

## TURNING EMPTY OFFICE BUILDINGS INTO SUSTAINABLE SOCIAL HOUSING

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**Abstract** This paper deals with the issue of the increasing presence of empty office buildings. Indeed, compared to the industrial buildings, that have been turned into public services (libraries, museums, etc.), into luxurious homes, etc. (thanks to their architectural character and / or their identity value for local communities), the reuse of offices seems to be quite a different and less attractive issue for designers, and of little interest to developers. This may depend on their more recent age and lack of any architectural or identity significance, as well as on their out of date systems and low energy performance. Nevertheless, they are preserved, even if vacant, because of their value as part of the property assets of the owners, as well as the high demolition costs. Furthermore, as most of empty buildings, they are easily occupied by squatters, who cause degradation and social problems, with companies forced to prevent these situations by hiring expensive security services.

ENPAM R.E., the real estate management company of the national pension and social security institute for doctors and dentists, has a number of these buildings, which are no longer required for rent. This led them to promote a collaboration with Politecnico di Milano, aimed at verifying the possibility that different office building types be easily and properly adapted for residential purposes (like dwellings, hostels, temporary residences, etc.), by the development of educational projects.

The idea of turning empty offices into homes to rent comes from a comparison between the large availability of the former and the lack of the latter. Thus, this strategy could become a way for meeting the great need for social housing (even for emergencies) without using any more land, but rather preserving a part of energy and raw materials already embodied in the existing building structures. In addition, the large number and rather small size of such situations seems to guarantee limited local problems and a large spread of urban rehabilitation opportunities in the future.

By the empirical activity on selected case studies, typological models and technological solutions for the adaptive reuse and refurbishment have been outlined. These models and solutions are expected to help the evaluation of the opportunities for reusing different types of buildings, as well as the promotion of high environmental sustainability goals, through works of transformation of building systems and equipment.

## 1. INTRODUCTION

### 1.1. Background and starting hypothesis

The presence of large quantities of run-down buildings formerly used as offices is becoming a growing problem in metropolitan areas with a service industry predominance. The economic crisis in recent years, and the resultant shutdown of many activities, has contributed to an acceleration and multiplication of the dereliction processes, the origin of which is traceable, however, to circumstances of a less contingent nature.

Office buildings, like most of the construction works realised in the course of the twentieth century, must confront significant problems of adaptation to the new binding requirements, especially with regard to the energy-related, environmental and safety ones. Besides, buildings of this functional type are subject to obsolescence processes far quicker than in other sectors (such as housing, services, etc.), due to the ongoing evolution of organisational schemes and the methods of implementing office activities, hence of the associated needs in terms of available space and equipment. The shrinkage of demand from a quantitative viewpoint and its rise from a qualitative one has accordingly rendered much of this heritage hardly of any interest for the real estate market.

The city of Milan, main service industry area in Italy, falls squarely within the scenario sketched above, as further evinced by a report from the Centre of economic and social researches in the building market (CRESME) [1], according to which in 2015 the share of vacant area out of the total office building stock approximated 31% and mainly consisted of properties deemed to be low quality on account of one or more significant factors, such as the location, the accessibility, the energy performance and the comfort for users. We are dealing moreover with a vacant share certainly bound to grow, given that in Milan, as at the date of the report, new office areas exceeding one million square metres, of which only a minimum part already allocated, were already planned or in the process of realisation.

Empty office buildings include, besides neglected real estate, also a share of never utilised or under-utilised, if not actually never completed, volumes. During the 70's and 80's, in fact, several properties were developed by property development companies, which then found buyers only in part, consisting mostly in insurance companies or pension funds that were not required to invest in property to let [2].

In the city of Milan, the presence of empty buildings (not just for offices) – and the attendant consequences in terms of decay, safety, etc. – have reached such a prominent level as to be a periodical focus of attention from media rather than from the Municipal Administration. The latter has launched a mapping headed “Monitoring inspection of buildings and areas in a run-down and neglected state” [3] and promoted in 2014 the three-year Ri-Formare Milano project [4] aiming to promote studies and projects on such issues through the educational activities of Politecnico di Milano’s School of Architecture Urban Planning Construction Engineering (AUIC).

Thanks to the Ri-Formare Milano project, a collaboration has been launched between Politecnico di Milano's Department of Architecture and Urban Studies (DASTU) and the company E.N.P.A.M.RE S.r.l. (agent for the management of the real estate assets owned by Fondazione E.N.P.A.M. – Ente Nazionale Previdenza Assistenza Medici ed Odontoiatri), the goal of which is to develop design themes, for the second year of the laurea programme in Architecture, aimed at identifying a process of re-functionalisation and reintroduction into the residential property market (by pursuing social welfare objectives as well) of properties, currently neglected and unused, falling under the assets of the said Fondazione E.N.P.A.M..

This hypothesis has been accorded preference because the real estate market keeps on expressing a still largely unfulfilled demand for low-cost rental houses, both for long-term leases by families without a high income and for the temporary needs of commuting students or workers, etc., since the supply of houses on the Milan market almost exclusively consists in houses for sale or high-end rental houses. Moreover, the demand for low-cost rental houses is far more widespread in the urban area than that for offices, and the change of intended use would thus enable the valorisation of properties in suburban areas as well. Besides, residential buildings and office buildings have often been realised with very similar building typologies and technological solutions, which thing facilitates the search for adaptation and performance redevelopment solutions. Last, but not least, the reuse interventions on empty buildings contribute to contain the consumption of raw materials and energy and produce less waste than demolition and reconstruction interventions, consistently with the environmental sustainability objectives promoted at national and regional level.

## **1.2. The promoter of the experimental activity**

The real estate assets of Fondazione E.N.P.A.M. are quite wide-ranging, varied and distributed across the entire national territory, with a special concentration in the Milan and Rome areas. The acquisition covers the period from 1956 to 1992, which explains why they include particularly heterogeneous properties in terms of both the constructive-structural characteristics and the intended uses (from housing to services, from commercial to tourism and hospitality). Currently, due to the unfavourable economic scenario and to the growth in available spaces located near or inside the main city centres, a portion of the assets destined for services, situated in suburban or semi-suburban areas, has lost much appeal, apart from marking in any event the inevitable and natural aging process. This reduced attractiveness has entailed that, in different places, there are real estate complexes devoid of a concrete possibility of relocation on the property market. By now, this quantity is beginning to represent a considerable percentage of the entire real estate package, and it was thus deemed particularly interesting to embark, through the university institution as well, on a study concerning a possible reintroduction into the active circuit of real estate realities selected on a four-handed basis, in such a manner

The collaboration with Politecnico di Milano has accordingly represented, for Fondazione E.N.P.A.M., an opportunity to reflect on and deal with a possible exit strategy relating to real estate complexes so far unsuccessful; being able to offer in exchange the possibility for Architecture students to work on a real case, as part of a simulated process of discussion with a client interested in the growth of the revenue-generating potential of their assets.

## 2. LITERATURE REVIEW

Turning empty office buildings into homes is a strategic hypothesis that has begun to be promoted since the turn of the last century.

Among the pioneers, Gann & Barlow [5] confronted the problem of redundancy of office buildings built in the UK until the 1990s. In 1993, they carried out a study to assess the feasibility of their conversion to meet demands for new housing, focusing on property market dynamics, the planning system and location of buildings and technical constraints to conversion. By the analysis of case studies of converted buildings they found out that the success of conversion attempts depends on a wide range of social, political, economic and technical variables. They asserted that technical constraints on their own are rarely insurmountable but the cost of making necessary changes may often be higher than other options of demolition and building anew.

In the same period, the Toronto City Council revealed that the glut of vacant office space had been causing a significant erosion in the tax base of the city. Consequently, in September 1993, it explored ways of countering the reduced revenue through actions aimed at enhancing the streetscape and thus attracting more people downtown. They also recommended a fast-track planning process to permit conversions from offices to houses and to find a means of eliminating the bureaucracy and easing the licensing process. According to T. Health [6], it was this policy-driven planning that stimulated the wide-ranging office conversion in Toronto, whereas private sector developers initiated it in London.

In 2007, Rob P. Geraedts and Theo J.M. van der Voordt [7] noted the mismatch between supply and demand in both the housing market and the Netherlands offices, and presented an evaluation tool aimed at measuring opportunities and risks of converting empty offices into dwellings mismatch between supply and demand, quantitatively and qualitatively. According to Geraedts and van der Voordt, the transformation prospects of office buildings primarily depend on three factors: duration of vacancy; reason for vacancy: market, location or building; municipal policy. In addition, transformation of unoccupied offices into housing only makes sense if the dwelling units produced meet a need. The supply must be in line with the demand of prospective tenants, as regards both the location – which should be a residential environment – and the features of the building. Transformation into low-cost accommodation may be a good choice. Accordingly, young people leaving families (starters), young couples and the elderly without high income were selected as main target. Finally, they listed both location and building factors determining demand for residential accommodation, and developed tools assisting a quick scan of the potential for building conversion.

As regards technical elements, in 2010 H. T. Remøy [8] stated that from different partial studies carried out in her doctoral research she had come to the conclusion that building structure and facade were found to be the two elements of a building that impact the most on the building transformation potential.

In the end, some actions have recently developed to promote the conversion of offices specifically into low-cost housing.

In the UK, for example, a Community Benefit Society, the AEOB (Abolish Empty Office

Buildings), has been set up for this purpose, so now they buy and convert empty offices into houses for people [9].

In the meantime, in the US, the D.C. council started work on finding out any financially viable way to turn some of the growing surplus of empty office space in Washington into rent-subsidized apartments, in order to cope with the problem of ever-worsening shortage of affordable housing for low-income families. In May 2017, this led to the presentation of a bill (currently under council review) aimed at establishing a task force, the Office to Affordable Housing Task Force, to determine the impact of transitioning existing vacant commercial space into affordable units on the District's affordable housing crisis [10].

### **3. EXPERIMENTAL ACTIVITY**

#### **3.1. Methodology and project requirements**

The project experiments aimed at ascertaining the aptitude of former ENPAM RE office buildings to be transformed from a typological and technological viewpoint in order to meet housing needs have been developed within the Construction Architecture lab with contributions from Architectural Technology and Environmental Technical Physics. The intention was in fact to provide students with an opportunity to tackle, through design practice, problems as real as inserted in broader scenarios of international research and urban development; having also the chance to benefit, in their work, from a dialectical exchange with a real and open clientele interested in evaluating even the most innovative or daring hypotheses. That is so since, according to Guazzo [11], in a programme of university studies it is not possible to realise projects properly so-called, but only practical exercises aimed at the students' acquisition of the total set of attitudes necessary for them to express, when called into the real world, a thorough and responsible planning.

Over the course of two academic years, projects have been developed in two neglected ENPAM RE buildings with different building typologies, and the collaboration is expected to be furthered in the coming years, on constantly new cases.

The student groups were able to freely put forward their proposals within a scheme of constraints that included, among other things, the study of interventions aimed at improving sustainability according to the principles of climatic design and containment of consumption levels through the use of resources tending towards nearly zero-energy buildings (NZEB), the analysis of functions to allocate to shared spaces with the aim of developing and enhancing the level of social and interpersonal relationships, and the development of housing sizes based on predefined and binding surface quantities.

The work program was carried out in stages. The first stage was the functional analysis of the context and the environmental analysis of the site, necessary for the subsequent development of the design concept; it was followed by the definition of the functional layout, the design of the houses and verification of the binding requirements; the last phase was dedicated to the constructive project and to verification of the overall energy performance.

The functional program required the design of apartments of various sizes, complying with the dimensional standards of public housing as regards minimum and maximum floor area.

Moreover, a smaller quantity of under standard studios was required for use by students and/or off-site workers or for emergency needs (evicted families, migrants, etc.). The under space standard accommodations had to be supplied even with shared community spaces and facilities, such as laundry, community kitchen, playroom, and so on. Furthermore, the ground floor of the buildings was to be destined to services or trade to increase the neighbourhood facilities for the benefit of both the new inhabitants and the already existing urban community, while the design of external areas should promote outdoor activities and socialization.

Projects were expected to comply with mandatory regulations, especially regarding energy, indoor comfort, fire safety, and accessibility for the disabled; besides single facing accommodations had to be very few. Then, again to improve building environmental performances (as regards natural ventilation, daily lighting, solar insolation, and so on), building shapes were susceptible of being modified, by adding or removing volumes or technical elements, while taking into account the effects on surroundings. Similarly, facades were to be renewed in both systems and components in order to improve both the energy performance and the whole image of the building. Finally, roofs were to be designed to integrate renewable energy systems and/or for common use.

### 3.2. The case studies

Both selected case studies are multi-storey office buildings with a concrete framed structure. They were built in the 70s and their use has ceased for a few years.



Figure 1. The case studies “Toffetti 121” and “Villoresi 13”: images and earth views.

The first case “Toffetti 121” was one of the sites of INPS, the national pension and social security institute. It is located between a brownfield area along the railway and a residential district in the south-east suburbs of Milan. The building stands in a triangular block and consists of six stories above an open ground floor with pillars, and of an underground floor with a parking garage. The plan of about 1,200 square metres is divided into 3 parts (each one with its own core of lifts and stair) slightly rotated around each other.

The second case study “Villoresi 13” is located in the midtown, near the Naviglio Grande channel, in a large block with an uneven development. It is an L-shaped building with one core of lifts and stair in the intersection of the two wings. It consists of a ground floor with a porch, four stories of about 500 square metres and an attic, as well as two basements and an underground parking garage. Large terraces connect each floor to the nearby buildings.

### 3.3. The outcomes

The large number of working groups (about 15 per year) involved in the workshop yielded good results as regards both variety and quality of design and project solutions proposed.

As an example, in order to meet the most updated energy requirements and renew the whole image of the buildings, external walls have been replaced or improved by the addition of insulation and cladding layers with a specific focus on thermal bridges in all junctions with original reinforced concrete structures, especially on cantilevered elements. In addition, on the most radiated sides, different shading device solutions have been conceived, while flat roofs have been mostly integrated with green lawns, as well as with photovoltaic and solar thermal systems.

Then, with the aim of increasing natural ventilation of flats, to access them, aside from traditional internal corridors, in both cases deck accesses (even detached from facades) or duplex apartments interlocked in pairs around a central access corridor (at alternate floors) were proposed.

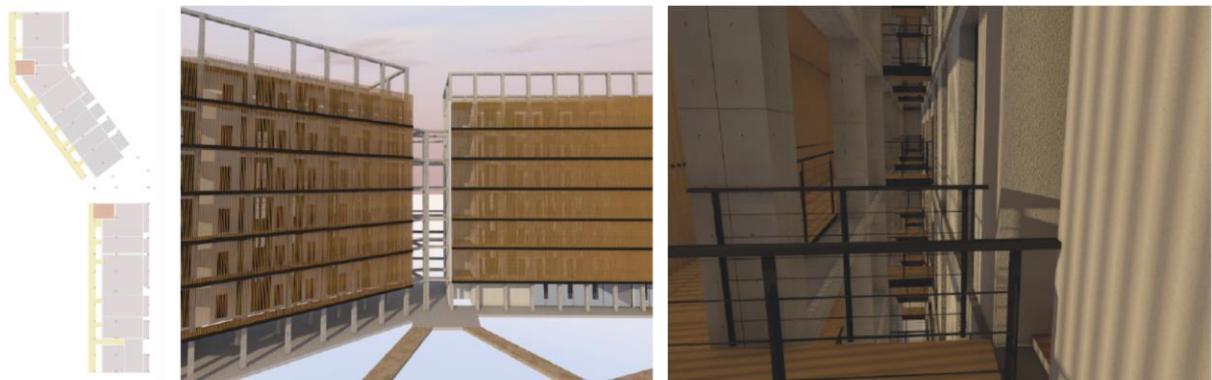


Figure 2. Deck-acces flats in Toffetti 121. Designed by A. Cazzaniga, I. Talamona, A. Tagliabue

The case study of Via Toffetti, which occupies an entire lot, proved easier to adapt and enabled the production of a wide range of solutions with different levels of conservation/transformation of both the floor circulation system and building shape and facades. The proposals envisaged the realisation of a number of houses ranging between 70 and 100, in addition to public services and those dedicated to cohousing.



Figure 3. South-facing solar spaces in Toffetti 121. Designed by L. Fontana, E. Frontini, M. Formolli

In the case of Via Villoresi, instead, both the contextual conditions and the size and shape of the building made shape adaptation harder. For this reason, the number of proposed houses ranged from nearly 35 to 50 units, whereas the surface quantity to let for services to the public was quite similar to that of the previous case.

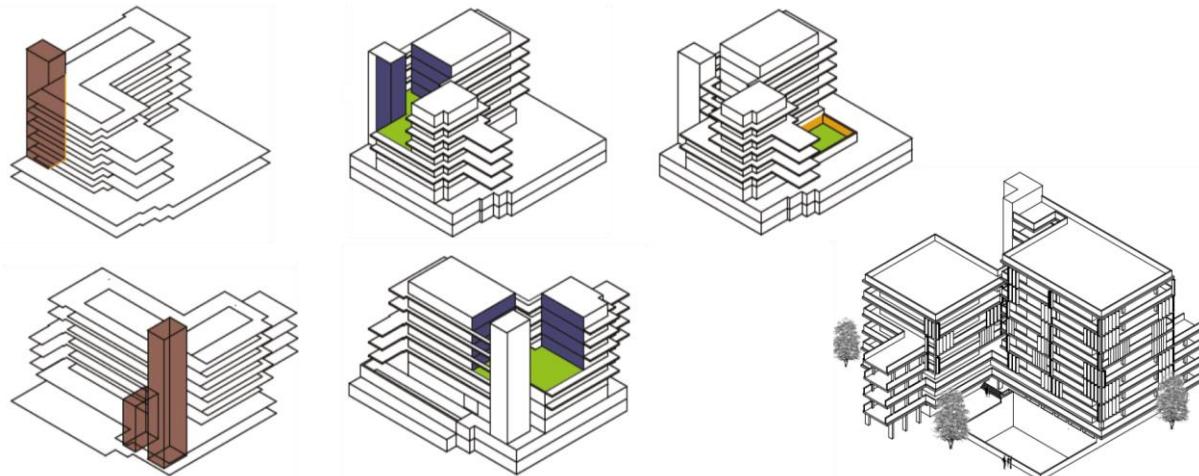


Figure 4. Concept generation for Villoresi 13. Designed by G. Dello Ioio, F. Di Savino, V. Minucci.



Figure 5. Different floor layout solutions for Villoresi 13. Designed by M. Cotugno; E. Fonseca Pizarro, C. Parissenti, B. Parma; M. Preda, P. Nardin, J Perestelo Cruz.

#### 4. CONCLUSIONS

The activity undertaken, the result of the collaboration between the two bodies involved, led to the elaboration of projects (at university level) of reuse of the abandoned properties within the scope of social housing, some of which included noteworthy design proposals deserving a more in-depth study.

By virtue of the results achieved, E.N.P.A.M. Real Estate S.r.l. has now a new perspective and new viewpoints on future developments and on the choices pursuable in respect of the building compounds under study. The future is not simple, as there might be a multiplicity of interests at stake. Currently, one of the opportunities might be to commission design studies, both in the specific case and for any other real estate complex (as envisaged by Legislative Decree No. 50/2016 that regulates the procedure for the owner Body to assign tasks) adopting as guidelines the most enlightened concepts of the papers submitted by the most deserving student groups. The main difficulties might be encountered when defining multi-year orientation choices, which E.N.P.A.M.RE S.r.l. equips itself with through the resolutions adopted by the Board of Directors that must ensure to the owners a proper risk to benefit ratio, in order to re-evaluate the income coming from its own ratepayers and thereby ensure to them a guaranteed future payment of the retirement pension.

Having said that, in the event that the Board of Directors were to express a favourable view about a development that envisages an in-depth treatment of similar issues to those tackled during the collaboration with Politecnico di Milano, the path to pursue would necessarily have to move from the premise of the aforementioned design tasks, to be then followed up until realisation of the new/renewed building product.

Lastly, from the viewpoint of a development that encompasses social issues about disadvantaged subjects, we likewise deem it possible to pursue the path aimed at activating

collaboration ties with such subjects as Municipal Administration, Metropolitan Area and, if need be, with private bodies inclined to subsidise operations for social purposes that might promote and incentivise the implementation of interventions, via economic subsidies, equity stakes and/or facilitations of various types and kinds.

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