segment is represented by all those policies aimed to encourage pedestrian and bicycle paths, mode defined as "soft mobility", especially in urban areas, in order to reduce the high environmental costs of motorized transport, modes that are still mostly in charge of the travel demand in urban and suburban.There is no precise definition of "soft mobility", but you can deduct it from some documents of organizations in charge of developing specific policies aimed at sustainable mobility of some European states already forward in the implementation of these policies.
A precise definition is given by the Federal Department of Environment, Transport, Energy and Communications (DETEC) of the Swiss Confederation, which states that the "soft mobility" includes "all forms of movement that do not involve the use of automated machine, but which use only the "human energy" (Human Powered Mobility) "[1], definition adopted also by the Ministry of Transport, Public Works and Land Management in Luxembourg, which, by assigning centrality to pedestrian and bicycle transportation, defines these modes, widely identified as "soft mobility", forms of mobility that involves , therefore, "the exclusive use of the physical capacity of man" [2].
However is possible to define the "soft mobility" as a particular form of sustainable mobility that, while respecting the right of a single individual to move, improves living conditions affecting in particular three aspects: the air and noise pollution, the congestion caused by urban traffic, the need to improve road safety standards. In any case, the "soft mobility" refers to pedestrian movement, bicycle, on roller skates, skateboard, and represent the main form of sustainable mobility for "zero impact" on the environment.
The relevance of "" soft mobility "" modes within the overall transportation system of any city had already been reported, since 1963, in the Buchanan Report [3], but is from the second half of the nineties that has gradually established in Europe the need to impress the sustainability criteria for urban mobility.
In the document signed by European cities to promote a sustainable urban model, the Aalborg Charter (1994), was identified among the key principles to reorient urban development, to encourage sustainable forms of mobility, giving priority to walking, cycling and to public transport giving priority to environmentally friendly ways of transport. In the late nineties and early millennium, there have been numerous European initiatives to stop the spread of cars in favor of a sustainable urban mobility, through co-ordinated actions aimed to innovate the modes and ways of urban transport , the expansion of public transportation, particularly railroads, and the encouragement of walking and cycling [4].
And again, in 2004, at the Fourth European Conference on Sustainable Cities, the Aalborg Commitments were approved that, among the strategic commitments of European local authorities, identified the reduction of need for private motorized transport and promote attractive accessible alternatives by increasing the proportion of journeys made by public transport, walking and cycling. The city today, therefore, as a result of the new concept of sustainable mobility are all engaged in the development and promotion of policies, procedures and interventions geared to increase "soft mobility", both as an alternative to urban traffic as well as opportunities to improve the quality of the urban environment.

3. Processes of urban regeneration / renewal with "*soft*" modification of mobility

The mobility problem and, consequently, the urban redevelopment, have grown to impose combined urban policies series as key issue for the economic revitalization of the city as for environmental protection.
The wave of major urban regeneration projects, which aim to create new districts and urban amenities of high environmental value and appeal, call into question, as result and epiphenomenon, important processes of transformation at economic, social and political level, but above all urban transformations that eliminate the car from the mode of mobility considered.
The spread of urban redevelopment / regeneration acts, with at the center the reorganization of the mobility and large urban projects, has to be placed within the set of new constraints and opportunities where you find the cities with the rise of environmental concerns.

The regeneration of entire urban segments, especially starting from the design / optimization of new systems, focused on "soft mobility", is becoming progressively as experimental field of innovation, transformation of the city and regeneration of marginal urban areas through public actions to increase urban livability that aim to improve the accessibility, the strengthening of central and urban polarity, the redevelopment of public space (open), the use of interstitial spaces, all elements of an experimental field that deeply affects an existing town livable.
Rearranging the downtown for the soft movement, was already one of the cornerstones of the urban vision of Lewis Mumford [5] who use to invite to put the pedestrian as a central element of the transportation system in urban areas, having empirically observed the inefficiency of the vehicle transportation private compared to public and pedestrians transportation. All this could be done only through a rethinking of the overall organization of the city as always recalling Mumford: "... Where urban services are concentrated, people still like to walk (...).
Nothing else could be done to restore life to our faded urban centers , than replenish the pedestrian in boulevards and pleasant places, designed to make the walking attractive. "
This is a step of no small importance if one considers that the soft mobility (pedestrian in this case), while representing a significant overall rate of mobility in urban areas, it has almost never been considered a way to move with autonomous dignity.
The first international important example of "soft mobility" is to be found in Curitiba. Curitiba is to be mentioned for having provided, in 1972, the first pedestrian island in the whole world, built in one weekend to avoid possible protests and neutralize discomfort ..

Figure No - Cicloruta in Bogota

In Bogotá the famous TranMilenio system works for the total efficiency of the "soft mobility" system built on the fringes of the BRT system. As part of the redevelopment projects of public space in the Colombian capital, directly connected to the TransMilenio project, designed to quickly and deeply boost the image of the city and to improve the quality of life for Bogota's citizens , a very important role has played the completion of the cycle network, called Ciclo ruta, the largest in Latin America for which is already planned a further extension. Through the completion of the cycling route network bicycle transportation has grown from 0.5% to 4.4% in ten years. The system is efficient because it has created a private entrance for cyclists in one of the main stops of *TransMilenio*.
The cost of bicycle parking at bus stops is covered by the ticket and is thought to stimulate the use of bicycles as a way to make more people flock to the TransMilenio stops.
Lately, some of the most interesting European realities within the eco-friendly planning, have increasingly proposed urban renewal strategies related to sustainable mobility policies focused on "soft mobility" in particular to bike transportation.
This happened particularly in countries like the Netherlands, Denmark and Germany, where bike has taken an important role in urban mobility. In particular in the Netherlands the rate of bike's use, as the average, reaches 26% of the share of total transportation, with some cities that reach peaks of 40%. In Denmark the value is quite high, with an average of almost 20% of movements that occur in the total number of bicycle trips, and an average value of the urban uniform across all cities in Denmark. Often in these cities the incentive to use the bike has been accompanied by policies of urban regeneration very incisive, over the years become real role models.
The first additions in this sense has been the experience of urban regeneration in the Netherlands in 70's, linked to the establishment of woonerven-recent "area 30" – nowadays used in many European cities.
In addition, the declinations of the experience of New Urbanism, have produced strategies that aim at the research of compact settlements based on public transport, characterized by high quality and functional mix of public space where, at its center, there is the pedestrian.
These trials have resulted in some Dutch cities to design entire neighborhoods completely "car free", as in the case of the town of Amsterdam. Transport policy in this city is the main objective of improving accessibility and quality

of life through the implementation of the Plan of mobility and transport (Amsterdam se en Verkeers Vervoerplan), which gives to the bike a central role by integrating the policies for cycling with environmental, transport and urban planning in general. The plan includes measures to promote modal shift car-bike (park and bike), the expansion of the Main Bicycle Network, the construction of a second Core Bicycle Network (equipped with fast lanes for average length journeys), the creation of cycle tracks with recreational purposes inside and outside the city, the introduction of automated warehouses for parking in the central mechanisms to prevent theft, increased road safety, the spread of the bicycle among ethnic minorities and a wide information campaign the benefits and possibilities of cycling [6].
In the mid 90's Amsterdam decided to upgrade, for residential purpose, an area that housed the municipal company for water management, the GWL terrein, an high density area with six hundred a accommodation for six acres. The choice was to create a neighborhood with no parking for cars with only a few areas outside for such use (allocated through a lottery among the people), to focus on an excellent public transportation with several stops located outside the area and numerous pedestrian and bicycle tracks to reach the buildings system located in the complex. GWL terrein thus combines a series of environmental and social sustainability features.

Figure No - Bike and walking paths in the district GWL terrein in Amsterdam

In the same year, interventions on the existing city show the relationships that exist between mobility and urban regeneration, particularly in relation to the upgrading of historic roads and areas , stating in particular the techniques of "traffic calming" [7] as happened in Copenhagen. The bicycle is an important element in the identity of the Danish capital, as evidenced by the continued investment in bike paths, parking lots, lanes, safety measures, information campaigns.
An interesting experience of integrated urban planning is the Metropolzonen, an urban development project which focused on areas of so-called "transit" and non-residential and thus characterized by a low level of quality of life in terms of services and accessibility .
Even the great urban developments have to maximize mobility in soft terms: public transport and bicycles: these will build the foundations of the mobility of Nordhavnen (and which already is based in large part the Danish transport system). The district will in fact be interconnected by a branched tube and cycle paths between station and the station.
It will have to be easier to walk, use the bike or the metro, than driving a car. For this reason the area is configured based on the "five-minute-city" principle, which is characterized by very short trips from home and work towards public transport, cycle paths, green areas, shops and services. There is a suspended metropolitan line that will connect Nordhavnen suspended with the rest of the city in 10 minutes, and that also functions as the cover of a super-cycle path, protected and without obstacles.
But the integrated transport (public transport + "soft mobility systems ") more widespread in Europe however is situated in Vienna,: there are 120 lines in Vienna - including buses, trams and metro - that form a network of public transportation of almost 1000 km, with almost 4,500 stops, but above all, there is no point that is more than 15 minutes walk away from a bus stop, tram or metro 1000 km of cycle paths and passes, doubling over 15 years ago, with in particular a beautiful bike path that runs through the Ring

4. Conclusions

It is clear from what reported in this paper that the promotion of soft mobility in urban areas requires not only the recognition of the soft transportation as a way of priority transportation in the city, but above all the rethinking and reorganization of urban places that, in the historic town as well as in peripheral areas, in the old as well as in new urban plants, are intended for solely or principally use with pedestrian and cycle paths with links between the various ways of transportation, notably by implementing, as evidenced by the examples given in the previous discussion, a close relationship between public transport and the mode of "soft mobility". In the discussion were presented and provided examples of urban redevelopment / regeneration projects well executed, it must be said that, to date, many interventions aimed at "soft mobility" have given mixed results, according to the different starting

conditions. In many cases their implementation was not able to be the starting point of a process of real incentive shift "soft" in the urban context, or even use the spaces for "soft" were often object of low-responding practices compared to the initial intentions.
The potential growth space for the slow mobility is, therefore, very clear, obviously at the condition that appropriate level of context will ensure personal safety and avoid injury, the low threshold of pollution pathways and possibly the pleasantness of the environment which we move.
Further on this research will seek to deepen in particular the possibility of replicating these best practices in different situations and, in many ways, more complex, like the southern Italian reality, the reality in which the different urban structure, more compact in the established reality of examples, creates more difficulties in accessing downtowns, always considered the magnetic attractor of human activities in these cities, with applications of "soft mobility".

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I – SMC INTERNATIONAL CONFERENCE
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NAPLES FEBRUARY THE 12TH-13TH-14TH 2012

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MEDITERANEAN VISION FOR CONTINENTAL URBAN SPACE

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Abstract

Think of a Mediterranean urban space. It might be in Spain, in Italy, in Southern France or in Greece. It might be a square, a plaza, or even an urban axis linking alveoli of different functionalities. But no matter the setting, no matter the typology and historical evolution, several essential, common qualities spring to mind, and upon closer inspection, they form a very solid basis for sustainable urban design even nowadays.

Firstly, their location within the city – usually, either within or connected with the very centre, or forming urban poles of varying importance – and the way they make use of cardinal point orientation gives them a head-start, when it comes to lighting and ventilation control: these spaces are well light throughout the day (even exploiting natural lighting to accentuate the facades of important buildings adjacent to the square), cooled by the breeze but protected from strong winds. Secondly, the organisation of urban space: it is clearly delimited by buildings, or opening on one side towards the sea, but not rigorously controlled enough to impede the vibrant expression of local specificity. The use of urban elements varies greatly depending on the particularities and tradition of the urban culture the city belongs to, and on its historical evolution, but they are all geared towards the enhancing public space; now, coupled with ecological principles, locally sourced materials and the emergence of cutting edge durable technologies, they can be used to enhance overall sustainability within the city. Lastly, but of no lesser importance, comes their role as social and cultural catalyst. Mediterranean urban spaces are lively, animated throughout the day, and serve not only as a background for the hustle and bustle of city life, but reinforce cohesion within the community.

The object of our study is to pinpoint these qualities, analyse them in the context of current, sustainable urban design, and see how they might be applied, in context-specific ways and incorporating new urban planning approaches, to continental city settings – for example, urban spaces in Romanian cities.

Keywords: spatial configuration, urban elements, orientation, material.

1. Introduction

A brief overview of the body of knowledge concerning European public space will first highlight the tendency of the "public space" construct to manifest concretely in certain spatial configurations. These spatial configurations – evolved to accommodate work and commercial trade related activities as well as spiritual practices – were largely dependent not only on geographic and climate conditions but also on the regional, national (and often international) importance and role of the city. Throughout Europe, the built environment, tailored specifically to suit the needs of social interaction in public space, presents the following characteristics:

- in Northern European countries (especially those of the Scandinavian Peninsula), the climates are harsh; collective life, generated by large groups of urban dwellers, is quite intense and its choice space of public manifestation is enclosed; contemporary instances of public space span the range between interconnected buildings with various destinations (sparing people lengthy walks through rough weather) to residential buildings with communal facilities also geared towards social interaction; multi-use entertainment and leisure activities for the whole community are also frequent.

- Central and Western Europe are characterized by constant evolution divided into historical cycles. Abundance in natural resources has contributed to the development of a well-rounded economy balancing agriculture, manual production of goods, and, since the 18th century, manufacturing and industry. These conditions were conducive to the development of commercial exchanges, which in turn triggered intensified social relations on the public space level. Thus appeared marketplaces, squares placed at the heart of the city and hemmed by shops, inns, etc. Currently, most public spaces within these cities evolve based on their historical setup. However, modern necessities, such as the separation of pedestrian and automotive traffic or of quiet areas from highly noise-polluted ones, have moulded public spaces into new forms. In present times, the quest for new urban shapes apt to satisfy an increasing variety of uses, interests and ever growing cultural demands (multi-use buildings) has to take into account the lack of free terrain within city limits.

- Mediterranean European countries, with their deliberately unhurried urban evolution, are inhabited by people forming extremely close-knit communities whose collective lives are preponderantly spent outside; naturally, the type of public space created to support social interaction is openly connected with the natural elements (but also the urban fabric) and enhancing civic and communal spirit: the agora of ancient Greece and all squares deriving from it, the forum of republican Rome, the streets designed for leisure activities (corso in Italy, ramblas in Spain, boulevards in France, and, though not part of the Mediterranean area *per se*, Romanian boulevards, combining leisure, commerce and promenade). **[1]**

In our quest to illustrate the proposed Mediterranean vision for urban spaces applied to Romanian cities, we have devised a comparative study between the city of Zaragoza (belonging to peninsular Spain) and the city of Bucharest (continental city and capital of Romania). The reason of this selection is threefold: firstly, we sought to contribute an interesting perspective on the importance of Mediterranean public space as model for urban configurations on the outskirts of its geographical area; secondly, the brevity of the paper and the wide variety of Mediterranean public spaces in both location and structure lead us to focus on one specific typology; thirdly, we aimed for a correspondence not only between public places, but also between cities – barring a difference of size/population, Bucharest and Zaragoza are uncannily similar in structure and patterns of urban fabric evolution.

This paper seeks to pinpoint a few basic principles of improving public life and, implicitly, public space in Bucharest by analyzing one of the most important axes of downtown Bucharest – Magheru boulevard, representative of an urban space whose maximum potential remains to be fully reached, and whose initial setup has suffered various modifications throughout the XXth century, not all of them propitious to social interaction and pedestrian space. We also mean to show that a "sustainable urban space" can be created with a minimum of effort through well-though-out reconfiguration and careful selection of equipments and facilities. Another point of interest is discovering ways in which an urban space can be configured and equipped in order to foster community-wide collective interactions and boost cultural life.

2. Location.

The city of Bucharest is located in the South-East of Romania; its geographical location is the Plain of Vlasia, a subdivision of the Romanian Plain. Likewise, the city of Zaragoza is also situated in a valley / plain. Both cities have the advantage of a natural element running through their very centres: the rivers Dambovita through Bucharest and Ebro through Zaragoza.

The capital city of Romania, Bucharest is the major commercial and industrial centre of the country, having a population estimated around 1.940.000 as of January 2009 – 6th most populated city in the European Union. Studies predict an increase of population density over the next five years, phenomenon which could push the number of inhabitants way past the 4 million mark. Zaragoza, capital of an autonomous community, has a population estimated at about 1.000.000 for a smaller surface area than Bucharest's. However, taking into account the general relation between population density, surface area and the type of collective life specific to both cities, we find more similarities than disparities, so a difference in size does not alter the premise of our study.

Further correspondence can be found upon examination of the two cities' relationship with water and the continental-mediterranean climate. Bucharest is 200 km away from the Black Sea, while Zaragoza is separated from the Mediterranean Sea by 170km of land. Therefore, the climates characteristic of the two regions where the cities are located are quite the same save for the pluviometric regime: Bucharest sees significantly more precipitations than Zaragoza.

Bucharest's plan reveals its medieval origins and structure, especially evident in the street grid: irregular of shape and organically developed over time, it meanders through low-density, small scale urban tissue. Within this urban fabric, the population's preferred meeting places were the public squares situated along the city's major streets and "maidanele", less developed spaces serving smaller communities; both these typologies accommodated various fairs, spontaneous or organized weekly. Despite the gradual densification and increase in height and scale triggered in the XIXth century, remnants of these areas are still perceptible in today's urban framework – for instance, the medieval tissue of the old city centre or Unirii Square and its market halls, placed in the very heart of the city near the Dambovita river. Bucharest is roughly divided into quarters by two axes intersecting in the aforementioned historical centre: East-West and North-South, the latter (Magheru and Bratianu boulevards) being the Romanian half of our typology study.[2]

Zaragoza bears the hallmarks of Roman urban planning: the street grid is much more precise, regular and geometrically developed according to strict rules; the old city centre, however, is in the same type of relationship with the river Ebro as Bucharest's is with the river Dambovita. Moreover, both cities sport an axis running through the old town nucleus in the direction of the river: in Zaragoza, it is the Paseo de la Independencia, which evenly matches its Romanian counterpart.

These axes connect urban poles of great importance as well as automobiles, and are intensely trafficked by automobiles and pedestrians – to which they offer major advantages and attractions. In Bucharest, the boulevard Magheru links Romana Square with Universitatii Square, connected in turn by the Ion. C. Bratianu boulevard with Unirii square on the banks of the Dambovita. Zaragoza's Paseo de la Independecia runs from Plaza de Aragon to Plaza de Espania and finally reaches (via a smaller street traversing the old city) Plaza del Pilar, a square facing the river Ebro on its South-West side.

The orientation and placement of buildings along these routes brings into discussion a few major points of interest, as perceived on a pedestrian level: for Magheru and Bratianu boulevards, the predominantly N-S orientation

determines poor lighting and exposure to the sun, resulting in the alternation of excessive shade or excessive sunlight, and thermal discomfort is high no matter the hour or season. The parallel disposition of buildings creates a corridor effect, and the long lines of shadowed façades contrasting with brightly illuminated façades do little justice to the valuable architectural objects placed along the boulevard. This also means that pedestrians will flock to one side or other of the street in order to seek minimal refuge and offset the effects of thermal discomfort.

Conversely, the NE-SW orientation of Paseo de la Independencia is one of its strongest advantages, ensuring an environment correctly and pleasantly lit throughout the day. Sunlight and shade succeed each other in intricate play over the façades of the buildings hemming this boulevard – a great, natural aesthetic effect complimenting their architectural qualities.

At the same time, orientation determines the way a certain built space is ventilated: Magheru boulevard, with its N-S course, makes for the "perfect" wind corridor – hot and highly polluted in summer and bitterly cold and biting in winter. As previously mentioned, there is little to no refuge: the whole axis boasts a single portico and too few planted alveoli. Paseo de la Independencia is far more sheltered, and its correct orientation, disposition of buildings and the open spaces of intersecting streets ensure a breeze effect is formed along the boulevard; these intersections manage not only to control wind speed, but also offer pedestrians "pockets" of tranquil urban space with broader sidewalks, often generously planted.

3. Spatial structure

Within their respective cities, the areas this study focuses on are major axes situated inside the first ring designed for automobile traffic; they run through the old city centres, and open up onto a river – a natural element of immense value in urban design. Structurally, both routes are linear segments connected via public squares (at the intersection with other major boulevards) and both present systems of small-scale urban alveoli, although still in incipient form along Magheru and Bratianu boulevards. Romana Square and Universitatii Square are positioned at the ends of Magheru; similarly Plaza Aragon and Plaza de Espana mark the Paseo de la Independencia, while Unirii Square roughly corresponds to Plaza del Pilar, both near the water.

Functionally speaking, Magheru boulevard receives a lot of pedestrian traffic because of the facilities it offers: besides commercial services, Romana Square and Universitatii Square are important educational poles within the city, housing nationally and internationally renowned Universities (University of Economic Studies, University of Architecture, etc.). The financial sector is well represented along Magheru through bank offices, while the various hotels transform this prestigious area into a tourist hotspot. Of still greater interest, Universitate Square is an intensely cultural place also known as "0 km", the point of origin – origin of the 1989 Revolution, and, with its National Theatre, Universities, and libraries, of the rebirth of modern Romanian culture.

In a nutshell, the only thing missing from what Magheru and Bratianu boulevards offer pedestrians is a more varied gamut of leisure activities: during the weekends, these public spaces are almost deserted and serve only as rendezvous points, but not as places where one actually spends time. The rush hour of pedestrian traffic coincides with the working hours of the shops and facilities. In the evening, the old city centre monopolizes the attention of public space users – and this should be good news for the Bratianu segment of the axis; sadly, it is used only to reach the old town and then promptly deserted – which shows how disconnected it is from the traditional urban fabric.

For Paseo de la Independecia, Plaza de Aragon is the educational and commercial hotspot, a trend carried through to the Plaza de Espana via a plethora of leisure, entertainment and commercial facilities interspersed with alveoli of various configurations. Like the Plazas themselves, these spaces vary greatly in detail, materials, vegetation, pavement, equipment and decorations, but their common denominator is the exquisite care with which they are planned, detailed and executed. Plaza de Espana enriches the cultural landscape of the area with its Principal Theatre – thus furthering the analogy with Universitatii Square (National Theatre). Finally, the last segment of the compared axes stretches from these Squares all the way to the water (Calle de Alfonso I, I. C. Bratianu boulevard), offering a connection with the historic city centres.

The Paseo's has been designed as a mainly pedestrian area cum carriageway; the sidewalks are generous, feature extensive vegetation areas and open onto numerous porticos serving as mediating access spaces to all the commercial and leisure facilities. The boulevard's transverse profile is quite wide and in balanced proportion to the height of the adjacent buildings, all subscribed to the same height limitations needed to protect the architectural integrity of the ensemble and its monuments.

Quite the opposite, Magheru and Bratianu reveal spaces and squares perceived more as redundant spaces, left-over from grand-scale urban reconfigurations. The attention give to pedestrian needs has dwindled to nothing since the interbellum years. Today, a boulevard is the exclusive domain of cars and every bit of public space is colonized by parking to the detriment of green spaces.

There is no preoccupation for sheltering areas such as porticos, although they seem to be in high demand, if we take into account the popularity of the "Columns" portico in Romana Square. and even when they exist, their

deplorable state of neglect rather spoils the experience. The transverse profile of Magheru boulevard is similar to a narrow corridor, marked by high buildings with fully enclosed first levels.

In Zaragoza urban spaces, urban equipment and furniture are used to great effect, and the sidewalk becomes an ideal space for refining small-scale urban arrangements which combine fixtures, sculptures, vegetation and locally sourced materials etc. Eco-principles have taken little hold in Bucharest's urban mentality; there is practically no direct preoccupation as to the source of paving materials, the re-use of construction materials still in good shape or bettering urban space through vegetation. For the time being, the car is omnipresent and the pedestrian has to deal with what little space is left over after high-speed streets and sufficient parking take the lion's share.

Magheru and Bratianu boulevards belong to historical area protection zones, and still comprise fragments of the urban tissue resulted from the succession of various stages of intervention on the street grid (either spontaneous or the result of urban projects and reglementations). Their advantages are manifold, and include the presence of sufficiently coherent and lengthy segments imprinted with architectural information from all periods, thus presenting lively images of the architecture and lifestyles of said periods. This also makes them quite easy to divide into pedestrian routes marked by architectural points of interest and high quality urban spaces. Sadly, all this potential remains dormant, and the small initiatives of treating planted alveoli as recreational spaces along this axis is very rare.

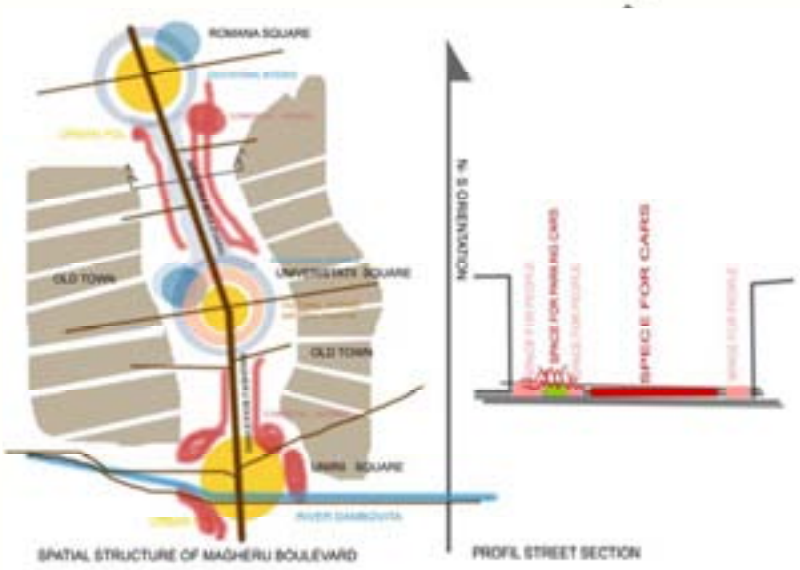

Figure 1. Magheru Boulevard – Bucharest – Romania

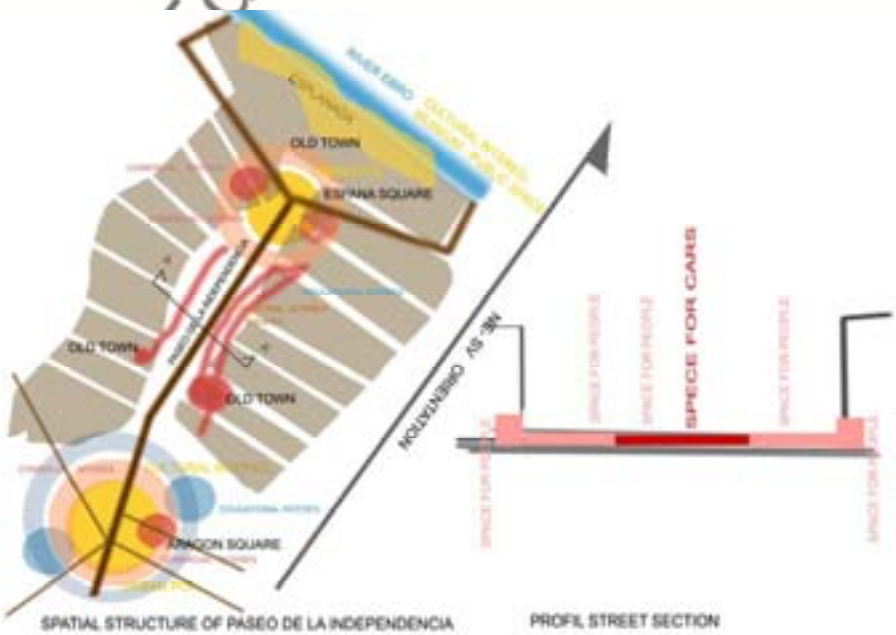

Figure 2. Paseo de la Independencia – Zaragoza – Spain

4. Socio-cultural role

From a social point of view, it is obvious that, in Zaragoza, public space is conceived with the human body as a frame of reference and the rhythm of footsteps as unit of measure. During the space design process, the relationship between man and place, materials, immediate vicinity and, last but not least, the street, is a major factor. Special attention is paid to the rapport between the carriageway and the sidewalk, making sure that most of the spaces (in quantity and quality) are assigned to pedestrian use. In this case, social space is also a space of representation and festivity – the Zaragoza carnival takes place in Plaza del Pilar which morphs into a great stage, animated by cultural and popular activities drawing people in.

Public space is therefore modelled after and for the life of the community, a principle also determining the shaping of architectural and urban space. Spain's example brings forth several ways of fashioning a public space of significant positive influence on the whole city (motor for development, change and innovation) and of great value to its inhabitants, by diversifying their built environment with pedestrian promenades and points of interest, such as the banks of the river Ebro – worthy of mention for their use of a natural element as a scenic support for socio-cultural facilities and activities.

This preoccupation with public space refining down to the minutest detail is also present along the Paseo de la Independencia: the pavement takes on different shapes, textures and patterns, and the two sidewalks are often connected by crossings and subterranean passages. In order to best organize or modify urban space, given its recognized impact on the socio-cultural life of Zaragoza, architecture competitions are often organized, and they all strive to apply this basic, yet difficult concept – ensuring high quality in design, execution and ultimately, public space performance.

Bucharest urban planning and architecture deal in abstract thinking. The life of the community unfolds secretly, in hiding and with the utmost discretion. The three squares – Romana, Universitatii and Unirii – along with the boulevards connecting them, are for the better part of the day deserted and drowned in the highly aggravating noise of automotive traffic.

5. Conclusions

The configuration of public space can determine and influence community life in accordance with its structure and the facilities it offers to intended users.

Where Bucharest is concerned, great strides need to be taken in integrating the Dambovita river into the urban fabric, and transforming it into an element of connection, not of separation – to this end, its banks should be reserved for more extensive, planted pedestrian promenades featuring leisure and entertainment facilities; an increase in the number of light-weight pedestrian bridges will prove beneficial.

Along Magheru and Bratianu boulevards, closer attention should be paid to interstitial areas – alveoli meant for relaxation and reprieve from the hectic flux of traffic. The 2,4km of monotonous, linear sidewalk should be segmented by many such sheltered areas where people can gather, interact and relax. The axis might also benefit from the introduction of the "stone room" concept, great urban chambers serving as city-wide hubs of social and cultural interaction: meetings, relaxation, animated activities of all kinds; naturally, adequate placement of cleverly-designed urban equipment and the increase of planted areas are crucial.

A successful urban place is also the scene of public initiative and creative partnerships – the public and private sectors should be able to collaborate for devising and organizing a wide variety of cultural events – festivals, exhibitions, street-art, performances, fairs, etc. – which should pepper the length of the boulevard.

At night, a new route could appear, punctuated by the lights and bright signs of the restaurants and cafés, and traffic could be restricted on a few segments in order to better support the alternative route scenario, and give pedestrians the chance to explore new perspectives.

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CULTURAL SUSTAINABILITY AND URBAN QUALITY

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Abstract

Cultural heritage, in all his aspects, is considered a particular productive ambit and at the same time it is a capital to preserve for its vocation to represent the values and traditions regarding a specific territory and its inhabitants. For this reason speaking about *cultural sustainability* means have to do with different problems; on the one hand the importance of sustainability related to the necessity of increasing in value the heritage and understood as attempt to make productive cultural goods, on the other hand the problem of safeguard and conservation of some goods (in the specific case the valuable historical cities) that, because of their identitary particular value, exercise a strong attraction catalyzing a substantial demand of fruition.
They represent, in the mediterranean urban survey, a particular resource, where differently from other regions that boast of other peculiarities (good urban organization and related organizing/administrative and functional benefits), this resource, (valuable historical cities) it isn't repeatable. Practice and theory, as years go on, have taught that both monuments and quarters, ancient cities and minor historical evidences, do not destroy themselves. These urban parts, nevertheless, cannot be considered special and independent ambits but they have to be part of the largest urban environment; they are under the quality of their context.
This is the main point of this consideration, that is the awareness that a *sustainable conservation* of these resources gives new values of use from and in coherence with the independent values from the use, in a way that the whole value is the highest possible, with the aim of building a more complete urban quality.

Key words: Identity, Heritage, Transformations

1. Introduction

The material and immaterials manifestations that substantiate what we define cultural heritage, are considered an extraordinary productive resource, but they represent at the same time a capital to preserve because they express the values and traditions of a definite territory and its inhabitants. It (the heritage), for this reason, holds a particular importance not only from its economic side, but also for the increase of relevance of problems concerning the qualitative point of individual and collective life to obtain in the ambits where its concentration is relevant, as for example the urban historical contexts of raised renard. Specifically, therefore, the heritage, object of this thinking is the settlement historical heritage, that, in the mediterranean context, represents a particular resource and, differently from other regions, that boast of other peculiarities (good urban organization and related organizing/administrative and functional benefits), this resource (valuable historical cities) is not repeatable.
Practice and theory, as years go on, have taught that both monuments and quarters, ancient cities and minor historical evidences, don't destroy themselves. These urban parts, nevertheless, cannot be considered special and independent ambits but they have to be part of the largest urban environment; they are under the quality of their urban context of reference, the city in its whole. *The ancient space translatability – this intuition and, at one time, this rediscovery, revolutionary on the plane of planning quality – brings with itself, nevertheless, some heavy questions that, not only they are not solved, but they seem grow while the actual recovery experiences continue. They can be summarized in the problem of space's offer interpretation and evaluation. It seems to me that the question can be explained with these simple steps: the ancient citty let itself to be used again, both totally – the fact that historical centre has often kept, just, its centrality compared with the whole contemporary city is the most clear evidence – and in its different components; this means that that space - big or little it is – knows how to offer to a different use, changeable in the time: in this sense, the ancient space has a strenght and an extraordinary resistance. But, at the same time, this own availability to transformation can represent an intrinsic weakness, a disarmed condition: because the action of use again can, as for saying, take advantage of this liberal offer and resolve, for example, in a deforming and destroying violence..* (Cusmano, 2002).[1] (Cusmano, 2002). Punctual and rigorous observations of possible risks that transformation processes, seen as events able to cause benefits to all the cities inhabitants, hide without distinction. In fact, besides a removal of the less well-to-do classes, it is possible to see a loss of places authenticity, a change of nature of them. The central areas of the city, the valuable one, transform themselves from a living place to a consumer place in which the predominant sense is the tourist one, accentuating depopulation processes, since the urban market demands are, indeed, inconsistent with those one of who lives there permanently.

[1] Cusmano M.G., *Oggi parliamo di città. Spazio e dimensioni del progetto urbanistico*, FrancoAngeli, Milano, 2002

2. Towards a sustainable conservation

The historical/cultural resources, that is the whole cultural heritage, represent the genetic settled heritage in the course of the centuries with whom past generations comunicate to the presento ne and to the future ones. Urban heritage, real resource, for the historical city is characterized by high intrinsic values, tied to the places, societies and inhabitants identities, it is sediment of of values which contribute to education, life and environment quality, producing positive effects in the transformation process.

About the whole settlement organism we define urban heritage the parts of it we consider valuable are those ones that suffer major changes in the spatial and social reshaping; physical complexity, identitary and social characters, cultural and patrimonial richness characterizing these places, cause remarkable problematic nature to which it ha sto be added that dynamism recorded in these parts of cities in the last decades. *We have saved buildings, but we have submerged them with a motor traffic that compromises even the aesthetical aspect and that is ruinous for the ancient fabrics. Once time the historical centres fabric was organized in functions: dwelling and close commerce, assistance to elderly people and children education, the craftsman of service and more popular goods production. Allowing that historical centre – place of maximum immovable value – filled itself with offices and emptied dwellings, we have corrupted it in a irreparable way, setting at zero the articulated urban complex system function. In this way the city centre is filled in the day and is empty in the night, except for the few areas voted to entertainment, that however disturbs the little resident people. From the historical centre have been disappeared first necessity shops, which were arranged along the ways and were useful to the upper levels tenants-, actually replaced by "shop windows", advertising tools of the multinational companies, whose economy isn't due to the local quarter market but to the worldwide one.*[2] (Campos Venuti, 2010). A real description of the structural, physical and social aspects that nowadays can be identified in the changes occurred in many cities and valuable urban ambits.

Relation between *urbs* and *civitas* in such ambits represents the identity itself with a well deined role in the whole urban organism evolution, the balance disintegration and/or the breaking of such a relation produces not only a physical and progressive decay of the urban heritage object of this reflection, but also an extended emptying and functional change of nature and, for this reason, in view, of sense and values, running the risk of weaking in a structural manner, the city stratified balances with effect of long term and difficult solution.

In a famous similitude, between the human mind and Rome, Sigmund Freud asserts that it exists an analogy between the psychical memory conservation, that one about mind and that city physical with a substantial difference between the two ones: forgetting doesn't means to forever destroy the mnemonics trace and furthermore the man can remember simultaneously facts referred to different times of its mental history, while, on the contrary this isn't possible in the city, because the same space cannot be filled in two different ways at the same time[3]. In other words places memory is delated or reviewed to make live them again. It's what we define *sustainable conservation* of these resources, that assignes new use value from and coherently with values independent from use, so that the aggregate value is the highest, in order to build a new and more completed urban quality. Nevertheless, deleting or reviewing doesn't mean identity loss and places changes of nature and making artificial but it means give again to the places new functions and adeguate activities related to the dynamism of contemporary life.

The term sustainability is often connected to the economic growing problems united by the environment preservation in order to not compromise it in a not reversible way, similarly cultural resources yet, cultural heritage, even if represent a source for territorial development tank to the possible indirect benefits, have to be protected for their transmitting values and traditions.

Single and univocal definition of *cultural sustainability* does not exist, but its importance is connected, on the one hand to goods and services valorisation, understood as an attempt to make them productive, to encourage consumption and to favour spread of heritage knowledge. Otherwise, sustainability is also linked to the safeguard and conservation of urban heritage in these contexts, particularly of those goods that represent a strong appeal, on which there is an enormous consumer demand.

Talking about cultural sustainability means dealing with different subjects:

- importance related to the need of heritage valorisation, understood as attempt to make productive the cultural-urban resources (economic value);
- the problem related to safeguard and conservation of some goods (in the specific case the valuable historical cities) that, for their particular identitary value, have a strong appeal catalysing a substantial demand of fruition/use (use value and correlated activities).

The quick changes of these contexts represent an important challenge, because their management, the imbalance of their progress and the urban historical fabric conservation lead to an economic stasis or to a loss of cultural heritage values and at the same time to a loss of identity. For this reason a sustainable cultural process could be that one of favouring a right balance between built cultural heritage conservation and contexts social-economic development in order to strengthen their appeal and competitiveness. Searching for historical city quality, therefore, means to

[2] Oliva F. (a cura di), *Giuseppe Campos Venuti, Città senza cultura. Intervista sull'urbanistica,* ed. Laterza, Roma-Bari. 2010

[3] Longobardi G., *Pompei sostenibile,* L'Erma di Bretschneider, Roma, 2002

recognize the building and architectural heritage overall value that gives shape a function to the urban spaces and represents the most important cultural landscape significance.

3. Development models and sustainable strategies for valuable historical cities

Urban historical landscape acquires its universal and extraordinary meaning from a gradual evolution, as planned territorial development in a defined period of time through urbanization process supplements environmental and topographical conditions and expresses social-cultural and economic values referred to the society. This recall from Memorandum of Vienna text (2005) about: *Worldwide Heritage and Contemporary Architecture-Urban Historical Management* marks again how these particular urban contexts cannot be simply considered as an important monuments ensemble, but they have to be considered, rather, as a living organism, a vital space for its inhabitants.
Their representativeness, identity and memory through an innovative valorization, but coherent and sustainable within the safeguard targets, ensures the collective memory and places sense continuity, introducing with contemporary use functions a *sustainable development model*, that conjugates common heritage integration with innovation need and whole territory competitiveness.
Nevertheless, quick changes conditions of modern age (as for example rapid growth of economic competition together with development pressure, climatic and demographic changes, etc.) represent a great challenge for many urban historical areas management that cannot be more managed by traditional policies mono sectorial. The lack of multilevel exchanges with management autorities and the lack of urban sustainable integrated that relate cultural heritage conservation with social-economic historical urban landscape development, could lead to the appearance of urban not competitive with a low appeal value areas for inhabitants and visitors.
Substantially the result should be the urban environment regeneration, through the integration of cultural and natural heritage with sustainable urban development policies, aimed to preserve and increase the value of natural and cultural resources and to develop, simultaneously, the appeal, the social cohesion and economic activity.
The fundamental principles of interventions on historical urban environments, as regeneration, favouring the access, improving life quality, that are imposing in the last times with the aim of increasing the quality of contexts and life inhabitants and users, the tourists. Indeed, little and big urban valuable centres are joined by the search of best ways to attract and welcome new tourists, which have less and less the looking of avid and improvised tourists and assume more and more the sembiance of respectful visitors of places culture and soul.
New manners of valorization develop in both large and little sized valuable historical cities, together with new intervention logics more strictly connected to experience factor, to management solutions sustainability and local communities participation. Sustainable and compatible, even if abused and trite terms, characterize a sensibility to the environment – cultural and physical – of cities and invite to create the conditions for favouring creativity and innovation. In other words it is possible to verify a new attention towards forms of *soft requalification* through which it is possible to reposition in the ambit of worldwide territorial competitive system.
Sustainable valorization strategies in these ambits have to be understood as, therefore, not as simple safeguard and conservation of goods and resources, but as an action founded on a more general economic revitalization process, in which the resources increase of value and their organization in system, favouring accessibility and right to use standards, can represent the keystone to generate new appeal and, for this reason, social-economic reintroduction.
Urban fabrics, regarded as living organisms in their continuous contaminations, have in the relation between ancient and new, a comparison that offers different possibilities and discussions. Historical city, both at a level of macro scale (historical centre and urban fabric) and at the level of micro scale (the handmade in its process of conservation and re-function) is called to modify its structure and configuration, in a closed relation between history and technology. Through valorization processes that are not only an actions ensemble finalized to increase economic value of areas and immovable properties, but they pursue wide objectives of social, economic, cultural requalification and revitalization of the urban context to which they are referred. It is useful to increase the value not only of the existing and potential resources, but also it is necessary to give answer to the lack of urban fabric and to the demands from the social economic context, in order to make the process not only an operation of simple immovable property valorization, or building recover or *urban make up*. We are talking, therefore, of an overall valorization strategy, able to make stay together physical, social, economic and cultural interventions. The different interactions between social, ecological and economic aspects show that these valorization/regeneration processes pass from a punctual intervention to a development overall strategy, assuming the role of a fundamental strategy for givig again quality and identity to valuable urban contexts; an extraordinary chance to answer challenges of the current social economic transformations, of climatic changes and undelayable engagements in the energy field.

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