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THE PRINCIPLES OF METABOLISM IN ARCHITECTURE FOR THE RECONSTRUCTION OF WAR-RAVAGED CITIES

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Introduction. Reconstruction of cities after war is a complex and multi-faceted process, requiring not only physical restoration of destroyed structures, but also careful consideration of social, economic, and cultural aspects. In this context, the principles of implementing metabolism in architecture become increasingly relevant and important. Metabolism, borrowed from biology, is a concept that allows buildings and urban structures to grow, change, and adapt to new conditions, meeting the needs of inhabitants and changing environments.

The concept of metabolism in architecture emerged in Japan in the 1960s and was proposed by a group of Japanese architects, including Kenzo Tange, Fumihiko Maki, and Kisho Kurokawa, as an alternative to Western rationalistic concepts [1]. Metabolism suggested a new approach to design and construction, inspired by biological processes, which laid the foundation for buildings to grow and transform in response to the current needs of society and the environment [2].

Currently, the principles of metabolism in architecture are gaining particular relevance in the context of reconstructing cities devastated by war. In this paper, we will examine the key principles of implementing metabolism in architecture in the reconstruction of war-torn cities and their significant importance in creating sustainable and viable urban environments [3; 4].

The *main purpose* is to investigate the effectiveness and benefits of applying the principles of architectural metabolism in the reconstruction of war-torn cities.

Results. The concept of metabolism in architecture offers a unique approach to implementing new solutions and concepts in the process of reconstructing war-torn cities, namely creating urban structures capable of growth, change, and adaptation to various needs of inhabitants and environmental challenges.

But why should attention be paid to architectural metabolism in the reconstruction of cities? In addition to traditional and standard approaches, the principles of metabolism in architecture offer several advantages that can make the reconstruction process more effective and sustainable:

Creation of urban structures that not only recover but also evolve over time. Instead of simply restoring damaged buildings and infrastructure according to previous standards, we can create urban spaces that can grow and change according to the needs of inhabitants and changing environmental conditions.

Creation of resilient urban environments capable of adapting to various challenges and threats. This includes creating buildings and infrastructure that can efficiently use resources, minimize the impact on the environment, and provide safety and comfort for inhabitants.

Creation of innovative and unique urban environments that can serve as symbols of renewal and revival after war destruction. This approach allows for the creation of cities that are not only functional but also inspire with their design and concept [4].

Next, we will consider several key principles and ideas that can be successfully implemented in architecture when reconstructing war-torn cities, taking into account their historical heritage, socio-cultural significance, and the needs of future generations.

Flexibility and Adaptability. This principle involves creating urban infrastructure and architectural objects capable of flexible adaptation to changing needs and conditions. For example, modular buildings or systems that can be easily modified or supplemented depending on the needs of the urban environment. In the context of post-war city reconstruction, flexibility and adaptability enable the creation of infrastructure that can quickly adapt to changes in population size, economic rehabilitation, or the development of new technologies.

Resilience and Resource Efficiency. This principle involves the use of sustainable materials and technologies in architecture, as well as the development of energy-efficient buildings and infrastructure. This includes the use of solar panels, waste utilization systems, and efficient thermal insulation. Implementing this principle can help minimize the negative impact on the environment and ensure the economic efficiency of long-term city development.

Socio-cultural Integration. This principle takes into account the socio-cultural characteristics and needs of the local community when designing the urban environment: public spaces that reflect local culture and developing architectural objects that consider the traditions and customs of local residents. Socio-cultural integration allows for the creation of urban environments that contribute to the restoration of social solidarity and cultural unity in local communities.

Innovations and Technologies. This involves the implementation of innovative technologies and solutions in architectural design and construction to improve the quality of life and safety of urban objects: using 3D printing, intelligent management systems, or smart technologies. When reconstructing war-torn cities, innovations and technologies allow creating modern and safe urban environments that contribute to the economic and social development of the city.

Reconstruction and Rebuilding. This principle includes the development of flexible plans for the reconstruction and rebuilding of urban structures while preserving the historical heritage and architectural character of the city. It includes the restoration of historical buildings and the adaptation of existing infrastructure to modern needs in order to preserve the cultural heritage of the city and restore its identity while simultaneously providing modern living and development conditions.

The outlined principles provide the opportunity to formulate a strategy for architectural and urban planning actions in the reconstruction of destroyed cities, which can include the following stages:

Analysis and Assessment. Researching the extent of city destruction, identifying key architectural and socio-cultural aspects, and determining needs and priorities for reconstruction.

Concept Development. Based on the analysis results, formulating a comprehensive reconstruction concept that considers the principles of architectural metabolism, as well as historical heritage and community needs.

Planning. Developing specific plans and projects for the reconstruction of various parts of the city, including infrastructure, public spaces, residential areas, etc.

Implementation. At this stage, the principles of metabolism are implemented through the specific projects and activities, including construction of new buildings, reconstruction of existing structures, improvement of public spaces, and other actions.

Monitoring and Evaluation. After project implementation, it is important to monitor and evaluate their effectiveness and compliance with set goals and principles. This allows for adjusting the reconstruction strategy according to changing conditions and needs [1; 2].

It is worth noting that the proposed staged approach to the reconstruction strategy of

war-torn cities allows for organizing the reconstruction process systematically, ensuring the most effective use of resources to achieve sustainable and long-term results.

Conclusions.

1. The reconstruction of cities after war is a complex and multifaceted process that requires a coordinated approach, integrating not only the physical restoration of damaged structures but also considering socio-cultural, historical, and environmental aspects. In this study, we examined the possibilities of applying the principles of metabolism in architecture to the reconstruction of war-torn cities.

2. The principles of metabolism in architecture offer an innovative approach, allowing for the creation of urban spaces capable of growth, change, and adaptation to various needs of inhabitants and changing environmental conditions. This enables the creation of sustainable and viable urban environments that reflect the historical heritage and socio-cultural significance of the local community.

3. The strategy of implementing the principles of metabolism in architecture in the reconstruction of cities includes a staged approach, starting with analysis and assessment, concept development and planning, and ending with implementation, monitoring, and evaluation. This approach allows for the systematization of the reconstruction process and ensures the achievement of sustainable and long-term results.

References

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