

Construction of Unique Buildings and Structures



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Reconstruction of Urban Areas: Sustainable Strategy of Obsolete Building Conversion to Residential Uses

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ABSTRACT

Changes in the existing urban structures that result in obsolescence and abandonment of buildings open up the opportunities for an alternative use of the existing building fund that would be in line with the current needs and aspirations of today. Conversion of obsolete buildings to residential buildings might be an optimal solution for the social and demographic changes that continuously influence and intensify the demands for new housing. The paper points out the quality of this approach and explores the extent to which conversion of obsolete buildings for residential uses may be a valid tool in sustainable development strategy.

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1. Introduction

In the existing urban areas, there are more and more abandoned buildings that face the problems of economic, technological, social or functional obsolescence, which may be conditioned by the building characteristics or resulted from the aspects of wider environment. The problem of architectural heritage obsolescence has been intensified with its inability to adapt to contemporary socio-economic demands and advances in technology. On the other hand, during the progressive growth of world population, the need to form a new housing environment in already defined and densely populated urban structures, has become one of the universal problems of today. Contemporary approach to architectural heritage conservation should pay more attention to the historical parts of the city in terms of its continuous exploitation through time i.e. to continuity of functions and relations that individual buildings define as part of dynamic urban context. Conversion, as an approach within the sustainable strategy, is a possible solution for the problems of obsolescence and abandonment of architectural heritage buildings and the growing demands for new residential environment in overcrowded urban structures. Obsolete building conversion for acceptance of residential function is one of the current approaches and the main issue of further research. Decisions regarding the implementation of conversion in order to build a new residential environment should be based on the possibilities and limitations that are unique to each individual building [1-20].

2. Advantages of obsolete building conversion to residential uses

Progressive socio-economic development, new legal frameworks, advances in information and communication technologies influence the creation of constant change climate that sets up new demands in architecture. The fact that the historic towns in contemporary conditions are increasingly losing their identity due to the negative impact of globalization, it is necessary to define the planning strategy that ensures its preservation and sustainability. Changes in the existing urban structures that result in building vacancy in terms of essential functions loss are opening opportunities for architectural heritage utilization in accordance with the needs and aspirations of the present. Since the conversion is only one of the possible methods of urban renewal, it is necessary to analyze the feasibility of applying this approach.

There are potential economic, environmental and social advantages of this approach. Using the obsolete buildings to form the residential environment primarily protects valuable resources of social community, reduces the costs of land acquisition, construction and rental housing. Since the housing function is placed in the old building, which saves the additional material and energy resources, the square cost is significantly reduced compared to the square cost in the new building. The quality of this approach is also reflected in creation of ecologically responsible living pattern in a healthy residential environment that reduces further environmental pollution by harmful construction and exploitation products. Seen from the social point of view, the quality of conversion is reflected in a better relationship between environment and existing architectural heritage that gives a sense of belonging to the tenants, close neighborhood, and encourages further revitalization of the residential environment. Sustainable development must aim to produce a city that is user friendly and resourceful, in terms not only of its form and energy efficiency, but also its function, as a place for living [1]. The possibility for creating more sustainable cities by existing facilities can be understood through the coordination of a plethora of measures at both local and national level, together with initiatives related to development, transport, energy efficiency and resource conservation [2].

3. Key factors of residential conversion process

Sustainable strategies of building re-use require a specific contextual response to each proposal and therefore careful consideration is needed for each proposed contemporary insertion. The process and decisions involved in creating adaptive re-use projects need to be carefully considered and managed. An engaged and creative consultant design team needed to ensure the potential of re-purposing buildings, structures, and spaces.

Conversion projects should integrate five principles into the design:

- performing the functions for which they are redesigned in quality manner,
- long lasting and adaptable performance in the context of new uses implementation,
- establishing the adequate connection to the immediate and broader surrounding while enhancing their context,
- providing the visual coherence for users and passers-by and aesthetic contribution to city development,

- creation of sustainable environment– nonpolluting, energy efficient, easily accessible with a minimal environmental impact [3].

Conversion of abandoned buildings to residential buildings only makes sense if the resulting transformation meets the wishes and needs of potential users. The offer should meet the requirements defined at all spatial levels. To assess the quality of conversion in terms of meeting the priorities and needs of target tenant groups, it is necessary to define the key factors affecting the choice of residential environment. To facilitate consideration of the basic housing requirements, two basic groups of conditions are defined: those related to housing environment and those related to residential building.

Location characteristics. The choice of residential environment largely depends on the subjective attitude of potential tenants. Some of the users choose the densely populated urban surroundings, with business and commercial buildings in the immediate environment, while the others prefer more peaceful suburban areas in a natural environment. The building position in relation to certain public facilities in many ways determines the housing quality in a particular location. Based on conducted research it is concluded that the availability and frequency of public transport have less influence on the choice of living environment than the proximity of urban roads and building access solution (Tab. 1)

Housing characteristics. Housing type, functional facilities and size of housing units are the key factors in terms of decision and choice of residential environment. Spatial organization of housing unit, special benefits it provides, environmental aspects and general terms and conditions have less influence on residents' choice. The relation between square cost and quality of housing unit as well as the neighborhood quality should be also taken into consideration (Tab. 1). [4] Type of requirements and priorities, based on given criteria, ranging from one to another target group and primarily depends on the age and socio-cultural structure of the tenants.

Table 1. Housing requirements related to location and housing facility

LOCATION (living environment)		BUILDING (dwellings)	
1. Representative/ character a. nature of building b. social image c. vitality d. greenness	3. Accessibility by public transport a. distance to public transport b. frequency and times c. distance to tram or metro d. distance to train station	1. Type of house 2. Entrance 3. Size of home a. number of rooms b. living room c. kitchen d. bedrooms e. sanitary space f. storage space	9. General conditions a. accessibility b. safety c. alterability d. adequate management
2. Facilities a. shops b. bars, restaurants, etc. c. schools d. bank/ post office e. medical facilities f. recreation facilities	4. Accessibility by car a. distance to motorway b. traffic through flow c. parking opportunities	4. Layout of the home 5. Level of facilities 6. Outside space 7. View out end view in 8. Environmental factors a. heating b. ventilation c. noise d. sun and daylight e. energy usage f. material usage	10. Costs a. purchase or rental price b. additional costs

With regard to location, it is easier to compare the existing situation and requirements than to analyze the aspects relating to the housing unit. At the location level, it is necessary to analyze the facilities that are located in the vicinity, distance to public transport and give a general impression of safety and quality of life in a particular environment. Evaluation of suitability at the building level is more complex. Some of the building characteristics are not necessarily related to the needs and desires of potential tenants, such as the new function adaptation to the existing structural and installation systems in the building. Regarding this, the extent to which the existing structure match the requirements cannot be determined if the initial phase of the conversion plan does not include

a detailed analysis of possible physical solutions, the number, size and type of housing units and assess of square costs.

4. Criteria for evaluating the quality of conversion process

Identification of key criteria that determine the quality of potential interventions is the first step in finding an alternative and sustainable solution to the problem of building obsolescence. Thus, in the process of analyzing the suitability of conversion, it is essential to:

- identify all negative factors for modification or elimination
- target the positive characteristics for promotion and exploitation
- recognize those issues that have largely neutral effect“ [5].

Sustainability of the approach will depend on degree to which the negative characteristics and limitations might be overcome as well as the extent to which the positive characteristics can be utilized. The evaluation of the benefits and limitations is the starting point in assessing the quality of conversion. Based on the group characteristics that are considered, the criteria for evaluation of the suitability of building conversion are defined (Tab. 2). [6] The rationality of the conversion of obsolete buildings to residential buildings is therefore a complex issue and requires detailed analysis of impact factors, advantages and limitations of such strategic approach.

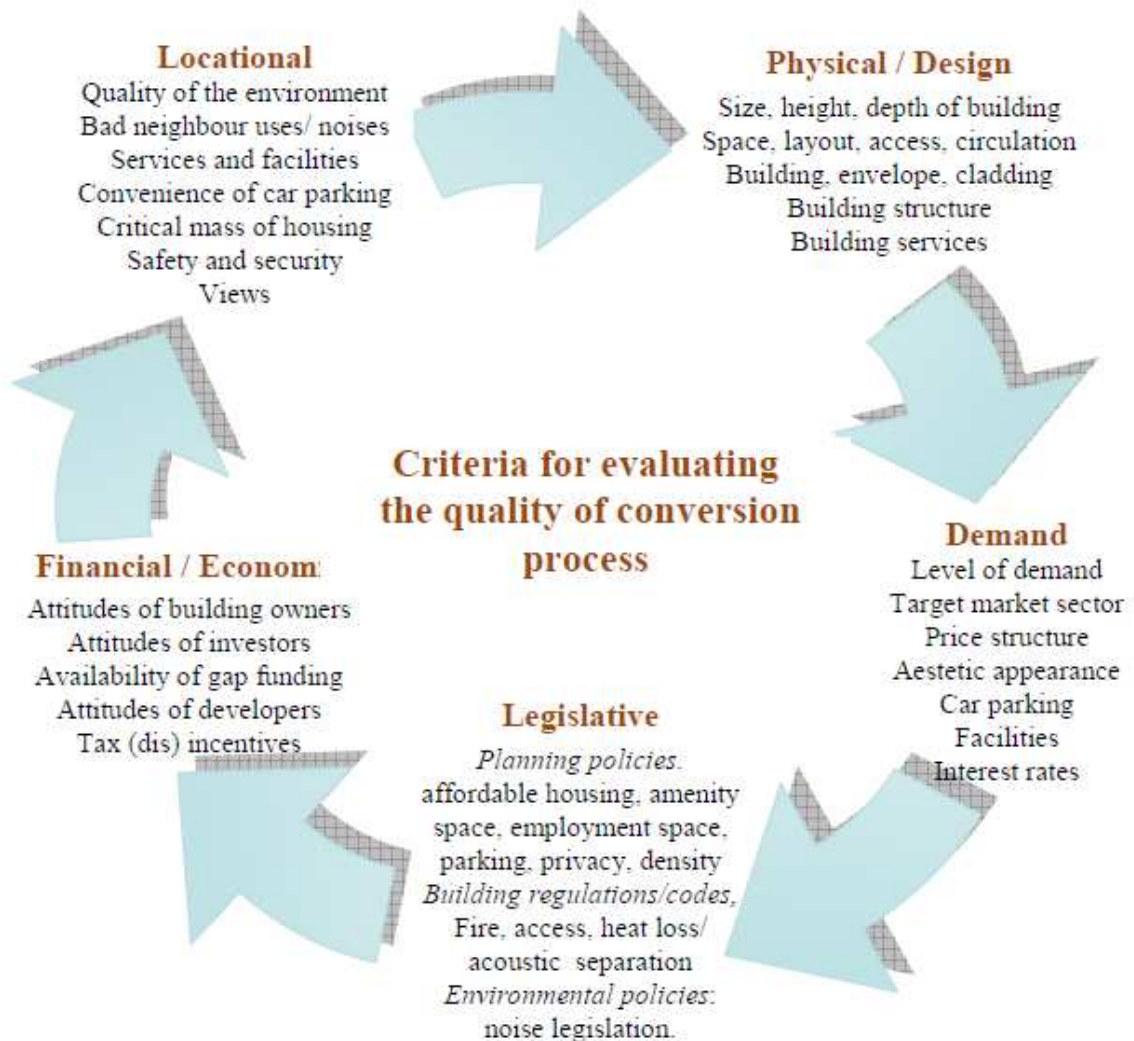


Figure 1. Criteria for evaluating the quality of conversion process

5. A case study: Conversion project for industrial complex “Napredak” in Leskovac, Serbia

In line with the current global trend of industrial zones relocation from the city center, old and abandoned factory are replaced with business, residential and commercial complexes while newly designed factories are built in the peripheries of the cities of Serbia. According to the previously defined criteria, the evaluation of architectural solution quality and applicability of conversion principles is conducted on the example of conversion of warehouse-manufacturing complex “Napredak” in Leskovac. Multi-criteria analysis identify the basic characteristics of typical conversion project. Based on obtained results, evaluation of suitability of concrete building in order to accept the housing functions was performed.

Within the complex, there are four objects that contain production facilities, warehouses, workshops, restaurant, kitchen and ambulance station. From 2010, once the most powerful printing office in the South Serbia is in bankruptcy. In the same year, the initiative for its conversion from industrial to residential complex has been launched. Conversion and extension project is currently underway. In further research, only those criteria related to architectural and structural building characteristics and characteristics of residential environment are analyzed.

Location characteristics. The existing structure is located in the central zone of Leskovac, in the complex that borders the streets Strahinjića Bana, Kraljevića Marka and 28. Marta, with the main entrance from the street Toma Kostić. In immediate vicinity of the site, there is the main bus station and the railway Belgrade-Nis-Skopje-Athens. The complex is situated near the residential area with a lower storey buildings protected from negative impacts of the industry by the green buffer zone. Important facilities in the immediate environment are City Heating Plant, Textile School, Higher School of Economics, Main Post Office and Faculty of Technology (Fig. 2).

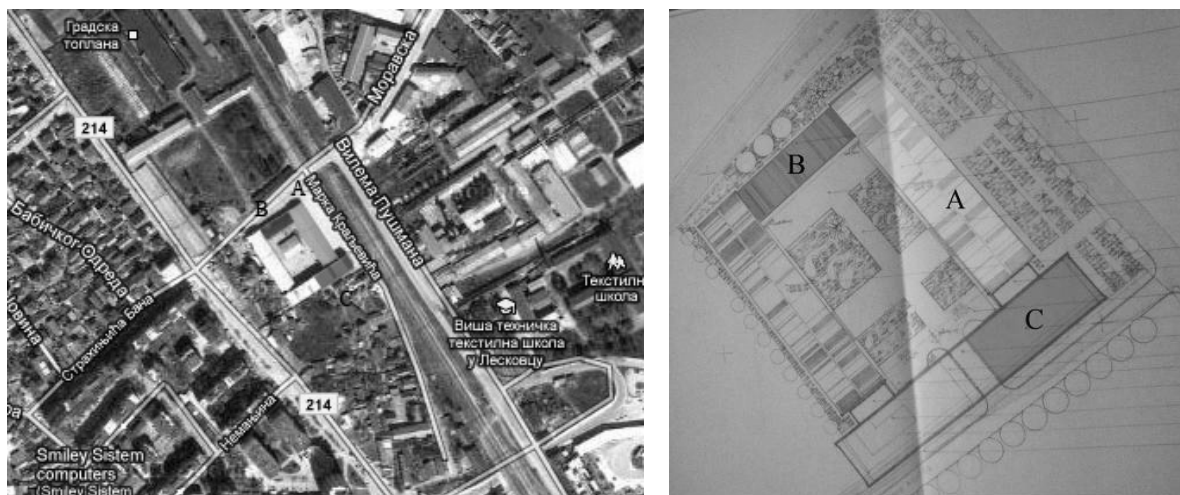


Figure 2. Situation plan and landscape design of complex

Housing characteristics. The conversion and extension project includes the facilities in the northern and eastern side as well as the part of the building in the southern side of the complex (buildings A, B, C). For the objects A and B, which housed production facilities, project includes building reconstruction and superstructure to accommodate commercial and residential facilities on the ground and first floor. The project for the building C, in which the ancillary facilities are placed, includes reconstruction of the part of the building with storage and ambulance station to accommodate commercial and residential facilities on the ground and first floor. The buildings were cored to their shell construction, which is constructed in reinforced concrete structural system, with storey height of 3.7 m. Structural, and design module of 6 m is adequate to accommodate the required facilities and generally corresponds to the width of a housing unit. Facility provided 36 housing units whose sizes range from 26 to 73 sqm (Fig. 3).

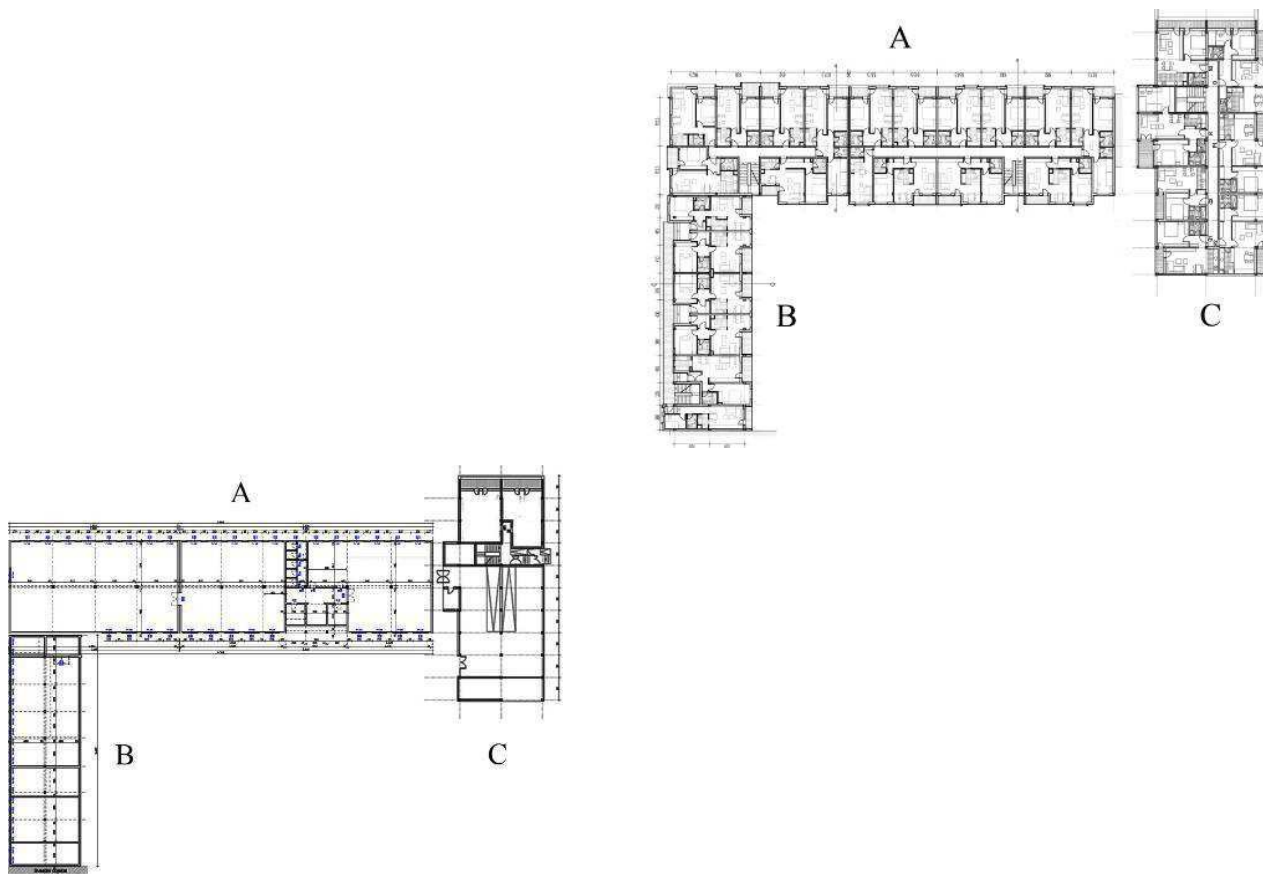


Figure 3. First floor plan of the object A, B and C before and after conversion

During the thoroughly analysis of the conversion potentials, the individual characteristics of the project were identified as assets and challenges. Within the table 3, x, o, and xo represent the characteristic being viewed as a challenge, asset, or both, respectively.

The characteristics in the table are the main influencing factors of the quality of conversion, related to environmental and locational aspects of project implementation.

This method is based on the previous research presented in the paper entitled „Adaptive reuse of Industrial Building in Toronto, Ontario: Evaluating Criteria for Determining Building Selection“, by Corey Andrew Wilson [7].

Table 3. Project characteristics defined as assets and challenges

CHARACTERISTICS									
Environmental				Locational				Total Challenges	Total Assets
Contamination	Architectural and structural conditions	Site work	Space layout	Surrounding	Uses and Quality Level	Compatibility	Site layout		
x: Characteristic viewed as a challenge					o: Characteristic viewed as an asset				

The mid-range contamination of soil (which typically originated from the by-products of the previous manufacturing or storage processes) required excavation from the ground and disposal, as required by law, at a premium cost, or remediation on site.

The architectural and structural characteristics of the building were considered as particularly suitable: tall ceilings, large quantity of big windows, large amount of interior open space, and the overall uniqueness and character of the building. The building is in architectural and structural terms suitable for accommodation of housing function. Uniform module and open plan design of the existing structures, leave space for a high-quality solution of spatial configuration of the assembly. A wide range of housing units' area obtained by their variety is corresponding to variety social structures of tenants. Long fronts with large openings on the facade as well as a large storey height and courtyard solution provide high quality housing comfort, which means an optimal ventilation and insulation, high-quality views and connections to the natural environment.

The complex location in the central city area, rich with variety of residential, cultural and commercial amenities as well as easy access to public transport and main roads correspond to the quality standards set for housing in urban areas.

The industrial complex has adequate pedestrian and vehicular access and parking space that are consistent with *The conditions and technical standards for design and construction of residential buildings*. Courtyard inside the complex contains a number of green surfaces, pedestrian walkways and recreational areas where the social community is shaped through informal interaction of tenants in natural environment. Assets and challenges ratio (7:2) indicates the high potentials of inherited structures conversion to residential uses. Based on the conducted research, it can be concluded that the application of this approach in our community is in accordance with established principles of obsolete buildings conversion to residential buildings.

6. Summary

With appropriate flexible and positive planning policies buildings of existing architectural fund that are out of their primary function may be transformed to objects with different purpose. Potential for obsolete buildings conversion to residential buildings is arising from relationship between the existing architectural fund and demands for a new housing environment. Using this strategic approach the numerous positive results are achieved, such as upgrading the residential environment, extension of building life span, maintaining its architectural and historical integrity, revitalizing the urban areas, saving energy and material resources, environmental protection, increasing the visual quality of built environment etc. In the process of evaluation the quality of conversion, primarily it is necessary to define the general residential requirements, which relate to the needs and desires of potential users. Identification of key criteria that determine the quality of potential interventions is the next phase in finding an alternative and sustainable solution to the problem of building obsolescence. In the research, process of obsolete building conversion to residential building it is necessary to make a serious analysis of positive and negative factors of this transformation. Sustainability of this approach will depend on the degree to which the negative factors and limitations can be overcome as well as the extent to which the positive characteristics and potentials can be utilized. Such intervention would have sense only in cases when the final result is more acceptable solution compared to alternative and radical problem solutions, taking into account all defined aspects of sustainability.

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Реконструкция городских территорий: стратегия модернизации зданий старой постройки

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градостроительство;
модернизация;
устаревшие здания;
стратегия устойчивого развития;

АННОТАЦИЯ

Реконструкция городских территорий на фоне технологического, социального и функционального устаревания нежилых зданий старой постройки открывает возможности для их альтернативного использования в соответствии с текущими потребностями современного развития городской среды. Одним из путей такого развития является преобразование зданий старого фонда, исчерпавших свою прежнюю нежилую функцию, в жилые здания. Такое преобразование может стать оптимальным решением на фоне современных социальных и демографических потребностей развивающейся городской среды. В данной статье исследуется, в какой степени реконструкция нежилых зданий старой постройки, с изменением нежилой функции на жилую, может стать действенным инструментом в стратегии устойчивого развития городских территорий.

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