

Extended summary

UPGRADING PUBLIC HOUSING

Methods of sustainable retrofitting of public housing built from World War II to the end of 80's

Curriculum: Architettura Costruzioni e Strutture

XI Clclo

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Abstract

The proposed work outlines strategies for an architectural project which sees the reuse and regeneration of urban heritage and the existing building as the only action possible today for a new sustainable development.

In particular, the field of investigation concerns the large amount of public housing built since the end of the world war II to the late '80s. This is a considerable heritage buildings, characterized by a general homologation e particularly unsuited to the needs of contemporary living and the control of energy consumption.

Most of our suburbs consists of buildings made of concrete, or prefabricated, made quickly without careful attention to technique, characterized by: serialization, standardization and functional rigidity.

Problems, which due to the urgent demand for housing, and speculative real estate needs. This has produced a heritage still in use recording technological problems that compromise both safety and structural sustainability. The research propose a change of paradigm that reverses the route of a now impossible expansive power to a new kind of progress that wake up, make the upgrade of the material made available. The research presents experimental hypotheses tested on several building complexes taken a sample between the shareholders E.R.A.P. and private residential group in the Province of Ancona on which we assumed regenerative actions of spatial, structural and energy, providing a thorough understanding of the existing material on which act for hybridization and addition of spatial and technological devices able to develop new life, beauty and stimulating identity.

Keywords. Spatial Upgrade, Energetic Upgrade, Structural Upgrade.

1 Problem statement and objectives.

Periods of economic and building boom have, over the years, generated buildings that are no longer sustainable, both in terms of energy consumption and the quality of available space, in particular in relation to housing. This is the result of a marked failure to link theories of design and operating practices, the former being too ideological and the latter having a speculative significance. Do not consume more land and design the new "city within a city", reusing existing assets is the main goal and the framework within which it moves this search. This involves identifying strategies to regenerate urban spaces and existing buildings and provide them with performance characteristics suited to satisfy both the current regulatory requirements seismic and energetic, the spatial and functional needs of contemporary living. The environmental and economic sustainability of the process of reuse and re-building existing generation implies a radical change of attitude, based on the idea of designing the building as a productive organism and thus making desirable the transformation and management in time.

In particular, the regeneration process shall involve the following aspects: the Financial cycle, the waste cycle, the energy cycle, the cycle of human resources, the water cycle, cycle power, the cycle of connectivity and the cycle of services.

The research is interested mainly in urban areas located in the Mediterranean countries, with particular attention to the Italian case. This choice is dictated by the low level of attention that today we see the problems of living in the Mediterranean city, especially when compared with the cases in northern Europe. The "state of the art" is, in factis mainly formed by experiences found in France, Germany, the Netherlands, Great Britain and Sweden, where issues related to the regeneration of the housing estate go hand in hand with a strong focus on Social Housing. Therefore, the research aims to codify innovative design tools capable of reducing the existing deficit performance, addressing the issue in an "inter-disciplinary" (coordinating with the architectural design the energetic, structural, economic and social issues) and "inter-scale "(moving from technological problems to the urban and territorial topics).

Research planning and activities.

After the definition of the objectives, the research activity has been planned according to the following steps:

- A) Analysis of the morphological type-built for the definition of the fields of investigation and intervention.
- B) Analysis of the state of the art. Current research and best practices, with particular attention to experiments in Germany, Holland, France and Italy.



- C) Analysis of critical points and performance deficits:

1. Architectural quality (manufactured housing) and urban (system of inter-scalar);

2. Flexibility (functional, distributive, plants);

3. Accessibility (inter-scalar thresholds, distribution systems, mobility networks);

4. Well-being (understood as usability overall comfort / livability);

5. Security (earthquake, fire, hydrogeological, pollution);

6. Economic and environmental sustainability (indicators and benchmarks).

1.D) Analyze regulatory instruments operating at the national level:

2. Norms for the development of urban green spaces (DDL 2472-B);

3. Reformation of apartment block (Legge n. 220 del 11/12/2012);

4. Thermal energy (DM 28 dicembre 2012);

5. Piano Casa;

6. Seismic safety (NTC 2008 e s.m.i.).

- E) Setting strategies to achieve the objectives through operational planning actions:

The project strategies are based on the concept of "retrofitting" existing buildings, which rejects the idea of demolition and reconstruction, proposing new innovative ways to re-use buildings, and it is aimed at the definition of design tools for the operational implementation of changes to buildings.

Our research focuses on the formulation and testing of new regeneration methods applicable to existing modern buildings that were built after the war, which characterises most of the suburbs of Italian cities, as well as those in other countries. These urban areas primarily consist of multi-storey buildings dedicated to residential housing, in areas without public spaces and services, a lack of greenery, and a high level of environmental degradation, which often corresponds to equally high social deprivation. The research project regards buildings and is aimed at developing technological and space regeneration, at the same time as investigating issues related to the interaction of buildings with their urban surroundings.

The idea is to define typical actions that can be taken, starting with individual buildings, defined as being the smallest unit, and tools for urban transformation.

The proposed actions are divided into three main strategies to guide the project:

- Re-Programming
- Transforming
- Enhancing/Improving

Re-programming

Re-programming means defining new uses and new possibilities for existing built-up areas. It means adding new features to buildings and/or re-organising existing ones in different ways and with different layouts. It requires defining innovative functional programs which enable new opportunities for dialogue between the public and private spheres. In particular, the project aims to implement strategies to define new layouts for *ground floors*, *roofing, facades* and *distribution elements*, giving them a key role in defining relationships between private living space and the surrounding public spaces. At the same time, the re-



search has the goal of bringing back uniqueness and individuality to *housing*, based on flexibility and overcoming typological uniformity and spatial definition as imposed by modern culture, which is no longer able to represent and solve the needs of contemporary living

Transforming

This action refers to the possible physical transformations buildings can go through, starting from their existing features. The project aims to capture the hidden potential within the space buildings occupy, trying to enhance it with targeted, precise works. The various transformations tend to maintain existing characteristics and re-use them in a more effective and efficient manner, assessing the necessary differences depending on geographical location. The typological uniformity that characterises modern buildings we wish to improve suggests that we can develop and take the following "typical actions": *Open, Extend, Overlapp* and *Cover*.

Enhancing/Improving

In addition to spatial and functional transformations, the research aims at improving the efficiency of buildings from static, energy and systems points of view. Making buildings safe despite earthquakes, the durability of materials, and energy and consumption aspects are key issues to be addressed in achieving the goal of sustainable and safe cities, and which are fundamental for the definition of re-use design strategies. In these terms, the research project focuses on two methodological approaches for improving the efficiency of existing buildings:

- Enhancing the existing building elements for improved performance.

- Improving existing features through the creation of new devices capable of communicating with existing buildings to improve efficiency.

- F) Impostazione del lavoro sulla base di piattaforme collaborative con diversi enti di ricerca e aziende (Eco Cluster Cooperation , Web Aided Design).

-G) Applicazione della ricerca all'interno di due progetti pilota:

Corvialexpo 2015 Rooftop Lab.

Il progetto nasce da una convenzione tra l'Università degli Studi del Molise e A.T.E.R. Lazio. La proposta di intervento rientra all'interno dell'iniziativa del MIBAC per la trasformazione di Corviale in un *Distretto Tecnologico d'Arte, Cultura, Ambiente e Sport* di interesse nazionale.

Upgrade di un complesso residenziale pubblico ad Ancona.

Il progetto consiste nel mettere a punto una proposta di intervento per la rigenerazione del complesso edilizio. L'attività parte da una convenzione (in fase di stipula) con l'E.R.A.P. di Ancona, proprietaria degli immobili.



2 Analysis and discussion of main results.

The work done on the case studies, particularly the case of the building owned E.R.A.P. of Ancona, has highlighted the potential of the approach proposed through the regeneration project.

The intervention program, based on the re-productive use of common areas, through the creation of new housing and new commercial areas, the use of new forms of incentives provided by the new norms (energy thermal and photovoltaic) and promotion of new business activities related to the provision of services for residents, showed how the project can bring out the hidden potential inside the existing building, creating the necessary resources for its regeneration.

The economic analysis conducted, although preliminary, showing how the proposed interventions are able to generate about 70% of the economic resources necessary for the transformation of the building, with a remarkable reduction of the costs of management and maintenance.

In addition, the proposed interventions for the transformation of the common areas, such as roofs and ground floors, have the dual purpose of generating a new source of income for residents, given the location of the common areas, and create new businesses that provide services to km0 for the inhabitants, such as the production and sale of agricultural products through the solar greenhouses provided in coverage or services, sales and service and / or entertainment and leisure for children and the elderly, kindergartens, recreation centers and services in general.



Synthesis of actions:





The state of fact





The project





The project





Preliminary economic analysis

COST					
voci		mq	a corpo	€/mq	importo €
C1	Ristrutturazione edilizia superfici esistenti, impiantistica idraulica ed elettrica	9650		€ 200,00	€ 1.930.000,00
C2	Miglioramento sismico struttura con micro-calcestruzzi.	12000		€ 200,00	€ 2.400.000,00
С3	Impianti termici e solare termico, sostituzione infissi, isolamento a cappotto	9650		€ 300,00	€ 2.895.000,00
C4	Esoscheletro verticale costutuito da: telaio schermate, frangisole, sistema di verde pensile	3500		€ 250,00	€ 875.000,00
C5	Ampliamneti volumetrici. Costituiti da box prefabbricati in legno. Sono comprese tutte le finiture e le parti impiantistiche.	900		€ 800,00	€ 720.000,00
C6	Ristrutturazione parti aperte, parcheggioi, corti, copertura	3000		€ 200,00	€ 600.000,00
С7	Impianto Fotovoltaico	1200 (180,00Kwp)	€ 320.000,00		€ 320.000
C8	Nuovo parcheggio interrato adiacente all'edificio	1380		€ 450,00	€ 621.000,00
				ТОТ.	€ 10.361.000,00

RICAVI ATTESI BLOCCO A

voci		mq commerciali	ricavo annuo	a corpo in 20 anni V c.e.	a corpo in 5 anni	prezzo vendita €/mq	ricavo dopo 20 anni €	ricavo dopo 5 anni €			
R1	Vendita nuovi alloggi.	1300,00				€1.900,00	€ 2.400.000	€ 2.470.000,00			
R2	Vendita locali commerciali	1400,00				€ 2.300,00	€2.640.000,00	€ 2.640.000,00			
R3	Fotovoltaico, ricavo nell'arco dei 20 anni.		€ 60.000,00	€ 1.200.000,00	€ 300.000,00		€1.200.000,00	€ 300.000,00			
R4	Incentivi conto termico versati in 5 anni dal Gse. 40% delle voci di costo C3 e C4				€ 1.508.000,00		€ 1.578.000,00	€ 1.508.000,00			
R5	affitto copertura		€ 50.000,00	€1.000.000,00	€ 250.000,00		€ 1.000.000,00	€ 250.000,00			
						тот.	€ 7.818.000	€ 6.918.000,00			



3 Conclusions

The retrofit and upgrade existing buildings through sustainable strategies are a central theme in the scientific debate in recent years. As evidence of this, the main cultural events related to the discipline face the issues contained in the thesis work.

In particular, we can cite the Universal Exposition will be held in Milan in 2015 (EXPO 2015), whose main theme will be linked to the regeneration of the city through urban agriculture and food production, or the last *Festarch of Perugia*, directed by Stefano Boeri, which addressed the theme of living connected to the reuse of the existing city.

Not least is the Venice Biennale in 2012, directed by David Chipperfield, whose main theme was the *Common Ground*, from which emerge the issues of the relationship between private space and public areas of the residence generated from the building.

The merger between states and disciplines, scales and operating procedures that reuse and reactivate existing materials and space, is the approach to construction of the city and its architecture on which is based on research.

The data that characterizes this mode of interpretation of architecture is that the scope, consistent with the current notion of dynamism and fluidity, is the creation of "spaces" instead of "objects", a kind of new porous identity that puts together activities and possibilities for the materials of the existing city. Spatiality open and multiple, related sequences from stimulants and not monotonous, able to develop freedom of movement and vitality. A strategy that offers architectural and urban re-compositions less aloof and more procedural produced by the inventive reuse of already known, which tend to get closer than ever before, the user action body building, possibly contributing to decrease the interest for ever more isolated and self that have nothing to do with urban culture to which we all share.

The thesis, therefore, opens the way for a number of possible depth specialized information that address the individual issues identified, such as: the theme of the enclosure and the study of passive devices for the design of facades, seismic upgrading through the use of nanotechnology and seismic exoskeletons, the agricultural issues in the built environment, renewable resources, social innovation, the new bio-economy and entrepreneurship.



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