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Evaluation and feasibility study of retrofitting interventions on social housing in Italy

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Abstract

While there are an increasing number of new projects aiming at combining high residential quality and low power consumption, it is clear that the main challenge in the short term concerns the performance upgrading of the existing residential buildings stock. The feasibility analysis should consider the economic implications of the retrofit projects. A Discounted Cash Flow analysis can be implemented in order to investigate the economic aspects of such interventions. The DCF approach allows the analysis of costs as well as the revenues and savings with the objective of understanding the period of time needed to recover the initial investment.

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1. Introduction: the paradigm of suburb areas

The suburbs of modern cities have become key elements of the ever changing cities: once considered problem areas, now they are considered in the planning projects as significant components for the urban redevelopment [1]. As a matter of fact, the issue of suburbs is today ever present in the processes of strategic planning and of urban redevelopment; they are considered as areas of integrated transformation that is areas presenting a **diversified** system of transformation actions, ranging from the landscape and cultural heritage enhancement to buildings retrofitting interventions, up to an economical lifting and to an improvement of the infrastructural systems.

The redevelopment of suburbs - in terms of open spaces, social or economical aspects - is not limited to just their physical recovery, or environmental restoration or to an improvement of roads access, but it

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also has an impact on their overall regeneration, through actions that not only influence the social and relations sphere, but also on the architectural and urban ones.

The decline of urban expansion has indeed lead to new needs for the re-use and regeneration of significant parts of the urban areas: the issues of recovery, renewal, conversion, redevelopment and reorganization of urban areas have become the focal points of the urban planners.

This type of intervention is becoming a process common to all European cities, which once exhausted their growth and expansion phase, now have to rethink their own global position and have to find effective solutions to ensure an acceptable quality of life for their citizens.

However, this trend, aimed at reusing of urban land and already built areas, requires the application of innovative techniques on both the physical and social context in order to rethink and re-plan urban spaces so to achieve the goals of renovation, requalification and restoration.

The main Italian case studies and the conditions of the suburban areas in modern cities (in decadence, or interested by upgrading processes) have identified some of the prevailing critical aspects of the planning carried out up till today. The first aspect concerns the suburb very nature: it may be marked by marginalization, where the fracture from the urban fabric caused a state of environmental degradation that often characterizes public housing estates; or, on the other hand, it may merge with the urban area where local services and facilities have kept alive the suburban context.

Another important aspect concerns the multi-functionality of the suburb areas: in many Italian urban experiences the strict application of mono-functional zoning policies has created situations of land use that has broken the variety and the urban liveliness. On the contrary, urban planning should forego the mono-functional zoning concept, favoring a social and functional mix. The promotion of a mixed use of the suburban areas is an opportunity to diversify and revitalize the urban fabric, avoiding the marginalization of the area, due to the single use application.

2. The housing stock

Generally speaking, the housing stock is characterized by low performances (as you can see in Fig. 1. (a); (b); (c)): it consumes high energy and does not offer suitable levels of comfort. It is characterized by different variables, from its historical background to the more recent suburban additions, and requires flexible methods of approach to define objectives and modalities of intervention.

This subject, considered very important in European Union countries, has been object of international operations related to specific local conditions both through researches and Community programs (as the program Concert-Polycity "Sustainable energy systems" within the Sixth Framework Program - FP6, 2005-10; Cost Action TU0701 [2]). These initiatives aim at focusing the attention on the energy issue, improving the level of performances and increasing the database of available experiences.

In Italy, the situation of the existing residential stock is very unsatisfactory. The level of energy demand for winter heating, the usual benchmark, is extremely high: for older buildings it is around 250 kWh/m²y, decreasing to an average of about 150 kWh/m²y in constructions built after the coming into force of Law n.10 of 1991. The comparison of these buildings with the more energy-efficient ones is rather discomfoting: a passive building does not consume more than 15 kWh/m²y; a Gold CasaClima building consumes no more than 10 kWh/m²y, a Class A building in the Emilia-Romagna region consumes less than 25 kWh/m²y, the production of hot water included.

Therefore, it is important to define methods of requalification to improve energy and morphological performances of construction in relation to the different operational areas.

It should be noted that our national climatic context is mainly characterized by Mediterranean

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