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TRANSFORMATIONS OF THE SOCIAL MODERNIST BUILDINGS DURING THE TRANSITION IN TERMS OF THEIR RENOVATIONS FOR BETTER ENERGY EFFICIENCY

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ABSTRACT

The catastrophic earthquake in 1963 caused over 1000 human losses, more than 80% building stock's destruction and irreversible degradation of the cultural heritage, that changed the image of Skopje forever. The post-earthquake period brought an expansion of the building sector, rapid housing construction in order to house as many people as possible, as well as intensive construction of public institutions. At that time, the country was under a socialist political economic system, and most of the buildings were built and financed by the State Budget and belonged to the State. The ideological drive for faster renewal of Skopje, allied with rapid industrial development and accompanying migration from the countryside to the city, created radical and modern architecture. On the other hand, in terms of energy efficiency aspect, the social modernist buildings were built without thermal insulation materials and they have poor thermal properties and thermal comfort. The transition from socialist to capitalist society brought new standards, norms and created a big transformation in architecture. The purpose of this paper is to investigate the transformations that happened to the social modernist architecture in Skopje during the transition to capitalist society from the perspective of energy efficiency renovation measures. For this purpose, through a critical selection of 30 case study buildings, documentation and analysis of the current state of the selected buildings were carried out. The buildings were analyzed according to their typology, construction, building materials, thermal properties, function, cultural heritage protection, degradation, preservation and retrofit measures. It can be concluded that in order to improve their energy efficiency, inadequate retrofit interventions are constantly being implemented and their authentic appearance have been changed. Solutions should be found for appropriate renovation of these buildings, whereby their energy efficiency and sustainability would be improved, while their authentic appearance would be preserved as much as possible.

Key words: social modernist architecture, transformation, transition, energy efficiency

I. INTRODUCTION

As a consequence of the political changes, economic flows and social relations, Skopje experienced dramatic spatial transformations during the 20th century. The architecture that was created as a product of the successive modernization cycles during that period, especially after the earthquake in 1963, has a special value (Deskova, 2015). After 1963, with the support of the UN, the Yugoslavian government adopted Tange's reconstruction plan and Skopje started to develop as modern, utopian metropolis, whose style was predominantly brutalist architecture. When Macedonia gained independence in 1991, national politics changed the identity of Skopje's architecture. The socialist international architecture could not represent Skopje identity any more (Positano, 2016). This period of transition brought many changes in architecture, not only through the construction of new buildings, but also through changes in the existing modernist buildings, which are important cultural heritage.

On the other hand, the social modernist buildings are facing serious environmental issues in terms of energy consumption, emissions and thermal comfort, because according to the standards of their time, they were built in lack of thermal insulation materials (Stratton, 1997). The transition from socialist to capitalist society brought new standards and norms especially in terms of sustainability and energy efficiency, which led to building new energy efficient buildings but also renovation of the existing ones for improving their energy efficiency.

This paper is investigating the changes that occur in social modernist buildings during the transition period, especially in terms of their energy efficiency, with particular emphasis of the renovation measures, i.e. how correctly they are implemented and whether they have repercussions in terms of the buildings' authentic appearance.

2. SELECTION CRITERIA AND METHODOLOGY

In order to see the impact that the transition has on the social modernist buildings in Skopje in terms of renovation procedures for better energy efficiency, comparative analysis of selected buildings are carried out, documenting their authentic and current condition. 30 modernist buildings estimated as cultural heritage, built in the post-earthquake period, are selected for the research. In order to see the impact of the transition interventions in different building's typologies related to function, form, value, construction, etc., the buildings' selection is according to the following criteria: architectural and cultural values, function, construction and façade design. The methodological approaches are used for the research are documentation of the buildings' existing condition and renovated condition through detailed data review of

the architectural projects, standards, norms, legislation and situ visits. Some of the social modernist buildings selected for the analysis are shown in the Figure 1.

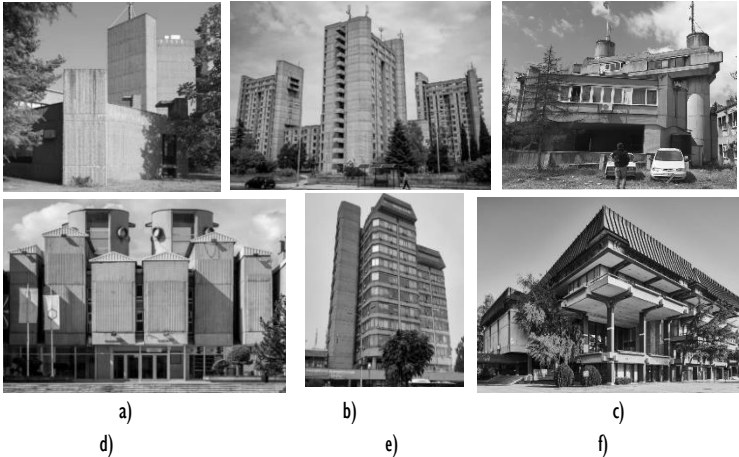


Figure 1: *Skopje social modern buildings – case studies a) Historical Archive of Skopje; b) Student dormitory "Goce Delchev" c) National Hydrometeorological Institute d) University Campus "Ss.Cyril and Methodius" e) Macedonian National Bank f) Macedonian Academy of Sciences and Arts*

3. RESULTS

According to the criteria for selection based on their function, the analyzed buildings have different functions: residential, commercial, educational, cultural, religious, health, infrastructural, public administration etc. The biggest part of the analyzed buildings are public administration and education, each with 23%, then culture with 20% and residential with 17% (Fig.1). Commercial buildings have a smaller percentage (7%), followed by health (4%), religion (3%) and infrastructure (1%). This leads to the conclusion that transition changes occurred in different types of buildings, however, mostly in buildings where people live and work most of their time, such as residential, public, educational and office buildings, which have a bad thermal comfort due to the lack of thermal insulation and they are in a great need of improving their energy efficiency. Results are shown on Fig.2.

To better understand the processes that happened during the transition renovation measures due to new energy efficiency standards, the interventions are categorized in four types, based on two aspects such as level of intervention (smaller or larger) and the degree of improvement of building's thermal properties: Type 1. Buildings that remain in their authentic condition with low thermal properties (no insulation added); Type 2. Buildings with minor interventions (interior renovation, carpentry or roof repair) with slight thermal properties improvement; Type 3. Buildings with major interventions (envelope renovation) with significant thermal properties improvement; Type 4. Buildings with major interventions but without thermal properties improvement, i.e. no insulation added; Type 5. Demolished buildings.

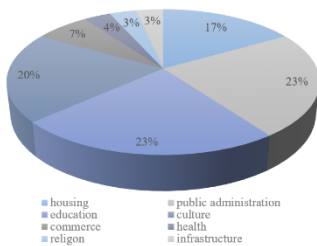


Figure 2: *Types of building's function*

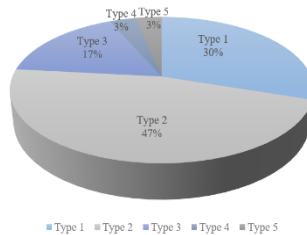


Figure 3: *Types of implemented interventions*

Results show that buildings with minor interventions and slight improvement of the energy efficiency are the most common (47%). 30% of the buildings remain in the original state without undergoing any interventions, but also without improving the energy efficiency. 17% are buildings with major interventions, (façade, roof and carpentry renovation) and there is a significant improvement of their thermal properties. However, there are also renovated buildings without energy improvements, since no insulation is used in renovation (3%). This is often a case where, due to the preservation of authenticity, energy efficiency is neglected. The demolished buildings share the same percent. More than 80% of the buildings have low thermal properties and not corresponding to nowadays standards. Results are shown on Fig.3 When implementing renovation measures to cultural heritage buildings, it is always difficult to fully respect the building's original appearance (Lembo, 2014). Improving the energy efficiency of cultural heritage is a complex process, which is even more complicated for daily functioning buildings. For this purpose, analyses of the above-mentioned renovation procedures impact on buildings' authenticity are carried out and results are shown in Fig.4. According to the authenticity impact, the buildings are divided into 7 types: Type 1. Unchanged authenticity; Type 2. Partially impaired authenticity; Type 3. Endangered authenticity; Type 4. Authentic appearance imitation; Type 5. Completely changed authenticity to an unrecognizable condition; Type 6. Preserved authenticity through restoration with identical materials.

50% are with partially impaired authentic appearance. 37% are in their authentic condition. 7% have endangered authenticity. 3% have implemented imitation as measure, by preserving the authenticity and improving the efficiency with new materials. 3% are with inappropriate interventions with completely changed looks to unrecognizable condition. There are no properly preserved buildings through restoration with identical materials.

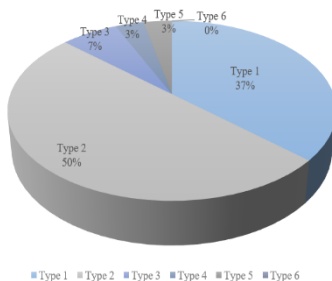


Figure 4: *Authentic appearance condition*

4. CONCLUSIONS

Social modernist buildings have undergone many changes during a period of transition until today. In order to improve their thermal comfort and energy consumption, interventions have been implemented which, according to this research, have proven to be inappropriate and degrading. According to the obtained results, more than 80% of the buildings still have low thermal properties, despite the implemented interventions. 60% of the renovated buildings have at least partially impaired authenticity, which leads to the conclusion that during the transition no appropriate methodology for renovation of modernist buildings has been established and the implemented measures negatively affect their architectural appearance.

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