

Investment and innovation potential of ensuring the viability of the construction business in new regions

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Abstract The features of overcoming the consequences of crisis phenomena on the basis of investment and innovative development of the construction industry in the conditions of economic recovery in new regions are considered in the article. Modern approaches in the field of improving the comfort and accessibility of housing, improving the quality of the urban environment, and mobilizing local resources to improve housing construction mechanisms are analyzed. It has been established that complex emergency situations require comprehensive measures based on the principles of public-private (municipal-private) partnership. It is shown that the priorities of sustainable development of the urban environment framework are determined by setting the tasks of spatial resource development, renovation, redevelopment and revitalization of urbanized territories. The necessity of a system of balanced indicators for assessing the viability of the construction business, taking into account the tasks of reproducing the housing stock of new regions, is substantiated. Examples of new opportunities for attracting investments in the development of additive construction technologies, the creation of information technologies for managing the life cycle of real estate objects based on the principles of "lean" and "green" construction are presented.

Keywords: housing stock reproduction, investment and innovation potential, sustainable development, life cycle management, spatial and resource development, complex emergency situation

1 Introduction

The large-scale nature of transformations in housing construction is caused by the use of new materials, technologies and innovations reflecting the essential content of the measures of the national project "Housing and Urban Environment" [1], as well as resource support for the implementation of the 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 [2]. At the same time, in order to overcome the crisis phenomena and the comprehensive development of settlements, liberated territories, a program has been developed [3] aimed at providing support to citizens who have lost their homes, restoring the social sphere, developing housing and communal services, developing industry and infrastructure facilities.

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The emergency situation caused by the consequences of the local military conflict [4] opens up new opportunities for comprehensive justification, strategic planning and management of investment projects for the social, economic and environmental development of the urbanized territory of Mariupol. Problematic issues are related to the tasks of spatial and resource development, renovation, redevelopment and revitalization, analysis of the conditions of the economic and geographical location of urban development in the center of the national landscape park "Meotida". Currently, the state budgetary institution "Khomutovskaya steppe-Meotida" has the status of a specially protected natural area (biosphere reserve). The park occupies a coastal two-kilometer zone in the south of the Donetsk People's Republic (DPR) for 150 km, which is divided by the city of Mariupol. The existing variety of landscape, botanical, ornithological, entomological, forest and geological reserves of the Meotida ecosystem (as the ancient Greeks called the Sea of Azov, which means "nurse"), near the densely populated urban development of the industrial region, creates a synergistic effect of increasing the investment attractiveness of projects for the sustainable development of the housing sector.

The priority Sustainable Development Goals were established by the United Nations General Assembly in 2015. According to the accepted definition, "Sustainable cities and communities" must meet the conditions of inclusivity, security, resilience and sustainability of development [5]. Taking into account the tasks of program-oriented development [3], the object of research is the processes of formation and provision of spatial and resource development, renovation, redevelopment and revitalization of housing and the urban environment of the Azov region in an emergency situation and the consequences of a local military conflict. The subject area reflects the theoretical, methodological and practical provisions of investment project management based on balanced indicators of the viability of the construction business.

2 Materials and Methods

The theoretical and methodological basis of the research is the work of domestic and foreign scientists and specialists in the field of business processes of investment, construction and innovation activities; organization and management of the life cycle of real estate objects in conditions of limited availability of resources, as well as technical, economic, environmental, social and other types of risks; development of the regulatory framework of spatial and resource management development of the urban environment framework.

The basis for the formulation of the purpose and objectives of this article are the provisions of a new generation of standards reflecting the best practices of supporting business continuity plans (BCP) and infrastructure restoration in emergency situations (Disaster Recovery Plan, DRP) [6]. A Complex Emergency situation includes various combinations of political, economic, environmental, conflict factors that require the development of comprehensive programs to overcome crisis phenomena. Thus, the program-targeted approach, defined by regulatory measures [1-3], creates a favorable external environment for the development of the construction business in a difficult emergency situation [4]. Effective management of investment projects for the reproduction of housing stock and the urban environment in this context depends on the sustainable functioning and development of construction enterprises, attracting innovative resources, promoting modern technologies, and creating competitive advantages in the construction industry.

The need for continuous development determines the development of strategic approaches capable of meeting the needs of the market with minimal capital investments, an optimal combination of technical and economic aspects of the sustainable functioning and development of a construction enterprise [7]. The methods used to assess the effectiveness of innovation activities are based on a comparison of the results and costs [8]. The progress associated with strategic management of investment and innovation resources is largely determined by the

justification of a balanced scorecard (BSC), which allows adapting a business strategy into a set of interrelated key performance indicators (KPI) [9].

The formation of the BSC is aimed at regulating investment and innovation potential by making changes of a socio-economic, environmental and informational nature, project scenario modeling, analysis of the sustainability of solutions for spatial and resource development, renovation, redevelopment and revitalization of the housing stock and urban environment. Thus, the use of KPI in assessing viability determines the capabilities of the construction business to timely adapt internal factors of investment and innovative development to a complex ecological, socio-economic system, preventive response to environmental changes through effective commercialization of new knowledge.

Methods for describing the objective function of investment and construction project management are considered in [10]. In the course of the research, an information model was developed that includes the actual project indicators and a description of situational problems, as well as a parametric approach that provides the best result of management actions. Comprehensive aspects of sustainable urban development, construction and real estate market management, formation and transformation of urban space, urbanized territories are reflected in the works of a number of authors [11-14]. At the same time, the development and application of technologies for the reproduction of housing stock (the object of this study) requires the development of a viable corporate strategy for the construction business in an emergency situation caused by the consequences of a local military conflict (hereinafter referred to as a complex emergency).

The purpose of the article is to substantiate the theoretical and methodological provisions, the structure of investment planning indicators and the effective use of innovative resources for the reproduction of the housing stock and the urban environment of the Azov region based on the strategy of managing the viability of construction organizations in a difficult emergency situation.

The implementation of this goal involves consideration of the following tasks:

- formalization of a process-oriented approach for modeling the BSC viability of the construction business;
- substantiation of the innovative potential of urban development reproduction of a complex ecological, socio-economic system of an urbanized territory;
- formation of principles of technical and economic protection of real estate objects at all stages of their life cycle.

As is known, viability determines adaptability to renewal, continuous improvement and strategic management, which together ensures sustainable development, realization of competitive advantages, achievement of set goals and high efficiency over a long period of time [15, 16]. Therefore, the relevance of improving organizational forms of audit, monitoring and diagnostics of BSC viability of construction enterprises is inextricably linked with the management of the life cycle of capital construction facilities, timely identification of possible limitations on the availability of resources, as well as technical, economic, environmental, social and other types of risks [17].

3 Results

The concept of real estate management in conditions of uncertainty and risk has been recognized at the global level and is being further developed in terms of increasing the efficiency and productivity of organizations, as well as improving the requirements of technical and economic protection [18, 19]. The problem of ensuring resilience, in addition to the methods of sustainable functioning of the construction business, includes management approaches and mechanisms for timely response to complex emergencies.

The priority tasks of managing the viability of construction organizations, systematization and identification of a complex ecological, socio-economic system of an urbanized territory should be considered in the aspect of the theoretical provisions of the constructive theory of information developed in the works of B.S. Fleishman [20]. The theory of potential efficiency is a synthesis of reliability theory, information theory and game theory, which are united by the fundamental concept of purposeful choice. The basic concepts of efficiency, reliability, efficiency and regulation are presented as the probability of achieving a goal with limited resources (time, materials, energy, etc.). The analysis of research [4, 17] allows us to conclude that it is advisable to use a process-oriented approach in developing a strategy for the viability of reproduction of housing funds and the urban environment in a complex emergency situation (Fig. 1).

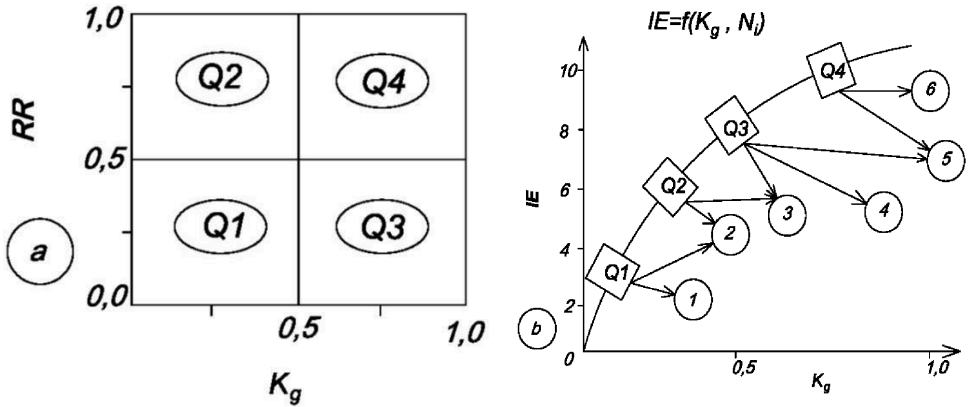


Fig. 1. Matrix of management (a) and models of rational choice (b) of cycles of reproduction of real estate objects.

Reproduction cycles: *Q1*– anti-crisis; *Q2* – resource; *Q3* – motivation; *Q4* – balanced. Rational choice models: 1 – restrictions; 2 – costs; 3 –quality; 4 –reliability; 5 –controlling; 6 – safety.

The proposed matrix of cycles of reproduction of real estate objects (Fig. 1a) reflects the behavioral economic theory, which uses the model of "limited rationality" by G. Simon [21]. Based on the established reproduction cycles, rational choice models (Fig. 1b) take into account the complexity and usefulness of the feasibility study of BSC viability.

The purpose of managing the viability of a construction organization is to continuously improve the output KPI of reproduction (Fig. 2). The possibilities for improving resource parameters and management technologies are determined by BSC, providing functionality in a competitive environment (durability and reliability), as well as investment and innovation potential (survivability and suitability).

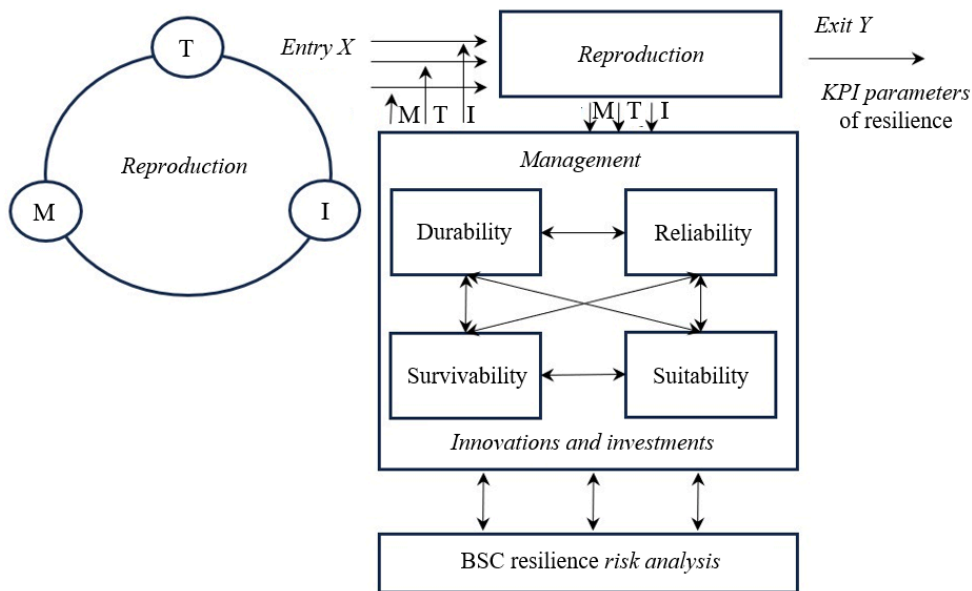


Fig. 2. The scheme of managing the viability of the construction business:
T – technical, *I* – information and *M* – management components

The essence of the risk-based approach to managing the viability of a construction enterprise is determined by the BSC and KPI audit and monitoring processes, which allow responding to changes in the innovation rate of return (RR) and integral investment efficiency (IE) indices in comparative scenario modeling of real estate reproduction (Fig. 1). The priority goals of urban development reproduction in a complex ecological, socio-economic system are taken into account using the suitability coefficient (K_g), as the ratio of the initial (IV), residual (RsV) and recovery (RcV) value of real estate:

$$K_g = (RcV - RsV) / IV \tag{1}$$

Thus, the K_g coefficient expresses the effectiveness of investment and innovative solutions for the reproduction of housing stock and the urban environment in the implementation of measures to restore viability according to the requirements of further functioning, taking into account the life cycle of the real estate object. The integral efficiency of IE reflects the dependence of the technical and economic indicators of investment planning, effective use of resources on the required amount of information (N_i) models of spatial-territorial spatial-resource development, renovation, redevelopment and revitalization of urbanized territories.

4 Discussion

The investment and innovative attractiveness of real estate in the Azov region is associated with the implementation of program measures to support the construction industry [1-3], sustainable development of the housing stock, the formation of a comfortable urban environment based on a balanced social, economic and environmental strategy for the restoration of new regions. Within the framework of the possibilities and traditions of the pre-crisis period, the priorities of the Azov region were a well-known set of landmarks "forges, granaries and health resorts" of

Donbass. The consequences of a complex emergency situation create a new perspective for restarting the investment and innovation potential of urban reproduction of a complex ecological, socio-economic system due to the strategic planning of the development of Mariupol as a "forge, granary, health resorts and wet nurses" based on the principles of spatial resource development and public-private (municipal-private) partnership. Thus, the economy, construction management and the real estate market should become the main tools contributing to the reproduction of urbanized territory in new regions.

The drivers of economic growth in the reproduction of the housing stock and the urban environment of the Azov region are:

- investment and innovation potential, which determines the resource base of scientific, technical, technological and personnel support, the viability of construction enterprises within the framework of the chosen strategy for attracting investment funds and implementing promising innovative projects;
- cluster approach to the formation of urban development directions, restoration of destroyed housing stock, mobilization of local resources for new construction, mainly individual low-rise residential buildings using industrial technologies;
- development (integrated development) of urbanized territories, creation of industrial technoparks, eco-parks and transport and logistics centers, development of high-tech sectors of the economy, modernization and diversification of industrial complexes;
- renovation of real estate objects within the framework of the municipal strategy for the formation and functioning of the territories of a historically established city, resort resources, the development of tourist, recreational and sports tourism clusters, ecotourism;
- redevelopment of ecologically disturbed territories, landscape design and further productive use, taking into account the natural resource potential and the appropriate zoning of the Khomutovskaya Steppe - Meotida biosphere reserve;
- revitalization of the viability of the territory or facilities that have ceased functioning for their original purpose;
- development of transport corridors through the formation of maritime, aviation, railway, and automobile passenger and cargo communications and related infrastructure.

Important priorities in the field of housing construction are the use of additive technologies in the construction of cottages or the creation, by the method of construction 3D printing, of structures for subsequent piecemeal industrial assembly of buildings and structures. The competitive advantages of the viability of the construction business, along with the processes of reproduction management (see Fig. 2), involve the timely implementation of intelligent resource-saving systems, technical and economic protection based on the principles of "lean" and "green" construction of real estate.

In general, the total economic efficiency of an urban megaproject for the reproduction of housing and the urban environment is defined as the sum of the components:

$$P_{int}^{\tau} = \sum E_{int}^{r.megaproj} * k_{i,p}^{inv.att.} =$$

$$= \sum (E_{icc}^r + E_{cc}^r + E_{tc}^r + E_{lc}^r + E_{uc}^r + \dots E_{ip}^r) * k_{i,p}^{inv.att.};$$

where, P_{int}^{τ} – organizational and economic sustainability of the urban real estate revitalization life cycle;

E_{icc}^r –integral indicator of the economic reliability of real estate in the investment and construction complex (including cluster portfolios, cluster objects);

E_{cc}^r - integral indicator of the economic reliability of the municipal complex;

E_{tc}^r - integral indicator of the economic reliability of the transport complex;

E_{lc}^r - integral indicator of the economic reliability of the logistics complex;

E_{uc}^r - integral indicator of the economic reliability of an urban complex (administrative buildings, universities, hotels, etc.);

E_{ip}^r – the same, other mono-projects;

$k_{i,p}^{inv.att.}$ – investment attractiveness of the territory (for an innovative type of city, its value is $0.5 \div 1$).

Based on the results of a strategic analysis, activities are being built to reproduce the housing stock and the urban environment of all participants in the construction complex.

5 Conclusion

A risk-based approach to the formation of a strategy for the viability of the construction business (Fig. 1, 2), the reproduction of housing stock and the urban environment in a difficult emergency situation is justified. The structuring of BSC and KPI of construction enterprises has been carried out, ensuring the effective implementation of investment and innovative solutions for spatial-territorial spatial-resource development, renovation, redevelopment and revitalization of urbanized territories of the Azov region.

The classification of cycles of reproduction of real estate objects is proposed (Fig. 1) based on the management matrix (a) and rational choice models (b), scenario options for investment and innovation planning. The risk analysis of the construction business is aimed at evaluating the system of viability parameters that ensure functionality in a competitive environment (durability and reliability), as well as investment and innovation potential (survivability and suitability). The developed methodological approach makes it possible to analyze the life cycle of the housing stock and the urban environment in a complex ecological, socio-economic system, taking into account the suitability coefficient (K_g), which determines the ratio of the initial (IV), residual (RsV) and recovery (RcV) value of real estate.

The use of a risk-based approach to manage the resilience of the construction business in a difficult emergency situation ensures the sustainable reproduction of urban real estate through the attraction of investment funds and the implementation of promising innovative resources.

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