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Cluster model of construction and economic development in the conditions of urban housing stock restoration in DPR



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The features of the introduction of new approaches to creating a comfortable urban environment, taking into account the social and economic conditions for the restoration of housing and social infrastructure in the Donetsk People's Republic are considered. The existing experience of implementing programmes for the formation of means and methods of housing policy to overcome the consequences of military operations, accidents and catastrophes is summarized. The analysis of the theoretical and methodological foundations of the formation and development of organizational models during construction and restoration work is carried out. It is shown that when solving the tasks of restoring the housing stock in the DPR, the principles and methods of production and investment planning, modern practices of integrated development of territories, improving the quality and comfort of the urban environment, updating dilapidated and emergency housing stock are in demand. Special attention is paid to the aspects of organizational and economic management of the rehabilitation and development of the housing sector, the construction funds of which consume significant amounts of resources and energy. The purpose of the study is to substantiate the cluster management model for the implementation of software solutions for creating a comfortable urban environment in conditions of uncertainty of the production and resource potential of the liberated territories. The special internal conditions of the region and the measures of state support necessary to ensure investment activity on the basis of improving the mechanism of public-private partnership are considered. The practical results of the development of settlements in the liberated territories, the restoration of housing and social services, the development of housing and communal services and infrastructure facilities are presented. The formation of conditions for a comfortable urban environment based on a cluster management model in the conditions of reconstruction and development of the housing sector reflects the strategy of the Programme for the socio-economic development of new regions for 2023–2025 and is an important component of the industrial revival of Donbass as part of the Russian Federation. **Keywords:** restoration of housing stock, cluster management model, economic development, production and resource potential of the region

Problem statement. Improving the mechanism of investment attractiveness is the most important tool for implementing sustainable development in the field of housing construction and urban real estate management^{1,2}. The formation of urban development reflects the opportunities, needs and problems of socio-economic development characteristic of various historical periods of urban development. Until 1995, the concept of real estate was absent in Soviet and Russian legislation, due to state ownership of land and fixed assets. The development of market relations in the country required the justification of the term urban real estate, which includes a set of property rights in the construction and reconstruction of buildings and structures, the development of land plots corresponding to them.

As a subject of market relations, urban real estate goes through all stages of its life cycle: intensive growth, stabilization, stagnation and crisis. In the absence of catastrophic influences (man-made, anthropogenic and natural) and armed conflicts, the processes of transition of urban real estate from one stage to another occur naturally. Of particular

relevance is the analysis of the features of the life cycle of urban real estate objects related to the provision of vital activity and restoration of infrastructure in new regions under martial law³. At various times, solving problematic issues in a crisis situation required the development of programmatic measures aimed at overcoming emergency circumstances, taking into account the socio-economic and political significance of the consequences of a state or regional scale.

The critical situation caused by the defeat in the Russian-Japanese war of 1904–1905 and the revolutionary actions of 1905–1907 contributed to reforms to stabilize the situation, which went down in history as the “Stolypin” programme for the transformation of Russia [1]. Appointed Prime Minister in 1906, P.A. Stolypin proposed a systematic approach to the reorganization of land ownership, implemented in legislative and regulatory acts prepared by ministries and departments at the beginning of the twentieth century. The intensive development model included the transition of peasant farms from communal home ownership to the formation of a wide stratum of landowners, stimulating entrepreneurship, attracting

1 Strategy for the development of the construction industry and housing and communal services of the Russian Federation for the period up to 2030 with a forecast up to 2035. URL: trategiia-razvitiia-stroitelnoi-otrasli-i/ (accessed: 02.15.2024). (rus.).
2 The standard of integrated development of territories. URL: standards/printsipy-kompleksnogo-razvitiya-territorii/ (accessed: 02.17.2024). (rus.).
3 The State programme “Restoration and socio-economic development of the Donetsk People's Republic, Luhansk People's Republic, Zaporizhia region and Kherson region”. URL: <https://постановление-правительства.рф/gosudarstvennaya-programma-vosstanovlenie-i-soczialno-ekonomicheskoe-razvitie-donetskoj-narodnoj-respubliki-luganskoj-narodnoj-respubliki-zaporozhskoj-oblasti-i-hersonskoj-oblasti/> (rus.).

investment, infrastructure development and modernization of agriculture.

In the early 20s of the twentieth century, the consequences of the devastation and famine of the civil war period and the policy of "war communism" were largely overcome thanks to the adoption of emergency measures of the new economic policy, initiated by V.I. Lenin [2]. The acute phase of the housing crisis was accompanied by measures to abolish private property and expropriate urban real estate. At the same time, the housing stock management is being reformed, and the regulatory framework for housing and construction cooperation is being formed. The need for extreme attention to the housing issue was dictated by the implementation of the state industrialization plan, which stimulated the growth of the number of urban cities and towns. To a large extent, by granting broad rights and measures of state support, housing and rental cooperative partnerships have managed to expand housing construction, restore war-torn housing and provide living conditions for working families.

The radical restructuring of the entire economy in a military manner required the maximum concentration of funds, construction materials and equipment at important military-industrial facilities. The increase in the scale of reconstruction work was aimed at reviving heavy industry, meeting the needs of the army and the material level of the population in the frontline and liberated areas. The initial programme for the restoration of Donbass represented the priority measures for the restoration of the coal industry of the Donetsk deposit (1943) [3].

The post-war reconstruction of the housing stock in the liberated territories was hampered by limited resources and the need to build industrial housing construction plants. The practice of housing construction included emergency measures for the restoration of destroyed multi-storey buildings and the construction of predominantly low-rise buildings based on a standard layout. In 1955, the era of Soviet monumental classicism ("Stalin's Empire style") in the design of buildings and structures ended. At the same time, there has been a transition from room-by-room accommodation, due to an acute shortage of housing, to family-by-family occupancy of apartments. This became possible as a result of the transformation of the entire design and construction system. The serial design model, worked out in low-rise construction, was distributed for the construction of four- and five-storey residential buildings. The industrial base of housing construction has allowed to increase the production volumes of prefabricated reinforced concrete structures and house-building plants using conveyor and cassette technologies.

The housing sector is highly vulnerable in extreme circumstances caused by earthquakes, leading to disruption of the normal activities of the population, loss of life, destruction and destruction of property. The strongest Tashkent earthquake led to the destruction of over 2 million square metres of living space, 236 administrative buildings, about 700 retail and catering facilities, 26 municipal enterprises, 181 educational institutions. The maximum strength of the earthquake reached 8 points. The houses made of mud bricks that have been preserved since pre-revolutionary times were the most destroyed. The relatively small number of victims (8–13 dead and several hundred injured) for a city with a million people is associated with the predominance of vertical (rather than horizontal) seismic vibrations, which prevented a complete collapse of even dilapidated adobe houses. The implementation of priority measures made it possible to provide shelter to more than 300 thousand residents before the onset of the winter period. By

decision of the government, a panel house construction plant was delivered to Tashkent from the French firm Camus, which produced building structures for five and nine-storey houses taking into account seismic conditions. In general, during the liquidation of the consequences, more than four million square metres of housing were built, of which more than 1 million 800 thousand square metres were built by builders of the Union republics and soldiers-builders. More than 60 thousand apartments have been restored, schools, cultural and administrative buildings have been built.

The 1988 Spitak earthquake had severe consequences as a result of several factors. Powerful tremors destroyed almost the entire northern part of the republic in half a minute, covering an area with a population of about 1 million people. In the epicenter of the earthquake, the intensity of the tremors reached 10 points on the 12-point MSK-64 scale. The catastrophic events revealed omissions in all parts of the seismic protection of the republic, gross errors in the design, construction and operation of multi-storey buildings, a low level of training in the field of response and management during crisis situations. Rescue operations were carried out in winter in mountainous areas with aftershocks of intensity from 3.5 to 5 points.

According to official data, 25 thousand people died, 140 thousand became disabled, and 500 thousand lost their homes. In total, 21 cities were affected by the disaster, as well as 324 villages, of which 58 were completely destroyed. Approximately 9 million square metres were damaged. Hundreds of schools, hospitals and kindergartens have been destroyed or have fallen into disrepair. 600 km of highways, 10 km of railways were put out of operation, 230 industrial facilities were completely or partially demolished (about 40 % of the industrial capacity of the republic). The total damage from the earthquake amounted to 12 billion rubles. 45 thousand builders came to Armenia to carry out restoration work. Until 1992, 500 thousand square metres of housing and social facilities were built. International financial assistance provided by individuals and foreign organizations from more than 100 countries played a significant role.

When man-made accidents and natural disasters occur, crisis phenomena occur in the socio-economic life of the regions. After the Chernobyl disaster at the nuclear power plant in 1986, a 30-kilometres exclusion zone was formed. 200 thousand km² were exposed to radioactive contamination. In total, 90,784 people were evacuated from 81 settlements in Ukraine by mid-August 1986. About 25 thousand people were evacuated from 107 settlements in Belarus.

To accommodate the resettled people, in accordance with government resolutions, more than 11 thousand manor-type houses, more than 600 social and household facilities were built for the rural population, 3.5 million m² of territories were landscaped, 1,400 km of roads, 600 km of gas pipelines, etc. were built and repaired.

In the period from 1986 to 1992, more than 526 thousand people took part in the work to eliminate the consequences of the disaster. Of these, the military personnel amounted to about 340 thousand people. More than 10 thousand pieces of equipment were used. About 200 billion Soviet rubles were spent on eliminating the consequences in the period from 1986 to 1990. There was a need to substantiate the legal problems associated with the development of the categories of "environmental refugees" and "environmental disaster zone". The provisions of State programmes for the elimination of the consequences of the Chernobyl disaster have been fixed at the legislative level.

In foreign practice, the experience of economic reconstruction of the European reconstruction programme, known as the "Marshall

Plan", is of interest⁴. The transition programme was developed in view of the emergency situation in order to provide material and financial resources to the participating countries, create strong internal and external ties of an integral Europe, and maximize the use of their own resources of national economies. The tasks solved within the framework of the Marshall Plan had very specific implementation mechanisms by providing assistance under the grants of the Programme. The priority areas for the use of grants from the Programme were investment projects for the restoration of national economies in Western Europe.

The analysis of the features of mobilization and investment models of the economy of crisis situations indicates the need for a comprehensive consideration of the dangers, risks and threats associated with vital activity and restoration of infrastructure, which determines the relevance of the study of trends in the revival and development of new regions under martial law.

The purpose of the work is to substantiate the theoretical and methodological provisions of the formation of a cluster model of revival and development in the conditions of uncertainty of the housing sector of real estate in the aftermath of a period of local military conflict.

To achieve the purpose of the study, it is necessary to systematize the features of the external and internal environment that affect the risk management of investment and construction projects and determine the tasks of technical and economic protection:

- perform an analysis of the current state of the level of economic security in the field of housing construction;
- identify areas for improving software solution models for the formation of a management structure and flexible planning in conditions of uncertainty;
- develop the structure of indicators for scenario management of technical and economic security, taking into account the life cycle of the housing stock.

As follows from the above, the housing sector is subject to the crisis effects of emergencies and disasters that have a negative impact on the implementation of investment and construction projects. The adaptation of the principles, methods and formats of synchronization of production and investment potential should provide for operational and flexible management, modern practices of horizontal network interaction in the conditions of restoration of new regions.

Analysis of the problem status. Changes in the external environment in recent years are associated with legislative, regulatory, technical and economic aspects of regulating housing construction and creating conditions for a comfortable urban environment¹. The standard of integrated territorial development reflects a set of principles for improving the current regulatory framework in the field of urban planning, creating functionally diverse, compact and safe cities with modern buildings, comfortable housing and high transport accessibility². Relevant regional regulatory legal acts have

been adopted regulating the specifics of urban planning activities in order to form investment opportunities for housing construction on the territory of the Donetsk People's Republic. The investment policy formed by the state is aimed at improving the directions, forms and methods of developing investment attractiveness, the active participation of responsible developers in the restoration, construction and bringing the housing stock of new regions to the all-Russian level.

The theoretical and methodological basis of the research is the fundamental provisions and principles of economic theory, cybernetics, special methods of information modelling of the life cycle of capital construction facilities, system analysis and process approach, business continuity, real estate management, anti-crisis management of construction and rehabilitation of housing in emergency situations and disasters. At the same time, the concept of facility management (FM) unites many disciplines focused on improving the efficiency and productivity of the economy, on ways to interact with the anthropogenic environment³. The organization of housing construction includes requirements for registration, collection, analysis and synthesis of relevant data necessary to improve the work of the organization⁶. The business continuity organization provides for the installation, implementation and maintenance of a formal documented risk assessment process for the systematic identification, analysis and assessment of the risk of destructive incidents⁷. The scenario analysis of the alternative life cycle costs of real estate objects involves a comparison of initial and operational costs, options for the use of energy-efficient technologies and materials [4].

Publications are devoted to the development of investment methods and models, which draw attention to various aspects of improving the mechanisms of efficiency of housing construction. The analysis of the institutional foundations of regional public-private partnership as an instrument of socio-economic policy in the field of housing construction is presented in [5]. According to the authors⁸, the assessment of the investment attractiveness of a real estate object in the pre-investment period makes it possible to reduce risks by justifying an integral indicator that takes into account the weighting coefficients of internal factors characterizing the real estate object. In [6], investment activity in housing construction is proposed to be considered as a set of subjects and objects of investment, investment projects, sources of investment and investment processes. The priority tasks of real estate management are related to achieving maximum efficiency in the use of real estate in the interests of the owner [7].

The conclusions of the study⁹ allow us to systematize and divide the essential features of the concept of "investment attractiveness of an enterprise" into four groups: as a condition for the development of an enterprise; as an investment opportunity; as a set of indicators of production activity and as a comprehensive assessment of the effectiveness of investments.

4 Magomedov R.Sh., Tatevosyan G.M. The programme for the restoration of Europe 1948–1951 (Marshall Plan): the experience of economic reconstruction. URL: <https://cyberleninka.ru/article/n/programma-vosstanovleniya-evropy-1948-1951-gg-plan-marshalla-opyt-ekonomicheskoy-rekonstruktsii/viewer> (accessed: 02.17.2024). (rus.).

5 GOST R ISO 41001–2023. Real estate management. Management systems. Requirements, including the guidelines for use, FSBI "Institute of Standardization". Moscow, Standartinform Publ., 2023; 34. (rus.).

6 GOSTR 55048–2012. Quality management systems. Special requirements for the application of GOST R ISO 9001–2008 in construction, FSUE VPO MGSU. Moscow, Standartinform Publ., 2013; 30. (rus.).

7 GOST R ISO 22301–2014. Business continuity management systems. General requirements, JSC "Scientific Research Center for Control and Diagnostics of Technical Systems". Moscow, Standartinform Publ., 2015; 38. (rus.).

8 Nikishina O.V., Morgunova T.A. Assessment of the investment attractiveness of real estate. URL: <https://cyberleninka.ru/article/n/otsenka-investitsionnoy-privlekatelnosti-obektov-nedvizhimosti-1?ysclid=lt4dcjibwy407064739> (accessed: 02.17.2024). (rus.).

9 Tolkachenko O.Y. Classification of approaches to determining the investment attractiveness of an enterprise. URL: <https://cyberleninka.ru/article/n/klassifikatsiya-podhodov-k-opredeleniyu-investitsionnoy-privlekatelnosti-predpriyatiya?ysclid=lt4de3ai9g21020401> (accessed: 02.17.2024). (rus.).

In general, as follows from the publications of a number of authors [8–11], investments in housing construction change in accordance with the cyclical development of the economy, have a high level of reliability, with a low degree of profitability. The dynamics of investment in housing in Russia in the period from 2018 to 2021 confirms the growth in investment volumes. At the same time, the gradual increase in the key rate of the Central Bank of the Russian Federation is a deterrent to mortgage lending.

Investment attractiveness is associated with an increase in profitability due to the economic benefits of using an integrated management system based on an object-oriented model of a construction object or a complex of construction objects (BIM – Building Information Modelling). In conditions of uncertainty, BCM (Business Continuity Management) standards and practices are in demand, providing for the analysis of financial risks of investment and construction enterprises caused by internal factors in case of violations of the normal functioning of business processes⁷. In [12], it is proposed to perform risk analysis of investment and construction organizations, taking into account internal factors grouped into four main categories: the final product; the production process; subjects of construction production, as well as information data of capital construction facilities.

The study of construction and the real estate market during the crises of 2009 and 2015, the current recession in the economy and housing [13], identified the need for innovative transformations that transformed the entire housing sector based on the application of programme-targeted development methods and cluster construction models [14–17].

Strengthening the regulatory functions of the state is aimed at the formation and development of innovations and investments in housing construction, overcoming crisis phenomena in the context of the formation of a non-market (neoliberal) risk management model of economic entities [18].

The dynamics of the formation of non-market relations is characteristic of the post-crisis restoration of urban housing stock in the implementation of the national project and state programmes for the comprehensive renovation of residential buildings in the regions of the Russian Federation. Relocation from dilapidated (wear of structures up to 65–70 %) and emergency (50 % of premises and load-bearing structures) buildings is aimed at the development of housing and communal infrastructure by attracting investments within the framework of a public-municipal-private partnership [19]. The management of the housing stock (dilapidated and dilapidated) in the urban infrastructure environment presents the possibilities of financial, organizational, industrial and economic activities for the development of the innovative potential of urban real estate reproduction based on the cluster model of the “competitive diamond” proposed by M. Porter [20]. Thus, the technology of cluster development in construction is based on the interaction of cluster participants, which allows the formation of information and analytical flows to expand innovation and investment attractiveness of housing construction and create a comfortable urban environment.

The strategy¹ divides the subjects of the housing stock of the Russian Federation into 5 main clusters according to the signs of differentiation of measures to support housing construction: cluster 1 (dynamic), cluster 2 (with a lack of demand), cluster 3 (with a lack of supply), cluster 4 (stagnant), cluster 5 (depressed).

A review of literary sources allows us to focus the tasks of researching investment activity in housing construction in new regions on substantiating the structural relationship between subjects and objects of investment, innovative and investment projects,

sources of investment using the methodology of programme-targeted and flexible organizational models of real estate management in conditions of overcoming the consequences of a local military conflict [21].

The paradigm of investment attractiveness of real estate objects, in the context of this study, represents a cluster of profitability indicators of the head developer-developer and specialized developer-investors in the process of urban real estate reproduction, related to the justification of effective solutions for life cycle project management in conditions of uncertainty caused by the emergency situation of a local military conflict.

Research methodology. As is known, the theory of risk management assumes an integral system of knowledge, which is characterized by a logical dependence and relationship between income and financial stability within certain risk boundaries in order to achieve the goals of the business entity.

A conceptual economic and mathematical model of the process of investment and reproduction of spatial and territorial development (PTD_{ip}) of urban real estate revitalization can be represented by a conditional probabilistic and functional dependence:

$$P_{H(t)} = U_{w,i,j}^N \{P_w\}, \{T_i\}, \{h_j\}, \{Q_{i,j}\}, V, \tau, Z, R, t \in \{T\}, \quad (1)$$

where $P_{H(t)}$ — the appearance of the system in time t ;

w, i, j — the number of hierarchy levels depending on the selected scenario of the development city types from 1 to N ;

$\{P_w\}, \{T_i\}, \{h_j\}$ — a subset of the functional and reliability state of the geosystem by type of work on the cluster object;

$\{Q_{i,j}\}$ — many environmental factors (unmanageable);

V — multiple structural factors (manageable);

τ — the life cycle of reproduction of a geosystem (subsystem);

Z — the set of parameters of the considered cluster territory;

R — cumulative investment risks (internal and external environment);

$t \in \{T\}$ — a variety of time parameters on the life cycle T of real estate revitalization (0.1).

The solution of equation (1) consists in presenting the dependence of the generalized criterion for the effectiveness of the organizational and economic stability of the life cycle of real estate revitalization $P_{int}^T(t)$ of spatial and territorial development PTD_{ip} in an explicit analytical form with the construction of an algorithm for sequential factor accounting. The area of effective solutions, taking into account the total investment risk, is the value of the profitability indicators of the head developer-developer and specialized developer-investors in the process of urban real estate revitalization. At the same time, the total costs associated with the development, implementation and operation of the megaproject (cluster facilities, cluster portfolios and cluster territories) will be minimal, and the organizational and economic stability of the system P_{int}^T will be maximum.

The total number of functional local subsystems of the spatial and territorial development of integrated development (F_o) will be defined as the union of three functional areas of Dkz, consisting of: functions–stages FDE_{i-j} — urban value; functions–tasks f_j — construction capacities (enterprises of the urban investment and construction complex); functions–objects — investment and construction facilities in the form of territorial real estate cluster portfolios (Pnk).

The scientific and methodological basis for evaluating the effectiveness of construction and restoration of urban real estate revitalization facilities is its decomposition into class-portfolios, class-objects by types and types of construction and organizational forms of reproduction and achieving on this basis an accelerated

► start of operational work and, accordingly, the commissioning of both a separate queue and a cluster-territory as a whole.

The application of the decomposition method makes it possible to apply intensive methods of construction and installation work, increase the economic reliability of construction and the effectiveness of the territorial reproduction system of urban real estate revitalization (TRSURR). The effectiveness of TRSURR is affected by special measures taken directly by the alliance of organizations (consortium) involved in the implementation of the megaproject and improving the technical and economic indicators of the main participants (or preventing their deterioration under the influence of passive trends in economic dynamics). The process of implementing measures of this type can be called active fortification or active fortifiers. They can be organizational (*O-fortifiers*) and technical (*T-fortifiers*).

The methodological scheme for assessing the economic efficiency of the integrated programme cycle of spatial and territorial development of PTD_{ip} revitalization of urban real estate is shown in Figure.

The analysis of reserves for the development of the urban environment is carried out in three stages:

The *first stage* consists in identifying reserves by their types using indicators that most accurately express the natural measure of use of this type of reserves.

The *second stage* of the analysis consists in a summary assessment of the identified external and internal reserves of spatial and territorial restructuring of urban real estate funds. It should be noted that the cost expression of reserves is used both in assessing the economic efficiency of the programme cycle P_{int}^* , and for correcting cluster portfolios (monoprojects) of urban real estate E_{ip}^* .

The *third stage* of the reserves analysis forms the initial basis for adjusting the PTD_{ip} strategy of urban real estate. The information base of the adjustment should be structured according to cluster portfolios, projects, participants and owners.

In general, the integral effect of development programmes for the restoration and development of urban real estate is defined as the total effect of all stages of the programme cycle, taking into account the corrective effect of administrative resources and the total costs (contributions) of all participants. Based on the results of the TRSURR analysis, activities are being built to strategically focus all participants in the cluster reproduction of urban real estate in the conditions of the DPR martial law. The main indicators of the sustainability of urban real estate development systems are: the intensity of construction; the level of consumption of aggregate resources; the duration of local life cycle stages [22].

Results. Currently, favourable conditions have been created for the implementation of innovative approaches to the reproduction of residential buildings and infrastructure development in the context of the formation of a non-market economy. In order to develop investment housing construction, in accordance with the requirements of legislation on participation in shared-equity construction, regional regulatory legal acts regulating the specifics of urban development activities have been adopted. In the Donetsk People's Republic, active work is underway to attract reliable real estate developers to the territory of the region, special conditions have been created for preferential mortgages at 2 % and a mechanism for subsidizing project financing up to 3 % for developers. Work has been completed on more than 18 thousand sites. By the end of 2023, 53 more than 4 thousand apartment buildings were built and restored, almost 2 thousand social facilities, more than 2 thousand km of roads were repaired.

The implementation of the Programme³ is aimed at ensuring the restoration and development of the housing stock, harmonization of strategic planning according to priorities, goals, tasks, activities and deadlines for their implementation, targets, financial and other resources, as well as making management decisions at the regional level on accelerated socio-economic development. The foundation of the innovative potential of reproduction can be the definition of the value of the sixth cluster of "revitalizing (viable)" housing, working out the actual situation, requirements of technical and economic protection, reserves of spatial and territorial restructuring of urban real estate funds in the areas of construction, housing and communal services, urban environment.

The analysis of housing construction crises in emergency situations and disasters presented by the authors is intended to substantiate a viable trajectory of urban real estate reproduction in the aftermath of a local military conflict. The cluster model of housing "revitalization" and the formation of a comfortable urban environment is based on the use of the following principles:

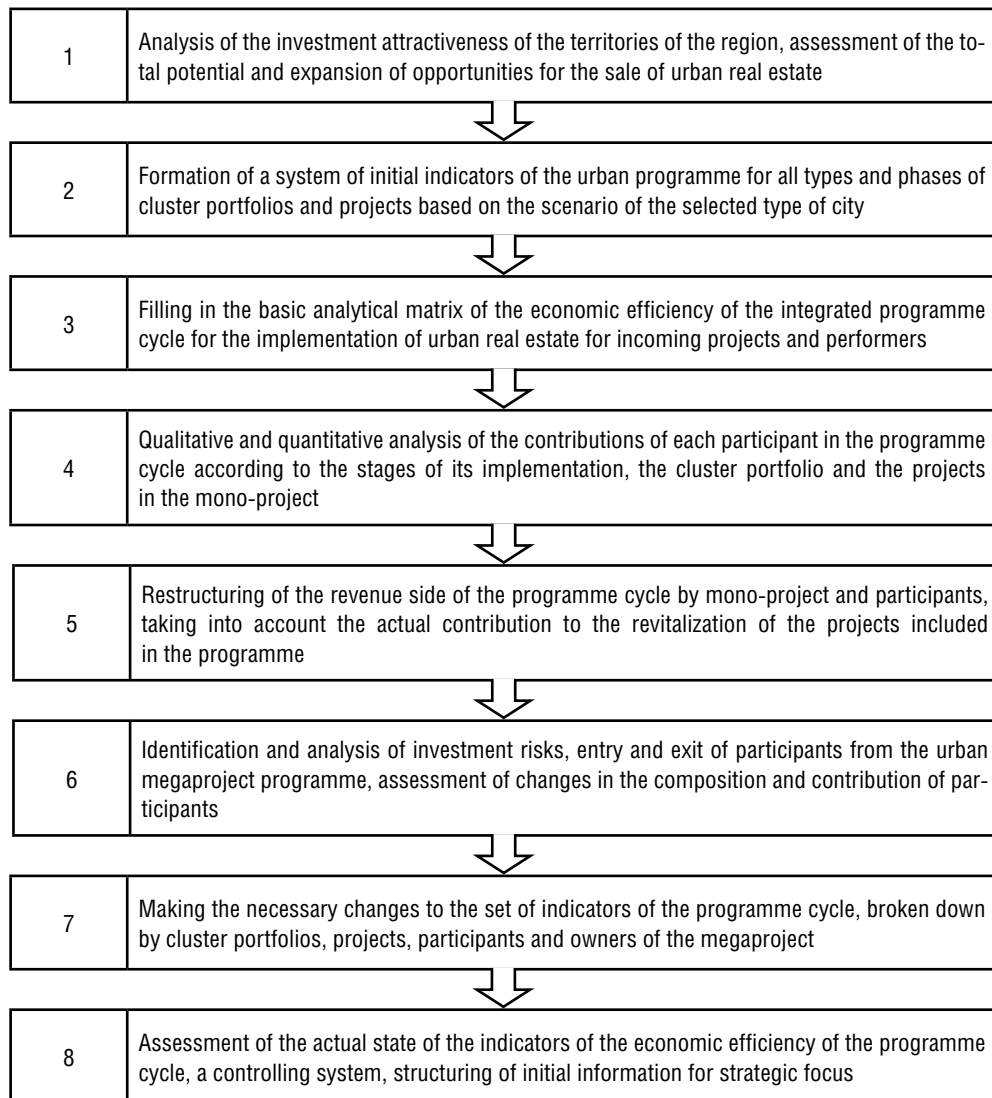
- methodology of the investment portfolio of development, which reflects the system of factors of sustainability, continuity and efficiency of spatial and territorial development of reproduction of residential real estate based on intelligent systems;
- system-structural analysis of construction and restoration work in emergency conditions;
- scenario identification of reserves of spatial and territorial restructuring in the conditions of reproduction of urban construction.

The cluster initiative to create a regional scientific, technical and technological complex "Donbasstechnoresurs" in the field of control, quality and safety, technical and economic protection measures for capital construction facilities was presented in the decision of the international scientific and practical conference "Donbass-Resource-2011", which was held at the Azov State Technical University (Mariupol, September 19–23, 2011) [23]. The experience of cooperation between contractors and specialized organizations, construction industry enterprises, design and scientific organizations, universities is still in demand today to promote innovative developments in housing construction.

Conclusions. The construction industry occupies a significant share in the Russian economy and is one of the drivers of its development. In 2023, the contribution of the construction complex to GDP amounted to about 13.4 %. The sustainable development of the construction industry is taking place against the background of stabilization of the socio-economic development of the country, growth of gross domestic product (GDP) by 3.6 %. About 16 % of the working-age population of the country is involved in the work of the industry. At the same time, the share of construction in GDP is consistently at least 5 %, and together with the housing and communal complex — almost 13 %.

The challenges of housing quality and affordability associated with achieving the average Russian standard of living in new regions by 2030 necessitate the innovative and investment development of engineering and construction life support systems for urban real estate. In the conditions of urban real estate reproduction, crucial importance is attached to integral indicators of organizational and economic stability in relation to the revitalization of housing development, taking into account regional peculiarities.

The socio-economic development of Donbass is connected with the formation of the Novorossiysk Joint-Stock Company of Coal, Iron and Rail Production, approved on April 18, 1869 by



The sequence of stages of the analysis of spatial and territorial development of urban real estate

Emperor Alexander II. The concentration of production and capital served as the beginning of the formation of the South Russian industrial district and created conditions for the cluster development of the territory of modern Donbass and Krivoy Rog. In this regard, the cluster model of housing "revitalization" and the formation of a comfortable urban environment is a necessary condition for spatial and territorial development of housing real estate reproduction, which will ensure the beginning of stable growth in the socio-economic and industrial development of the DPR.

REFERENCES

1. Pozhigailo P.A. Stolypin programme of transformation of Russia. *Property relations in the Russian Federation*. 2006; 12(63):4-12. (rus.).
2. Zuev A.N. Overcoming housing shortage in Russia during first years of the soviet power and role of building and loan cooperation. *Vestnik of Kostroma state university*. 2019; 1:56-60. URL: <https://www.elibrary.ru/item.asp?id=37353095> (rus.).
3. *Development of construction science and technology in Ukraine : in 3 volumes*. Kiev, Nauk. dumka Publ., 1989–1990. (ukr.).
4. Methodology for calculating the cost of the life cycle of a residential building, taking into account the cost of total costs. Moscow, National Association of Designers Publ., 2014; 15. (rus.).
5. Buzulutsky M.I. Mechanism of state-private partnership in the sphere of regional housing construction. *Bulletin of the Russian Academy of Sciences*. 2018; 02:22-27. (rus.).
6. Tsybikzhapov M.S. Features of investment in housing construction. *Business Education in the Knowledge Economy*. 2017; 2: 121-125. URL: <https://www.elibrary.ru/item.asp?id=29094133> (rus.).
7. Kavychko E.V. Goals and main tasks of real estate management. *Modern trends in economics and management: a new look*. 2013; 19:116-120. URL: <https://www.elibrary.ru/item.asp?id=20882207> (rus.).
8. Zolotareva G.A., Podoprigora I.V. The impact of investments in the housing sector on economic growth. *Bulletin of the Tomsk Polytechnic University*. 2013; 323(6):62-67. URL: <https://www.elibrary.ru/item.asp?id=21126092> (rus.).
9. Kostrikin P.N., Le Wan Thuong, Andreeva A.I. Innovative approaches in the field of low-rise housing construction and digital transformation of investment and construction activities as the main focus of the All-Russian Housing Congress. *Real Estate: Economics, Management*. 2021; 3:6-10. URL: <https://n-eu.iasv.ru/index.php/neu/article/view/28/171> DOI: 10.22337/2073-8412-2021-3-6-10
10. Cu Ilar-Franca R.M., Azapagic A. Life cycle cost analysis of the UK housing stock. *The International Journal of Life Cycle Assessment*. 2014; 19:174-193. DOI: 10.1007/s11367-013-0610-4
11. Kauskale L., Geypelle I. An integrated approach to the analysis of the real estate market in the context of sustainable development for decision-making. *Procedia Engineering*. 2017; 172:505-512. DOI: 10.1016/j.proeng.2017.02.059

12. Kardashov S.S. Investigation of financial risk factors of investment and construction companies. *Modern Trends in Economics and Management*. 2013; 7:72-75. URL: <https://www.elibrary.ru/item.asp?id=20882209> (rus.).
13. Tetushkin V.A. The real estate market research during the economic crisis. *Financial Analytics: Science and Experience*. 2016; 40:37-52. URL: <https://www.elibrary.ru/item.asp?id=27187607> (rus.).
14. Tsikhan T.V. Cluster theory of economic development. *Theory and Practice of Management*. 2003; 5:33-39. (rus.).
15. Ivanova E.V. About the nature and types of clusters in economics. *Organizer of Production*. 2012; 3:83-88. (rus.).
16. Ramazanov A.O., Borisova L.A. Building clusters as a basis of the strategical advantages formation for the Russian building enterprises. *WEPS: Management, Economics, Politics, Sociology*. 2016; 1:13-18. DOI: 10.24411/2412-2025-2016-00003 (rus.).
17. Shalunov S.G. Improvement of cluster interaction of economic entities in the construction industry. *Journal of Economic Regulation*. 2017; 8(4):60-66. DOI: 10.17835/2078-5429.2017.8.4.058-066 (rus.).
18. Dobrynin A.I., Zhuravleva G.P. World economic crisis and economy market model transformation. *Izvestiya of Irkutsk State Economics Academy (Baikal State University of Economics and Law)*. 2010; 6(74):5-15. URL: <https://www.elibrary.ru/item.asp?id=15522281> (rus.).

19. Pershina T.A., Kalentyeva N.A. Features reproductive management of emergency and dilapidated housing stock from the standpoint of system and process approaches in order to improve the comfort of living of the population of the city. *Fundamental Research*. 2016; 5(3):611-615. URL: <https://www.elibrary.ru/item.asp?id=26189862> (rus.).
20. Porter M. Competitive strategy: A methodology for analyzing industries and competitors. Translated from English. 3rd ed. Moscow, Alpina Business Books Publ., 2007; 453. (rus.).
21. Kushchenko I.V., Volgin V.V. Spatial and resource development in creating a quality framework for the urban environment of the Donetsk People's Republic. *Real Estate: Economics, Management*. 2023; 4:6-12. URL: <https://n-eu.iasv.ru/index.php/neu/article/view/156/272> DOI: 10.22337/2073-8412-2023-4-6-12
22. Grabovyy P.G., Volkov R.V., Volgin V.V. Intelligent real estate management. *Real Estate: Economics, Management*. 2023; 1:16-20. URL: <https://n-eu.iasv.ru/index.php/neu/article/view/111/132> DOI: 10.22337/2073-8412-2023-1-16-20
23. Kushchenko I.V., Korolev V.P. Traditions and innovations in the educational process and university science for development of competences in the construction sector, *Construction: Science and Education*. 2023; 13(3):130-146. DOI: 10.22227/2305-5502.2023.3.7 (rus.).

Кластерная модель строительства и экономического развития в условиях восстановления городского жилищного фонда ДНР

Рассмотрены особенности внедрения новых подходов к созданию комфортной городской среды с учетом социальных и экономических условий восстановления жилья и социальной инфраструктуры в Донецкой Народной Республике. Обобщен существующий опыт реализации программ формирования средств и методов жилищной политики для преодоления последствий военных действий, аварий и катастроф. Выполнен анализ теоретико-методологических основ формирования и развития организационных моделей при строительно-восстановительных работах. Показано, что при решении задач восстановления жилищного фонда в ДНР востребованы принципы и методы производственного и инвестиционного планирования, современные практики комплексного развития территорий, повышения качества и комфорта городской среды, обновления ветхого и аварийного жилого фонда.

Особое внимание уделено аспектам организационно-экономического управления восстановления и развития жилищного сектора, строительные фонды которого потребляют значительные объемы ресурсов и энергии. Целью исследования является обоснование кластерной модели управления для реализации программных решений создания комфортной городской среды в условиях неопределенности производственно-ресурсного потенциала освобожденных территорий. Рассмотрены особые внутренние условия региона и меры государственной поддержки, необходимые для обеспечения инвестиционной активности на основе совершенствования механизма государственно-частного партнерства.

Представлены практические результаты развития населенных пунктов освобожденных территорий, восстановления жилого фонда и социальной сферы, развития жилищно-коммунального хозяйства и объектов инфраструктуры. Формирование условий комфортной городской среды на основе кластерной модели управления в условиях восстановления и развития жилищного сектора отражает стратегию Программы социально-экономического развития новых регионов на 2023–2025 годы и является важнейшей составляющей индустриального возрождения Донбасса в составе Российской Федерации.

Ключевые слова: восстановление жилого фонда, кластерная модель управления, экономическое развитие, производственно-ресурсный потенциал региона

СПИСОК ИСТОЧНИКОВ

1. Пожигайло П.А. Столыпинская программа преобразования России // Имущественные отношения в РФ. 2006. № 12 (63). С. 4–12.
2. Зуев А.Н. Преодоление жилищного кризиса в России в первые годы советской власти и роль жилищно-строительной кооперации // Вестник Костромского государственного университета. 2019. № 1. С. 56–60. URL: <https://www.elibrary.ru/item.asp?id=37353095>
3. Развитие строительной науки и техники в Украине : в 3-х т. / ред. М.М. Жербин. Киев : Наук. думка, 1989–1990.
4. Методика расчета стоимости жизненного цикла жилого здания с учетом стоимости совокупных затрат. М. : Национальное объединение проектировщиков, 2014. С. 15.
5. Бузулуцкий М.И. Развитие механизма государственно-частного партнерства в сфере регионального жилищного строительства // Вестник РАЕН. 2018. № 2. С. 22–27.
6. Цыбикжапов М.С. Особенности инвестирования в сектор жилищного строительства // Бизнес-образование в экономике знаний. 2017. № 2. С. 121–125. URL: <https://www.elibrary.ru/item.asp?id=29094133>
7. Кавычко Е.В. Цели и основные задачи по управлению недвижимостью // Современные тенденции в экономике и управлении: новый взгляд. 2013. № 19. С. 116–120. URL: <https://www.elibrary.ru/item.asp?id=20882207>
8. Золотарева Г.А., Подопригра И.В. Влияние инвестиций в жилищную сферу на экономический рост // Известия Томского политехнического университета. 2013. Т. 323. № 6. С. 62–67. URL: <https://www.elibrary.ru/item.asp?id=21126092>
9. Кострикин П.Н., Ле Вань Тхьонг, Андреева А.И. Innovative approaches in the field of low-rise housing construction and digital transformation of investment and construction activities as the main focus of the All-Russian Housing Congress // Недвижимость: экономика, управление. 2021. № 3. С. 6–10. URL: <https://n-eu.iasv.ru/index.php/neu/article/view/28/171> DOI: 10.22337/2073-8412-2021-3-6-10
10. Cu Ilar-Franca R.M., Azapagic A. Life cycle cost analysis of the UK housing stock // The International Journal of Life Cycle Assessment. 2014. 19. Pp. 174–193. DOI: 10.1007/s11367-013-0610-4
11. Kauskale L., Geypel I. An integrated approach to the analysis of the real estate market in the context of sustainable development for decision-making // Procedia Engineering. 2017. Vol. 172. Pp. 505–512. DOI: 10.1016/j.proeng.2017.02.059
12. Кардашов С.С. Исследование факторов финансовых рисков инвестиционно-строительных компаний // Современные тенденции в экономике и управлении. 2013. № 7. С. 72–75. URL: <https://www.elibrary.ru/item.asp?id=20882209>

13. Тётушкин В.А. Исследование рынка недвижимости в условиях экономического кризиса // Финансовая аналитика: проблемы и решения. 2016. № 40. С. 37–52. URL: <https://www.elibrary.ru/item.asp?id=27187607>
14. Цихан Т.В. Кластерная теория экономического развития // Теория и практика управления. 2003. № 5. С. 33–39.
15. Иванова Е.В. О сущности и видах кластеров в экономике // Организатор производства. 2012. № 3. С. 83–88.
16. Рамазанова А.О., Борисова Л.А. Строительные кластеры как основа формирования стратегических преимуществ российских предприятий строительного комплекса // УЭПС: управление, экономика, политика, социология. 2016. № 1. С. 13–18. DOI: 10.24411/2412-2025-2016-00003
17. Шалумов С.Г. Территориально-производственные кластеры: принципы формирования и траектории развития // Вопросы регулирования экономики. 2017. Т. 8. № 4. С. 59–66. DOI: 10.17835/2078-5429.2017.8.4.058-066
18. Добрынин А.И., Журавлёва Г.П. Мировой экономический кризис и трансформация рыночной модели хозяйства // Известия Иркутской государственной экономической академии. 2010. № 6 (74). С. 5–15. URL: <https://www.elibrary.ru/item.asp?id=15522281>
19. Першина Т.А., Калентьева Н.А. Особенности управления воспроизводством аварийного и ветхого жилищного фонда с позиций системного и процессного подходов в целях повышения комфортности проживания населения города // Фундаментальные исследования. 2016. № 5 (ч. 3). С. 611–615. URL: <https://www.elibrary.ru/item.asp?id=26189862>
20. Портер М. Конкурентная стратегия: Методика анализа отраслей и конкурентов / пер. с англ. 3-е изд. М. : Альпина Бизнес Букс, 2007. 453 с.
21. Кущенко И.В., Волгин В.В. Spatial and resource development in creating a quality framework for the urban environment of the Donetsk People's Republic // Недвижимость: экономика, управление. 2023.

- № 4. С. 6–12. URL: <https://n-eu.iasv.ru/index.php/neu/article/view/156/272> DOI: 10.22337/2073-8412-2023-4-6-12
22. Грабовый П.Г., Волков Р.В., Волгин В.В. Intelligent real estate management // Недвижимость: экономика, управление. 2023. № 1. С. 16–20. URL: <https://n-eu.iasv.ru/index.php/neu/article/view/111/132> DOI: 10.22337/2073-8412-2023-1-16-20
23. Кущенко И.В., Королёв В.П. Традиции и инновации в образовательном процессе и университетской науке для развития компетенций в сфере строительства // Строительство: наука и образование. 2023. Т. 13. Вып. 3. С. 130–146. DOI: 10.22227/2305-5502.2023.3.7

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