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Best practices in heritage
conservation and management
From the world to Pompeii

Le vie dei Mercanti _ XII Forum Internazionale di Studi

Carmine GAMBARDELLA

La scuola di Pitagora editrice

Carmine Gambardella (a cura di)

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editing:
Manuela Piscitelli

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Via Monte di Dio, 54
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Telefono e Fax +39 081 7646814

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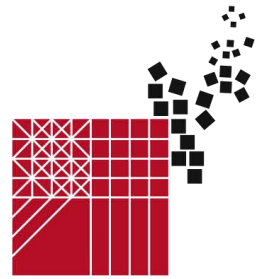
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Le Vie dei
Mercanti

BEST PRACTICE IN
HERITAGE
CONSERVATION
MANAGEMENT



FROM THE WORLD TO POMPEII

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Knowledge and representation as instruments for evaluation of retrofitting in the historic cities. The Jewish *Ghetto* in Rome.

Gerardo Maria CENNAMO

Engineering Faculty, International Telematic University UNINETTUNO, Roma, Italy
g.cennamo@uninettunouniversity.net

Abstract

Approaching with method to the problem of dissipation of non-renewable energy and, in general, environmental pollution is now an imperative condition at the international level.

This issue concerns not only the new urban settlements but also the historic cities, with all the difficulties arising from the need for transformations resulting by retrofitting in the historical heritage.

In the range of the difficult dichotomy between conservation and innovation, the historical city must address the complex path of the research of an equilibrium between its own essence and the new modernity needs along with a development in line with the environmental sustainability .

We can say that now there are already many technologies and procedures applicable for this purpose in the new buildings, so the issue becomes very controllable in the event of new buildings.

Likewise, when it is possible to work in a decisive manner on the building, making necessary changes to the plant and architectural level, the action of retrofitting is a simple application. But in the case of historic heritage, how is it possible to operate?

What choices such as shares, assessments must be implemented in urban areas characterized by historical or however formal and architectural balance structured, in different historical periods?

One possible way could be the analysis of the potential transformations or, better said, analysis of the transformations compatible with the historic cities, resulting by the application of retrofitting techniques, already studied in specific disciplines.

In this direction, the "sustainable retrofit" of the historical city, becomes an element able to initiate policies for restoration and urban innovation of the historic cities, to refurbish of the obsolete housing stock and to implement the construction sector.

This paper is in the interest of PRIN 2010/PEA4H8, supported in part by the MIUR. It is part of a research carried by Engineering Faculty, civil and environmental department, of the International Telematic University UNINETTUNO about the topic of the role of the representation as an instrument for control and evaluation of the retrofitting transformation in the historical cities, principal through the survey and subsequent graphic simulation as a means of monitoring changes of the architectural heritage.

Keywords: Historical cities, survey, representation, retrofitting, architectural heritage.

1. Introduction to the issue

The historical city, harbinger of a cultural, sociologic, iconographic and mnemonic heritage, ancestrally rooted in the conscience of civilization, addresses the complex path of the research of an equilibrium between the own essence and the new modernity needs. Individual buildings or entire urban areas and pieces of city, have begun to deal with a new one (in terms of perception) and postponed requirement, established by the need to embark on a path towards a logic of sustainability in terms of functionality and energy.

In fact the Italian conurbation is characterized by a large number of urban and suburban areas, nucleus and districts of cities that express, most times, a remarkable formal language, a synthesis of morphological and architectural archetypes which have developed in the succession of ages. Many Italian and also European historical towns show a number of features, peculiarities and common traits

to each other which, although in different places, have often contributed to give a common identity and similar conurbation. The real question, in fact, for which this research seeks to identify possible solutions or at least good practices and methodologies, does not affect only heritage and historical areas of most valuable historical interest or, for better said, those areas that are already subjected or protected by specific statutory regulations.

This path is not easy, especially in the pleasant setting of formal and architectural balance in Italy and in Europe, recognized as a historical city; in fact this path cannot be abstracted by the clear definition, from a verse, of the extraordinariness of historical heritage and, from an other verse, by just as important identification of imposed -or deriving from a contemporary historical place- needs, functions, conditions system.

This paper therefore aims to highlight the main procedural issues, planning and management authority relating to regeneration in the historic city, through the reading of an urban environment taken as an example, where specific and relevant formal features.

1.2 Historic city and energetic requalification

The awareness that most of the historical heritage or however built until a few decades ago are the true responsible for a high proportion of environmental pollution and releases of carbon dioxide in the atmosphere, produced by their "lives passive", through the usual and daily use of domestic utilities and equipment has led to the attention of the scientific community and civil society in general the problem of retrofitting of the housing stock.

We can say that now there are already many technologies and procedures to be applied for this purpose in the new building, so the issue becomes very controllable in the event of new buildings.

Likewise when it is possible to work in a decisive manner on the building, making necessary changes to the plant and architectural level, the action of retrofitting is a simple application. But in the case of historic heritage as it becomes possible to operate?

What choices such as shares, such assessments must be implemented in urban areas characterized by historical or however formal and architectural balance structured in a different historical periods?

As we said in the introduction, the scope in the fully interests of research are represented by urban and suburban areas, nucleus of cities, districts and city of pieces that much characterize of the Italian and, in general, European conurbation that express a remarkable formal language, a synthesis of morphological and architectural archetypes which have developed in the succession of ages. It is precisely these the "essences", the genius loci, the most salient characteristics of the conurbation of our territories, Italians and Europeans in general, so that it was not wrong to use the definition of "historical city" wanting to synthesise, in this expression, the sum of the characters and archetypes we have mentioned. This is the test, this is the place of confrontation in which explore how annul, or at least moderate, the conflictuality and criticalities resulting across the great value of cultural heritage, to be preserved as it is, and the demands, not be postponed, of a contemporary living environmentally friendly and conscious that natural resources are quickly running out.

Andreina Maahsen-Milan talks about incessant changeability of the urban scene. Changeability also determined by the ability to translate into physical elements also the formal technical and technological device, like form and matter. *«Whether it be "armed scenes", ie looms or light materials however detached from the space functional, from the main structure, or changing - screens, either physical or virtual - the urban scene wetsuit incessantly. Different instead is the evaluation of what the outcome will, the sum of retrofitting energy in the overall image of the city and landscape. Given as a fact the failure of any practice aimed at hampering such phenomenon, it is that the only possible way is the "virtuous use" of practices and technological devices required and imposed by sustainable planning and design onto design practice. An unresolved issue is still represented by energy upgrading of existing building heritage while there is increasing risk related to the visual pollution caused by the – so called "third landscape"».*[1]

Actually, this complex path through a delicate balance in which the conflict between conservation and innovation cannot be abstracted from that and that a clear definition, on the one hand, the extraordinary nature of the historic and, on the other, the equally salient identification of that system requirements, functions, conditions imposed by or derived from a use contemporary historical site.

How and in what way it can be considered "sustainable" if the historical place related to an ecosystem characterized by the current conditions?

How and to what extent can change the perception of the site in relation to the pursuit of these objectives in terms of sustainable energy?

It's necessary to determine the priority of values, defining rules of conduct such as moderate, if not cancel, the resulting conflict that inevitably comes from the prelude and comply with the same, including the value of the past and expectations of the contemporary.

The identification of these "rules" and practices inevitably passes through the design of context that, as the primary instrument of knowledge and simulation, takes the value predominant in these specific transformation processes. [2]

1.3 Main problems and criticality

The issue, especially in Italy, it becomes urgent if not impelling, partly because of common sense of people and partly because the many directives (UNESCO Recommendations HUL, the Directive 2009/28/CE "20 20 2020", Horizon 2020). But this question is not already enabled and, especially, not systematically implemented by the Italian statutory regulations that interest urban development and construction industry. Yet it seems that in recent times the attention of regulators is still paid to aspects that do not appear to address the issues under discussion, which still are of interest exclusively of scientific communities. Continuing our main interest in the representation as an efficient instrument of knowledge, monitoring and analysis of the transformation of cultural heritage, we have sometimes researched items of interest in the urban planning area, but without satisfaction.

We would like to clarify that the scope of interest of this research is not precisely the project, (it would be in a specific field of competence of scientific sectors discipline already extensively studied with excellent results), but priority of knowledge, survey and analysis.

Thorough knowledge of the areas of intervention, in order to learn and recognize the most salient constitutive characteristics, the essences, the fundamental archetypes.

The genius loci, but also through a systematic approach, recognizing the momentous layers, influences that exist and can be found in the historical building.

Define the scope of intervention, representing the conurbation, the space complexity, the architectural composition, the compositional language, the colorimetric quality. That 's the first fundamental step of the work. Analysis of the potential transformations or, better said, the transformations compatible with areas of interest, the historical city, resulting across application of the techniques of retrofitting already, as before mentioned, notes, studied in specific disciplines and of which are we take note of the results useful for our specific research, through the modelling and the graphic simulations the most better methodologies and the best practices. [3]

2. The case study

The Jewish ghetto in Rome is a great place for our research; few roads, the subject of numerous descriptions and representations, viewed as a city within a city, always dodges from the influence of the Vatican, expression of Jewish otherness, but also bearer of roman "authenticity", even during the dramatic event of Nazism. Few streets that retain and return the ancient memory of the epochs, recognizable through the residual parts of the native urban plant or otherwise "old" in the morphological characteristics of the architectural heritage, in the archetypes constructive hidden or visible in the fabric of the buildings, the monuments, in the names. Everything in continuous relationship with a path still in place that you see the evolution of the place from the conclave introverted to a kind of organism in permanent osmosis with the outside, the full expression of the contemporary social dynamics, highly productive thanks to an uninterrupted cycle put in act by a variety of exercises and economic activities such as restaurants, bars, shops, small-capacity accommodation, crafts and much more, where the evolution has strongly reversed the proportional relationship between living - so a place of protection, limited socializing - and produce - then place open to flows "external" and the widest use.

The morphology of the Ghetto, as it appears today, the result of four basic stages of processing, three of which made for exclusive the will of the Vatican and only the last, the modern one, dictated by a planning approach.

First phase: 1555 Paolo IV imposed the construction of a boundary wall accessible by only three doors that go to delimited an area of approximately three hectares in the valley of the river Tevere.

2nd phase: end of 1500 beginning of 1600, Sisto V ordered the expansion of the area in southwest direction near the Tevere, going to be a new settlement, accessible by two new doors.

3rd phase: 1830 Leone XII imposed the closure of the insula that facing Via del Portico di Ottavia, Piazza Mattei, Reginella's street and St. Ambrogio street in north - south direction.

4rd phase: 1800, intervention rather radical urban transformation that has given us the current morphology. [4]

It's clear that the evolution of the urban area of the ghetto into a period of about four centuries, derived solely from the application of religious dictates. This of course until you reach the conformation "modern", which saw the implementation of a project on urban development over most of the area between the Tevere and the axis of via del Portico di Ottavia, handing down to us today, such as residual areas the original system, some urban blocks upstream of the street Portico di Ottavia as, in particular, the aggregate bounded by the axes cross street of the Reginella, and so Sant'Ambrogio.

It must be pointed out that, although under the morphological and typological aspect can certainly be understood as an integral part of the system "ancient" of the Ghetto also some areas immediately surrounding the area between the Reginella's street and Sant'Ambrogio is ultimately, only to return

again the vision of the original Ghetto, intense according to the physical boundaries of strictly imposed by the Church.

This does not mean that truth in the "new" Ghetto has lost the genius loci so distinctive and peculiar; the place, although in the wider conurbation which now identifies it as an area in the historic center part of the district of St. Angelo extended between Monte Cenci, the Theatre of Marcello and Piazza Mattei, preserves the legacy of a widespread manner redolent of the original memory essence.

In addition to the architectural and cultural aspects, for the purpose of our research is necessary to take into account the high energy dispersion and consequent environmental pollution resulted from a place like the Jewish ghetto. In fact, as mentioned in the introduction, the peculiarities of the place, its location, its historicity, mainly its beauty and charm, has led to an economic process of "inversion" of the original functions. An area that for centuries has maintained a predominant feature of settlement to inhabit, although almost made it "forced" as we have said previously, in contemporary times has had a strong boost production quickly, becoming a real center of productivity, including economic, based primarily on accommodations, restaurants and subsidiary activities. (Fig. 3 – 4b)

This has determined to be able to welcome visitors and new streams of visitors to almost continuous cycle, the need to fortify the various exercises, the production equipment of its stores (kitchens, plants and equipments), on the one hand with a consequent increase in the energy requirements, for another the need to equip with thermal regulation systems increasingly powerful acts to regulate the climate temperatures, but above all to counter the rising thermal determined by its production facilities (electric motors, cookers, refrigerators, freezers, heat pumps) more and more powerful.

A sort of paradoxical vicious circle, which leads to the need of enhanced energy to be able to adjust the effect by itself procured or otherwise increased.

For this reason that the scientific communities are starting to verify that the only recourse to the type of plant technologies will not be sufficient to achieve the levels of reduction of energy dissipation that the Community directives (and common sense) dictate to the society soon.

2.2 Possible solutions

We will need to move towards more complex interventions that take into account the possibility of a practical and concrete use of natural resources; naturally obtaining a good yield deriving from natural resources need for a much longer metabolic process or, in terms Inverted, more extended quantitatively.

So the boundaries between visible and invisible, between perceptible and imperceptible, inevitably will vanish, and the society will be responsible for establishing criteria and procedures for the correct but decisive approach of retrofitting on the historic heritage, causing necessarily exterior changes but reaching to check out the original characteristics, in order to preserve the readability of the good and the place. You will have to develop the right knowledge to be able to use in our historic towns photosensitive roofing, ventilation chimneys, solar greenhouses and any other device that, in warm climates, make the most of the solar resource effectively controlling the temperature rise liabilities.

For this issue becomes a priority the role of knowledge, through the survey, the modelling and representation, as a fundamental instruments in the evaluation of the exterior modifications. [5]

2.3 Survey and representation as instrument of evaluation

Considering the solar exposure, urban structure and construction type orientation, conurbation, the dimensions and characteristics of general climatic, as the winds in summer that are prevailing direction from quadrants SW, NE and NW, with average temperatures of 23 at 31 degrees for three hours in a day, the entire area has characteristics of high energy dissipation. (Fig. 1, 2)

For a site like the one selected as a case study, the main aim so, for the purpose of upgrading the energy efficiency of action, is to moderate the thermal dissipation due to the particular exposure and climatic conditions of the area especially in relation to the type of construction, if that does not achieve of significant architectural quality particular performances in terms of transmittance. The main issue is that it does not negatively affect the view of the architectural features the district and define the right choices in this regard. A valley so of the analysis phase is fundamental the ability to simulate, through the representation of some hypothetical transformations, the possible forms in order to control the transformations and analyze the right responses.

We have analyzed four different applications, singly and combined, and simulated through the representation of the effect of the changes on the perception of the architectural heritage.

Among these, the common element introduced is the application, upon the original roof, of an energetic roof called "TECU solar system". It is an innovative integrated radiation-absorbing roof system constructed entirely in similar copper. The roofing covers a certified system of tubes in copper, through which runs a vector fluid which captures the solar energy. This latter transfers the heat to the water in a storage tank and thus to the building's heating system. As shown in the image, the architectural perception of the building is not negatively altered.

Besides this, three other different interventions have been proposed:

1 - Transformation implemented through the utilization of trees, positioned in a front and parallel to the curtain of buildings. By the climate data, it is identified the opportunity to use caducous leaves trees, so the positive effects are maintained during the transitional seasons and eliminate almost all the unfavorable effects during the Winter. Therefore we make use of broadleaved large foliage species and in the specific of *Tilia Tomentosa*, (Basswood), originating from Eastern Europe that is resistant to Summer, drought and pollution. This type of intervention allows various results. The first results consist of a totally naturalistic approach. Then, taking into consideration that the area faces on the South, so trees have the effect of shading, the mitigation of temperatures, and a creation of air currents which increase the summer ventilation during the day.

During Winter, the caducous leaf trees lose their shading function. However, the presence of spin (trees with hemispherical shaped crown) allows, even without of leaves, to have a windbreak, like a wind barrier, that has still greater effect if we lower the distance among the trees. In the images is simulated the change made to the visual perception by this change. (Fig. 5 - 6b)

2 - Transformation implemented through the realization of solar greenhouses, working as thermal regulators. Solar greenhouses aim at capturing the light energy of the sun and convert it into heat energy and store it. The solar energy passes through the glass and heats the interiors. What really happens is the short wave infrared waves going in and turning into long infrared waves, which cannot escape. So they just reflect around and get absorbed by their surroundings. They reveal to be very useful during Winter season. They trap solar energy during the day, usually with benefit of south-facing placement and sloping roof to maximize sun exposure. Once the sun goes down, they are able to retain that thermal heat and use it to warm the house at night. In Summer, users can open up the double line of windows and let fresh air go in. Thus, these changes modify the visual on average perception of the site, introducing changes that, in certain territory or places, do not adversely alter the architectural and formal balance of the site. In the images is simulated the change made to the visual perception by this change. (Fig. 7 – 8b)

3 – Transformation implemented through the introduction of thermal chimneys, built upon the facades, as independent and reversible elements from the buildings. Solar chimney is a way of improving the natural ventilation of buildings by using convection of air heated by passive solar energy. A simple description of a solar chimney is that of a vertical shaft using solar energy to enhance the natural stack ventilation through a building. During the day, solar energy heats the chimney and the air within it, creating an updraft of air in the chimney. The suction created at the chimney's base can be used to, naturally, ventilate and cool the building below. (Fig. 9 – 10b)

Finally, through the representation techniques it is possible to evaluate and analyze the result of the combined application of the three interventions. [6] It's sure that this methodology introduces changes that strongly modify the visual perception of the site. This does not mean that these modifications negatively impact on the formal and architectural balance of the site, but surely they modify, also thanks to new compositional elements of the facade, the comprehension of buildings, their original characteristics and, generally, of the site. In the images, the change made to the visual perception by the introduction of these interventions is simulated. (Fig. 11 – 12b)

Bibliographical References

[1] MAAHSEN-MILAN Andreina. *Retrofitting practices to renovate the urban scene*. In: Russo Ermolli S., D'Ambrosio V. (edited by) *The Building Retrofit Challenge*, pag. 42, 2012 Alnea Editrice, Napoli.

[2] CENNAMO Gerardo Maria. *Survey, analysis and representation as instrument for control and evaluation of the transformations resulting by retrofitting in the historic cities. A sustainable energy requalification through monitoring of the changes of the architectural heritage*. International Journal of Energy and Environment, 2014, vol. 8; p. 61-68, ISSN: 2308-1007

[3] FLORIO Riccardo. (edited by) *Città storiche. Città contemporanee. Strategie di intervento per la rigenerazione della città in Europa*. Clean, 2012 Napoli.

[4] CENNAMO Gerardo Maria. *Jewish ghetto in Rome between narration and representation*. In: Città Mediterranee in Trasformazione. Identità e immagine del paesaggio urbano tra Sette e Novecento, 2014, Napoli: Edizioni Scientifiche Italiane, p. 603-612, ISBN: 9788849528145

[5] CUNDARI Cesare. *Il rilievo architettonico. Ragioni. Fondamenti. Applicazioni*. 2012, Aracne Editrice, Roma.

[6] DOCCI Mario, MAESTRI Diego. *Manuale di rilevamento architettonico e urbano*. 2009, Laterza, Bari

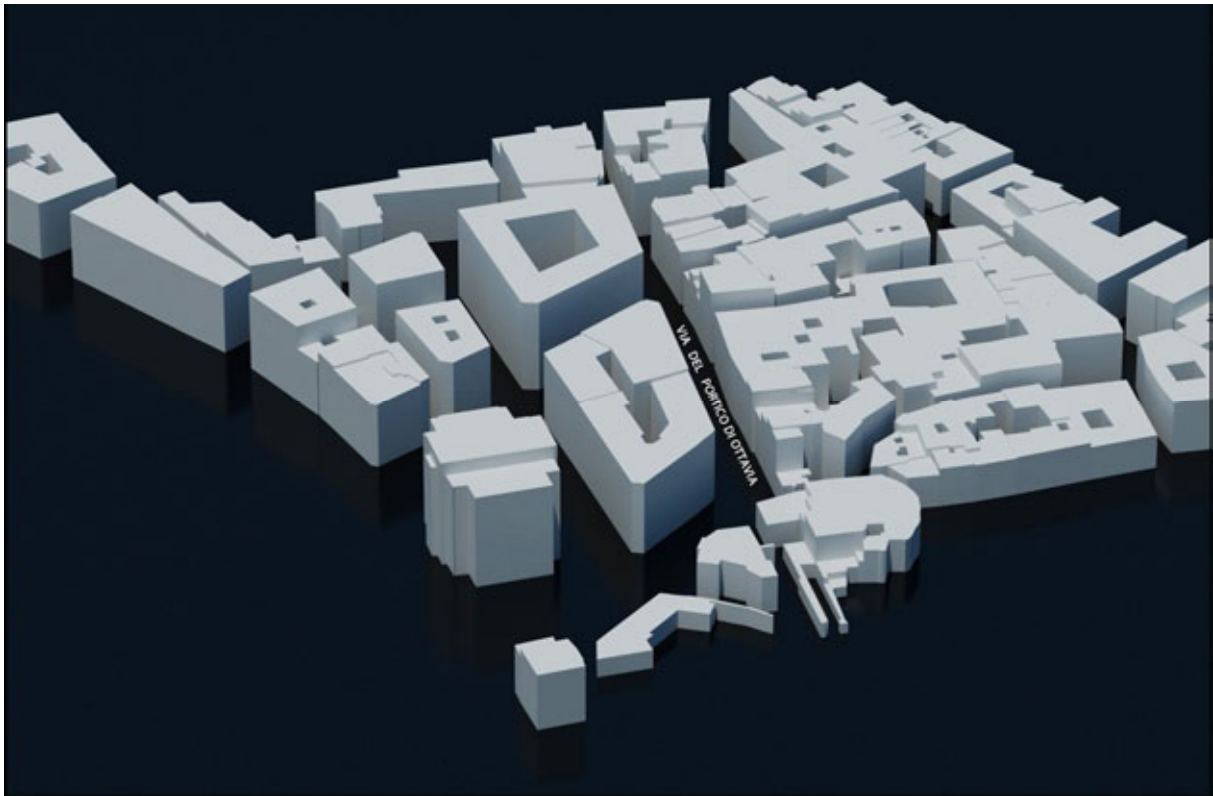


Fig. 1: 3d representation of Jewish Ghetto area. Realistic simulation of solar irradiation on the building curtain on “Portico di Ottavia” street. (on the right side). Time: 21 June 11:00 am. Facades are fully exposed.



Fig. 2: 3d representation of Jewish Ghetto area. Realistic simulation of solar irradiation on the building curtain on “Portico di Ottavia” street. (on the right side). Time: 21 June 5:00 pm. Facades are still strongly exposed. Sun exposure continues for all day long.



Fig. 3: Survey. Urban detailed plan of "Portico di Ottavia" street.



Fig. 4: Survey. Photoplan (*fotomosaicatura*) of the whole facades. Thus, it is also evident material and colorimetric aspects of the building curtain.



Fig. 4a: Survey. Details of the first and second blocks, from left to right.



Fig. 4b: Survey. Details of the remaining groups.



Fig. 5: Evaluation. Urban detailed plan of "Portico di Ottavia" street.



Fig. 6: Evaluation. Photoplan (*fotomosaicatura*) of the whole facades. Representation of n. 1 solution, roofing by TECU Solar System plus shielding by tall trees.



Fig. 6a: Evaluation. Details of the first and second blocks, from left to right. Representation of n. 1 solution.



Fig. 6b: Evaluation. Details of the remaining groups. Representation of n. 1 solution.



Fig. 7: Evaluation. Urban detailed plan of "Portico di Ottavia" street.

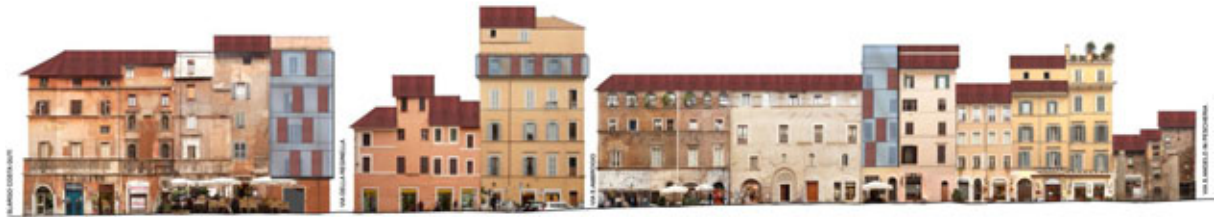


Fig. 8: Evaluation. Photoplan (*fotomosaicatura*) of the whole facades. Representation of n. 2 solution, roofing by TECU Solar System plus solar greenhouses.



Fig. 8a: Evaluation. Details of the first and second blocks, from left to right. Representation of n. 2 solution.



Fig. 8b: Evaluation. Details of the remaining groups. Representation of n. 2 solution.



Fig. 9: Evaluation. Urban detailed plan of "Portico di Ottavia" street.

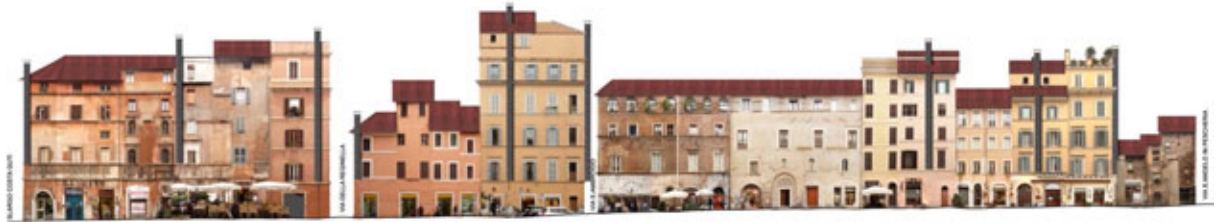


Fig. 10: Evaluation. Photoplan (*fotomosaicatura*) of the whole facades. Representation of n. 3 solution, roofing by TECU Solar System plus thermal chimneys.



Fig. 10a: Evaluation. Details of the first and second blocks, from left to right. Representation of n. 3 solution.



Fig. 10b: Evaluation. Details of the remaining groups. Representation of n. 3 solution.



Fig. 11: Evaluation. Urban detailed plan of "Portico di Ottavia" street.



Fig. 12: Evaluation. Photoplan (*fotomosaicatura*) of the whole facades. Combined representation of the four solutions.



Fig. 12a: Evaluation. Details of the first and second blocks, from left to right. Combined representation.



Fig. 12b: Evaluation. Details of the remaining groups. Combined representation.