

Sustainability Valuation for Urban Regeneration. The "Geomatic Valuation University Lab" Research

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Abstract. Starting from the awareness that the world is experiencing a severe ecological crisis due to the increase of pollution [1], research of "Geomatic Valuation University Laboratory at Mediterranean University" Uni Lab has embraced the imperative mission to better understand the causes of increasing environmental decay. Going further, Uni Lab is trying to address a strategy of global warming mitigation, paying particular attention on the role of the construction sector [2]. In the last decades, the environmental negative impact of the construction and building sector worsening down, due to energy over-consumption. Consequently, pollution has increased considerably due to wrong architectural management. A heap of crisis that makes desirable and urgent general mitigation measures as well as a strong incentive toward architectural sustainability. Research set-up a methodology to mitigate energy consumption in historical and new buildings. Additionally, research analyzes the eventual increase in market properties value due to the sustainable interventions for thermal behaviour amelioration.

1. Background

Urban appraisal has been a pillar in urban management giving a relevant support of urban activities, through valuations of:

- intervention, construction, running and management *costs*;
- building future *rent* and *income*;
- asset market future *value*;
- real estate *price data* collection and related market analysis;
- environmental footprint and estimate of ecological impact of buildings and settlements.

Nowadays, demand from urban management to urban appraisal for valuation support is large and growing.

Support is provided to many sectors of urban life such as maintenance and construction, in private sector and public institutional city government.

Appraisal might support innovative integration of environmental, economic and social concerns, which is the cornerstone in new approach to urban management.

Urban policies, in fact, are increasingly oriented towards:

- sustainability;
- energy efficiency;
- conservation;
- reuse;
- retrofitting;
- revitalization of the existing city;
- effective management of historical and architectural heritage.

In an urban context, sustainability is a process and it describes the potential that, in the medium or long term, the city has to improve environmental, social and economic levels.

Sustainability concerns both new construction and existing buildings and the systems for its assessment can be a fundamental framework and tool to support strategic choice between alternatives: planned existing built settlement retrofit *versus* spontaneous land transformation.

In the last few years, several approaches and methods to assess urban sustainability have been developed and experimented to evaluate buildings from both the energy and environmental point of view [3]. An emerging choice toward architectural and urban sustainability is the buildings (new and existing) “passivation” through roofs and walls insulation and ventilation by using bio-ecological materials allowing the dramatic reduction of thermal dispersions and consequently an efficient buildings energy management.

As described above, this paper aims to investigate how choosing sustainable scenario and long-lasting natural bio-ecological materials, characterized by excellent physical-technical performances (energy efficient), might mitigate energy consumption in historical and new buildings and might also increase market value of properties [4].

2. Cognitive aspects. The role of digital archives for urban regeneration

Architectural and urban conservation contribute, respectively, to urban regeneration and revitalization of historic buildings.

Urban history studies land dynamics and evolution, and its transformations and stratification. For general urban regeneration activities, historical knowledge is very useful, both in terms of documentation (building design and construction), and for the choice of measures toward conservation and enhancement.

This information, if systematically organized, support the identification of clear recovery actions for the land, cities and urban and architectural heritage treasuring [5].

Knowledge for the revitalization, restoration, and enhancement projects is going to be organized in computerized archival heritage.

Understanding and awareness of the historical values are important in supporting the treasuring, rather than replacing, of historic urban non-reproducible heritage.

Frontier projects, as expressed in more detail in the following paragraphs, have as objectives: energy optimization; improved seismic performance; technological upgrading. That will inevitably lead to a modular design based on the history as well as status at present time of the individual city blocks.

Archives Documents, coming from public as well as from private sources (“fondi”; professional architects deposits; enterprises), allow to get extremely rich documentation: sketches; list of prices; working drawings; old pictures of buildings under construction; old urban picture useful to record city development processes [6].

Archives preservation, supported by new computerized technologies, is utmost useful for both historical research as well as coherence among historical knowledge, revitalization project and practices.

Urban and building history (settlement, architectural and construction analyses) helps to define policies encompassing the most appropriate actions for: historic settlements recovery; building energy performance improvement [7].

The preservation of archive collections allow to keep for posterity the memory of historical sources, avoiding the risk of time degradation.

3. Urban and architectural regeneration to foster-up Mediterranean Smart Cities

Architectural design derives utility from the historical knowledge addressed in the previous paragraphs. Enhancement of existing buildings has great cultural significance because it revitalizes assets of historical and architectural value (also known by the archival contribution). They are the memory of the city. Treasuring of heritage is a choice of great civilization, is the innovative action

needed to reverse the contemporary trend of architecture and urbanism. The innovation in the field of architecture, consist of "maintain" (instead of "replace") for the understanding of the existing city.

Urban quality, due to aesthetics and amenities (discussed in the next section), is taking characters and technical implications, related to spatial and urban future. In fact need for the quality control has taken an important value influencing urban management in choosing urban retrofitting with ecological characteristics.

Ecological retrofitting, is a form of wisdom architecture, enhanced by a constructive dialogue between old and new, past and future. The result is a new way of creating spaces, camouflage (no increase in volumes) or ephemeral (related to the power of the image as part of redevelopment of urban space).

The primary objective of the ecological retrofitting is the regeneration of city and existing buildings to reach the best of performance: energy; seismic; housing; quality; aesthetic. The ecological retrofitting consists of all innovative solutions in the energy management fields, such as: lighting, heating, building materials, floors, and curtain walls. All of this, with a specific focus on environment and related certifications.

This new way of making architecture actually means optimizing investments and unlocking new markets for: builders; developer; all the construction companies; designers; and those involved in architectural design and construction process [8].

The ecological retrofitting improves comfort, well-being and productivity of human life, with a quick return of investment cost in term of permanent saving in energy bill.

Conservation and functional reuse of existing stock that pursuit the bio-climatic and energy approaches are realized through prototype yards. These are a living manual to show real examples for people who had to do building restoration.

Prototype might be and become a good example and create replicable abacus actions for urban settlement.

These concepts can be generalized at the urban scale and can ensure the activation of a green economy if linked to architecture finalized to large energy consumption mitigation.

4. Costs, effects, benefits estimation of construction

Uni Lab research encompasses real world prototype yards, as described above, that allow interesting testing and experimentations including direct costs and resources observations, survey, monitoring and control.

In urban regeneration, costs have a key role since they might guide designers, than it comes to light the importance of providing a predictive costs system [9].

Full knowledge of intervention price \ quality ratio might be the right way to make a correct choice between materials alternatives to be used in retrofitting design.

Through the direct observation and analysis carried out on buildings in real world prototype yards is possible to identify first cases of sustainable right interventions [10]. These virtuous examples allow to immediately verify (through ex-ante, on-going and ex-post evaluations by data loggers) the effects generated on building climate behaviour by choosing sustainable and long lasting natural materials, characterized by excellent thermal and ecological characteristics (energy efficient).

Benefits achievable in the middle and long term are:

- better indoor climate behaviour.
- energy consumption reduction;
- CO₂ emissions reduction;
- energy management costs reduction;
- maintenance costs reduction;
- expected increase in building real estate market value.

The need for building revitalization and restoration becomes an opportunity to implement and promote sustainable architectural conservation, i.e. architectural - ecological - energy retrofitting.

Such action may be designed according to different alternatives. The choice of the best alternative is driven by the intervention costs as well as materials characteristics and benefits achievable in the short, middle and long term.

Alternatives, or intervention scenarios, differ from each other just in the use of different material, while processing, indeed, doesn't change.

Cost differential, higher in sustainable scenario, depend from the higher quality and much longer durability over time of the specific material used, otherwise the technology is not distorted but remains very similar.

The initial costs of the sustainable intervention are higher if compared to a business as usual one, but the over-time valuation shows how this differential is rapidly equalized thanks to dramatic saving in annual: energy bill; costs; maintenance costs.

In conclusion each interventions should be driven not only on the basis of the pure initial intervention costs, but paying special attention to the overall overtime balance of costs and benefits, the latter refer to technical benefits set out above, as well as to future potential real estate market positive impact as introduced below in subsequent paragraph.

5. Valuation as a support for settlement and architectural quality

Urban regeneration strategies (described above) might improve real estate capital by enhancing buildings features and amenities and might increase market value [11].

Urban regeneration design and planning shall be supported by real estate market analysis, to provide the range of property values involved in the actions that form the basis of public private partnership (PPP) and negotiations.

In real estate market occur: property construction and purchases trading of different types of objects (residential, industrial, commercial) than is a heterogeneous market; segmentation, objective in transaction as well as subjective and analytic, in order to distinguish the commodities and facilities for valuation. A segment is the set of units, or commodities, with similar characteristics, often defined by building type, and not only.

In real estate, the value of commodities (dependent variable) depends upon a number of variables (independent), especially location [12,13].

Focusing on housing market, quantitative analyses are focused on the influence of the urban services and the distance from the centre, searching for the structural relationship between disposable incomes, travel costs as commuting, housing market prices.

Recently, other features or characteristics, begin to influence the market price, in terms of environmental quality [14], comfort and aesthetics. New themes are emerging as well as the issue how to evaluate these amenities that might have a considerable influence on the real estate market performance, and then on the housing prices.

Amenities might be qualitative in nature and can make an improvement of architectural context and housing. Uni Lab research attention is directed toward detection and testing of a potential economic premium for amenities, or for the benefit of all those features produce.

Uni Lab research investigated influence of features and amenities on residential property values, with the use of regressive stochastic models. Influence of ecological retrofitting on market price is a research frontier.

All this makes possible to improve knowledge of real estate markets through a continuous observation on the influence of emerging variables and the subsequent development of prices. Also allows raising the quality information on real estate in an urban settlement, through a systematic updating.

A valuable contribution comes from geomatics, useful to create a real estate GeoDataBase [15] containing, for each property useful characteristics to estimate real value: location; conservation; net area; room number age.

6. First conclusion

Urban regeneration aims to overcome the lack of productivity, one of the major gaps of national economy, by ameliorating the milieu and fostering-up proximity and integration among urban factors of modern production: University; research firms; innovation incubators; young people; skilled workers; metropolitan environment. Besides strengthening the economic productivity, other features arise as feasible goals of urban regeneration projects: the opportunity to plan, design and ecologically enhance the building stock by implementing sustainable retrofitting programs.

This calls-up appraisal to provide assessments for useful valuation to make possible regeneration programs. Appraisal provides several supports such as: computerization of urban archives; design of interventions; urban dynamic analysis; valuation of any involved costs, prices, values.

Regeneration design promotes the ecological retrofitting at the urban and architectural scales by pursuing the great objective of energy efficiency in building and less energy slavery and geo-strategic dependence of the national economy. Initial larger higher costs of ecological retrofitting encompassing energy regeneration, compared to common maintenance and Business as Usual scenarios, are paid back in the short term thanks to a huge energy saving generated by virtuous interventions.

Ecological improvements make possible higher real estate selling prices giving a “market premium” to virtuous owner. Investigations of this key aspect is the frontier of research: “market premium” might drive private sector to pay for long term sustainability and energy independence due to high quality and everlasting natural ecological materials.

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