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SPATIAL DIFFERENCES IN THE DEVELOPMENT OF THE CONSTRUCTION SECTOR IN THE REGIONS OF UKRAINE

O. Greits, S. Kudelina

Odessa I. I. Mechnikov National University

Abstract

The article examines the spatial differences in the development of the construction sector in the regions of Ukraine in the conditions of war destruction and post-war challenges. The role of the construction industry as a key factor in the restoration of social, industrial and transport infrastructure, as well as as a system-forming element of the regional economy, is determined. Regional features are analyzed: in Western Ukraine - the predominance of housing construction for internally displaced persons, in Central - the concentration of production facilities and infrastructure projects, in the South - large-scale tasks of reconstruction of ports, hydraulic structures and transport hubs, in the East - colossal destruction and the need for long-term reconstruction strategies, in the North - an emphasis on the restoration of border areas and small towns. It is established that spatial disparities in the development of the construction sector determine the need for a regionally differentiated policy of reconstruction and integration into the European economic space. Particular attention is paid to the introduction of innovative and "green" technologies as tools for modernization of the industry.

Keywords: construction industry; spatial differences; regional development; reconstruction; infrastructure; innovations; "green" construction; Ukraine.

ПРОСТОРОВІ ВІДМІННОСТІ РОЗВИТКУ БУДІВЕЛЬНОГО СЕКТОРУ В РЕГІОНАХ УКРАЇНИ

О.Грейц, С. Куделіна

Одеський національний університет імені І.І. Мечникова

Анотація

У статті досліджуються просторові відмінності розвитку будівельного сектору в регіонах України в умовах воєнних руйнувань та післявоєнних викликів. Визначено роль будівельної промисловості як ключового чинника відновлення соціальної, промислової та транспортної інфраструктури, а також як системоутворювального елемента регіональної економіки. Проаналізовано регіональні особливості: у Західній Україні – переважання житлового будівництва для внутрішньо переміщених осіб, у Центральній – концентрація виробничих потужностей та інфраструктурних проєктів, у Південній – масштабні завдання реконструкції портів, гідроспоруд і транспортних вузлів, у Східній – колосальні руйнування та необхідність довгострокових стратегій відбудови, у Північній – акцент на відновленні прикордонних районів і малих міст. Встановлено, що просторові диспропорції у розвитку будівельного сектору зумовлюють потребу в регіонально диференційованій політиці відбудови та інтеграції у європейський економічний простір. Особливу увагу приділено впровадженню інноваційних та «зелених» технологій як інструментів модернізації галузі.

Ключові слова: будівельна промисловість; просторові відмінності; регіональний розвиток; відбудова; інфраструктура; інновації; «зелене» будівництво; Україна.

Problem statement.The construction sector is one of the basic elements of the national economy, because it is it that ensures the reproduction of the material basis of social life - housing stock, industrial and transport facilities, social infrastructure. In the context of modern challenges associated with large-scale military destruction, its role acquires special importance. The speed and quality of reconstruction of territories, the return of the population, stabilization of economic activity and integration of Ukraine into the European spatial and economic space depend on the efficiency of the organization of the construction industry.

The scientific relevance of the study lies in identifying spatial differences in the development of the construction sector in the regions of Ukraine. The spatial approach allows analyzing the industry not only as a set of enterprises or economic processes, but as a territorially organized system that functions in connection with natural, demographic, social and economic conditions. This approach corresponds to the concept of territorial organization of society, according to which economic sectors are not homogeneous in their development, but form regionally specific structures and clusters.

Spatial differences in the development of the construction sector are manifested in various aspects. First, the scale of destruction and reconstruction needs, which vary between regions: from significant damage to infrastructure in the East and South to the relatively stable development of construction in Western Ukraine. Second, the resource potential of the industry is unevenly distributed: cement plants, metallurgical enterprises and construction materials factories are concentrated in certain regions, which creates dependence on transport and logistics schemes. Third, the level of innovative development and implementation of "green" technologies also differs, which affects the quality and sustainability of reconstruction. In modern conditions, regional policy is of particular importance, able to take into account territorial features and ensure the comprehensive use of existing potential. For western regions, housing construction for internally displaced persons and the development of social infrastructure are relevant; for central regions, modernization of transport and industrial facilities; for southern regions, restoration of ports, hydraulic structures and logistics hubs; for the eastern regions – long-term programs for the reconstruction of cities and industrial centers; for the northern regions – the reconstruction of border areas and small towns that serve as strongholds in the new settlement system.

Thus, the study of spatial differences in the development of the construction sector allows not only to assess the current state of the industry, but also to determine its strategic role in the formation of a new spatial framework of the country. This study is aimed at identifying patterns of regional differentiation, analyzing production and resource potential and substantiating reconstruction priorities taking into account the European integration course and sustainable development goals.

Analysis of recent research and publications.

The corpus of theoretical and methodological works on spatial analysis of the economy establishes a framework for studying the construction sector as a functional element of territorial organization. The classical approaches of M. Dolishny reveal the role of infrastructure and sectoral relations in regional policy and spatial differentiation of

development (Dolishny, 2006). The methodological principles of socio-geographical analysis formulated by O. Topchiyev (territorial systems, spatial interactions, multi-level planning) provide a toolkit for assessing the construction industry as a subsystem of the regional economy and for interpreting regional differences (Topchiyev, 2005; 2012)[12].

In the applied dimension, S. Kovalchuk analyzes spatial differences in the development of the construction industry, pointing to the uneven distribution of the production and resource base (cement, reinforced concrete, metal structures), logistical constraints, and the formation of local clusters in industrially urbanized areas (Kovalchuk, 2021). S. Onyshchenko examines investment processes in construction, emphasizing cyclicality, dependence on the institutional environment and credit resources, and differences in regional growth trajectories (Onyshchenko, 2018; 2020). At the intersection of industry and infrastructure economics, B. Hubsky and A. Melnyk highlight the importance of infrastructure investments as a multiplier of regional development and the conditions for the integration of peripheries into national and international value chains (Hubsky, 2010; Melnyk, 2014)[3,5,7].

The statistical basis for regional comparisons is provided by data from the State Statistics Service of Ukraine (construction activity yearbooks, housing commissioning indicators, construction product indices). To measure losses and reconstruction needs, analytical reports of the KSE Institute (2022–2025) are widely used, which detail direct damage to the housing stock, transport and industrial infrastructure and allow for spatial comparisons. In the international context, framework assessments and approaches to reconstruction are presented in the World Bank's Rapid Damage and Needs Assessment (2022–2024), where the construction sector is identified as the core of post-war recovery and modernization. The EBRD in its annual reviews (2023–2024) focuses on financing critical infrastructure (transport, energy) and institutional mechanisms that reduce risks for private investors in construction. The United Nations Development Programme (UNDP) is promoting a "sustainable/green recovery" framework, focusing on energy efficiency, construction waste recycling and digitalisation (BIM, GIS). In the context of European integration, Regulation (EU) 2024/1679 on TEN-T sets standards for multimodality, safety and digitalisation for transport facilities, which directly defines technical requirements for construction and reconstruction projects at the regional level[8].

In general, the scientific and analytical discourse converges around four theses: (1) the construction industry is a system-forming factor of spatial development and a tool of regional convergence; (2) interregional differences are due to different depths of destruction, the structure of the production and resource base, and logistical inclusion; (3) institutional

frameworks (state policy, IFI financing, EU standards) determine the trajectory of modernization; (4) the scientific and practical focus is shifting from macro assessments to the analysis of territorial structures and clusters with a priority on innovative and “green” technologies. At the same time, a methodological gap remains: the lack of regionally disaggregated studies that combine microdata on damage/repair with demand models for building materials and personnel, as well as with spatial calibration of logistical “shoulders”. It is precisely filling this niche that determines the scientific novelty and practical significance of further research[1,5].

Formulation of the article's goals. The aim of the article is a comprehensive study of spatial differences in the development of the construction sector of Ukraine, determining its current state in a regional context and substantiating the strategic role of the industry in the post-war reconstruction of territories. Within the framework of this aim, it is planned to:

• clarify the scale of destruction and the need for the restoration of residential, social and industrial infrastructure in different regions;

• characterize the production and resource potential of the construction industry and its territorial differences;

• identify regional priorities and spatial disparities in reconstruction;

• assess the possibilities of modernization of the construction sector based on innovative and "green" technologies;

• determine the importance of the construction industry as a system-forming factor of spatial development and integration of Ukraine into the European economic space.

Presentation of the main material.

The construction sector of Ukraine occupies a special place in the structure of the national economy, as it ensures the restoration of the housing stock, the development of social and industrial infrastructure, the creation of conditions for the location of production and the formation of spatial frameworks of the economy. Spatial differences in the development of the industry reflect the unevenness of resource potential, differences in the level of urbanization, transport accessibility and investment attractiveness of regions. In the conditions of war and post-war challenges, the construction industry acquires a new functional role - it becomes a system-forming factor in the reconstruction of territories, the revival of local economies and the formation of a new architecture of spatial development of Ukraine.

First of all, an important task is to clarify the scale of destruction and the needs for infrastructure restoration. According to estimates by the World Bank and the Kyiv School of Economics (2022–2024), direct losses to the housing stock exceeded 50% in the eastern

regions, while in the southern regions (Kherson, Mykolaiv, partly Odesa) significant damage was caused to energy, hydraulic and port facilities. This determines different spatial priorities: in the East, the task of restoring mass housing and industrial facilities dominates, in the South - the restoration of critical infrastructure (hydraulic structures, ports, transport corridors), in the Center - the reconstruction of industrial nodes and energy systems, in the West - the development of housing and social infrastructure for internally displaced persons[11].

The next task is to characterize the production and resource potential of the construction industry. Ukraine has a developed base for the production of cement, reinforced concrete products, metal structures, glass and other materials, but their spatial distribution is uneven. The largest concentration of cement plants is observed in the Podilskyi and Pridneprovskyi regions, which form certain “logistical shoulders” for providing the East and the South. The metallurgical base of the East of the country provided up to 40% of the construction industry’s needs in metal structures before the war, but a significant part of these capacities is now destroyed or inaccessible. This necessitates a reorientation to the Western and Southern regions, where the development of new production facilities and logistics parks is possible[6].

An important aspect is the identification of spatial differences and regional priorities for reconstruction. Thus, in the Kherson region, the key task is the restoration of hydraulic structures and irrigation systems after the destruction of the Kakhovka HPP, which determines the specifics of construction work in the field of water management and agricultural infrastructure. In the Mykolaiv region, the main emphasis is on the modernization of shipbuilding and port infrastructure, which is of strategic importance for maritime transportation. The Odessa region, while retaining the functions of the main transport and logistics hub of the country, requires not only the reconstruction of housing for internally displaced persons, but also the modernization of sea ports, transport corridors and the creation of new industrial and logistics clusters. Western regions concentrate on housing construction and social facilities, which is associated with the reception of a large number of displaced persons.

An important task of the study is to substantiate the possibilities of modernization of the industry based on innovative and "green" technologies. In particular, the introduction of energy-efficient materials (sandwich panels, heat-reflecting glass), technologies for processing and reusing construction waste, the use of BIM and GIS for planning reconstructions is becoming widespread. Such practices combine the tasks of reconstruction with the goals of sustainable development, forming a new quality of the housing and

industrial stock, adapted to the climatic challenges and requirements of the European space[7].

Finally, determining the importance of the construction industry as a system-forming factor of spatial development involves its consideration in the broader context of regional policy. It not only creates jobs and stimulates related industries (metallurgy, chemistry, transport, energy), but also forms spatial clusters that act as nuclei of regional integration. In this sense, the construction industry becomes a basic element of restoring territorial integrity and integrating Ukraine into the European economic space.

Thus, the tasks defined in the article allow for a comprehensive description of the current state of the construction industry, its resource capabilities and spatial differences in development. At the same time, they outline modernization trajectories associated with the implementation of innovative and environmental solutions that determine the strategic role of the construction sector in post-war reconstruction and the formation of a new spatial framework for the development of Ukraine[10].

Conclusions. The study showed that the construction sector of Ukraine is one of the basic system-forming factors of spatial development and restoration of the regional economy. Spatial differences in its development are due to a combination of three groups of factors: (1) the scale of war destruction and the degree of preservation of the production and resource base; (2) the level of integration into transport and logistics systems and the presence of construction materials production; (3) institutional conditions and investment attractiveness of the regions.

The analysis showed that in Kherson region, reconstruction focuses on housing, hydraulic structures and agricultural infrastructure, in Mykolaiv region - on the modernization of the shipbuilding, port and industrial base, and in Odessa region - on the development of transport and logistics corridors, seaports and housing infrastructure for internally displaced persons. For the Central regions, industrial facilities and transport infrastructure are becoming important, while the Western regions are focusing on housing construction and social facilities for displaced persons.

The construction industry demonstrates the potential for structural modernization based on innovative and “green” technologies that combine the tasks of rapid reconstruction with long-term sustainable development goals. The use of energy-efficient materials, digital construction management systems (BIM, GIS), and construction waste processing technologies contribute to increasing the efficiency and environmental sustainability of the industry.

The strategic role of the construction industry is to create a new spatial framework of Ukraine, which combines the functions of reconstruction with integration into the European economic space. The restoration of the industry has the potential not only to compensate for losses, but also to transform the spatial structure of the economy, form competitive regional clusters, and provide conditions for long-term development.

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