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Integral assessment of resource and innovation potential of industrial housebuilding enterprises: mechanism of formation taking into account risks and uncertainty

The article highlights the significance of the resource and innovation potential of industrial housebuilding enterprises in the context of the rapidly changing global economic environment. The author emphasizes the need to develop a mechanism for a comprehensive assessment of this potential in order to provide a comprehensive understanding of the strengths and weaknesses of the enterprise and to identify areas for improvement. The proposed mechanism for assessing resource and innovation potential takes into account both internal and external factors affecting the enterprise. The authors suggest that this approach can lead to a more accurate and reliable evaluation of the enterprise's potential, as it considers both the resources available to the enterprise and the external factors that may impact its performance.

The article also points out the importance of risk management in the enterprise capacity assessment process. The proposed mechanism takes into account risks and uncertainties associated with the activities and development of an enterprise, allowing decision-makers to identify potential risks and develop appropriate strategies to manage them. The study concludes that the proposed mechanism can be used as a tool for decision-making related to the development of industrial housebuilding enterprises. The authors suggest that the results of the study can be of interest to specialists in the field of innovation management, risk management, and industrial housebuilding, as well as to business owners and government agencies involved in the development of this sector.

Keywords: industrial housing construction enterprises, risk and uncertainty, investment, resource potential, economic reliability



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In an unstable geopolitical situation in the country and a rapidly changing economic environment, construction industry enterprises need to have a well-developed resource and innovation potential in order to operate effectively and be competitive in the market [1]. However, assessing such potential is not always an easy task, especially considering the risks and uncertainties associated with enterprise activities.

A systematic and comprehensive analysis of the production and construction process of an enterprise is associated with its comprehensive evaluation of organizational and economic stability. Therefore, before starting the analysis, it is advisable to group the production factors and identify the reserves that can be used. Factors are a combination of elements and causes that affect the change in the controlled indicator taken as a criterion. The factors are classified depending on the purpose and objectives of the analysis [2]. If the analysis is carried out to identify the reserves that intensify the production process, then factors are divided into three groups: extensive, intensive, and integral.

The grouping of factors will change when setting other analysis tasks. After selecting factors, assessing their significance and classifying them into groups and levels, it is possible to move on to the analysis of specific production tasks.

A comprehensive assessment of production intensity is reduced to comparing indicators of production-technical and financial resources.

- In the most general form, the complex analysis of the production process for construction industry enterprises includes the following main stages:
- assessment of production intensity;
 - analysis of production and product sales;
 - analysis of product (object) technological feasibility;
 - analysis of fixed asset utilization;
 - development and analysis of operational, tactical, and strategic tasks.

The risk assessment of the strategy of industrial housing construction enterprises of the territorial investment and construction complex engaged in the implementation of housing construction programs involves a thorough study of the sociological, scientific and technical, marketing, and technological situations in the real estate market (Fig. 1).

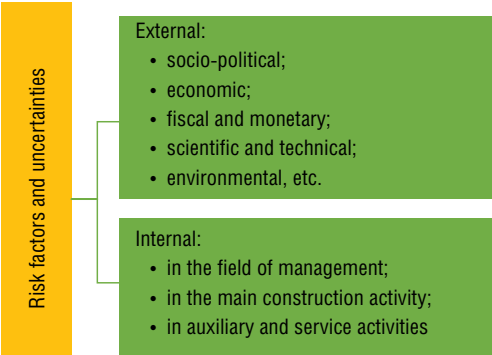


Fig. 1. General scheme for classifying risk factors for industrial housing construction enterprises

At the present time, the forecasting of risk and income is one of the key concepts in the economic activities of industrial housing construction enterprises [3]. Based on the existing classifier, possible risks and uncertainties in the economic activities of industrial housing construction enterprises can be divided into the following categories:

- 1) national;
- 2) sectoral;
- 3) territorial-regional;
- 4) project-specific;
- 5) local.

Country risks for industrial construction companies are unmanageable, while industry risks are difficult to manage. Territorial-regional risks include changes in municipal and regional construction and legal regulations, tax requirements, changes in consumer preferences, etc. [4].

To date, it is practically impossible to completely eliminate the negative impact of risk on the economic activities of construction companies. Let's consider risks that can be managed and reduce their negative impact on the further economic activities of construction companies:

- investment risks associated with the construction phase of the project's life cycle, i.e., the probability of loss of assets of an economic entity due to inefficient choice of investment and construction project, as well as an increase in the cost of the project at individual stages and phases of its life cycle, the nature and quality of management of the technical and technological components of the project (for example, risks of ensuring qualified labor resources, equipment, building materials, design errors, accessibility (remoteness) of the construction site, changes in quality, non-compliance with project documentation, contract risks);
- business risks associated with the implementation and partial operation of the investment and construction project (performance and management risks).

At any stage of the life cycle of a real estate object, there is an element of risk that can affect its profitability. However, in some cases, risk can become a stimulus for obtaining high profits: the higher the level of risk, the greater the potential reward for successful investment [5].

To successfully implement new projects for industrial housing construction as a developer, a thorough analysis of the current situation is necessary. According to research, there are various types of local risks associated with the functioning of industrial housing construction, such as financial risk, inflation risk, physical property violation risk, liquidation risk, and reputational risk.

1. Financial risk. With any type of investment, there is a risk that the invested financial resources may turn out to be unreliable, partially or completely. In addition, there may be situations where the enterprise has to use its capital to cover unforeseen expenses caused by changes in market conditions. When selling real estate, there is also a risk of losses and losses associated with underestimating risks. All of these factors can have a negative impact on the organizational and economic sustainability of industrial housing construction. There is also a risk associated with the loss of potential income that could have been generated if the capital was invested in another project. Additionally, there is a possibility of losing some or all of the investment capital.
2. Inflation risk. Economic inflation can negatively affect the return on invested funds, as even if there is a profit, it may be lower than the invested capital due to inflation.

3. Physical property risk. There is always a risk of physical damage and, consequently, of deterioration in the quality of the property as a result of natural and climatic phenomena, as well as of various natural disasters. Although insurance may partially compensate for the costs of restoring the property, physical destruction can significantly affect the further implementation of the project.
4. Liquidity risk. Due to the fact that real estate is not a highly liquid investment, such as equity capital or bonds, the company may take longer to own a property than originally planned.
5. Image risk. Various methods of marketing analysis are now used in practice for indicators of the organizational and economic sustainability and economic reliability of construction companies (financial position, experience, list of services etc.). In Fig. 2, the risk distribution is presented for the stages of implementation of an investment and construction project, taking into account the mechanism of risk management and uncertainty.

Research of the market segment for this type of real estate is crucial for achieving success in project implementation (the more research is conducted before construction begins, the more chances of identifying potential risks):

- random events associated with the acquisition of land;
- diversification of activities of industrial house-building companies;
- transfer of financial risk to the future consumer. Rental payments should compensate for the increase in current expenses and rent payments, which in turn will protect the company from inflation;
- limitation of financial responsibility. Reduction of costs associated with paying interest on loans during project implementation, as well as attracting partners who will share the responsibility of the investment and construction company;
- distribution of legal responsibility among partners [6].

The Fig. 3 illustrates types of risk and positive outcomes of effective solutions.

The economic reliability of the production and construction system of a construction company varies significantly and depends on many of its components, such as the material-technical, organizational-technological, and financial state [7]. Therefore, the overall integral coefficient of the economic reliability of the production and construction system, E_j^d can be expressed as a combination of its technical-technological and financial states.

If the efficiency of the production-construction system, E_s is expressed as a function of its output potential capacity, P_{en}^i

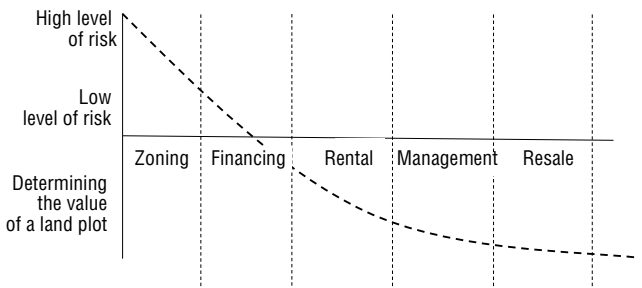


Fig. 2. Distribution of risk by stages of implementation of an investment and construction project

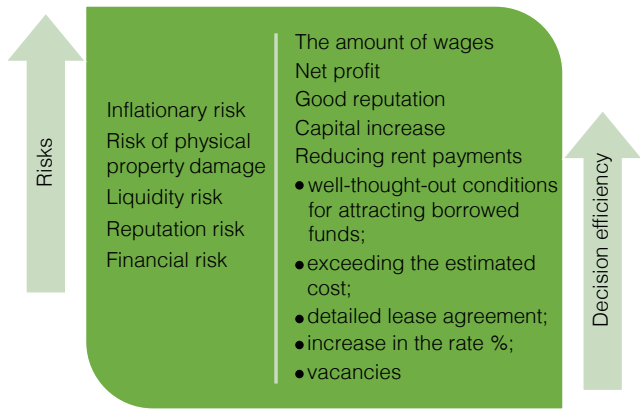


Fig. 3. Types of risk and results of effective decisions

(resource-innovation potential), and the integral coefficient of performance results, $K_r = \int(R_i)$, then [7]:

$$E_j^s = P_{en}^j \int(R_i). \tag{1}$$

As the degree of risk increases, enterprises experience losses of their resources utilized (Fig. 4).

In accordance with the analysis of the feasibility of costs at risk during the implementation of an investment and construction project, the overall financial condition can be divided into 4 areas — a normal state (E^A), an unstable state (E^C), a critical state (E^T), a crisis state (E^H), which in turn, they can also vary depending on the degree of risk management [8].

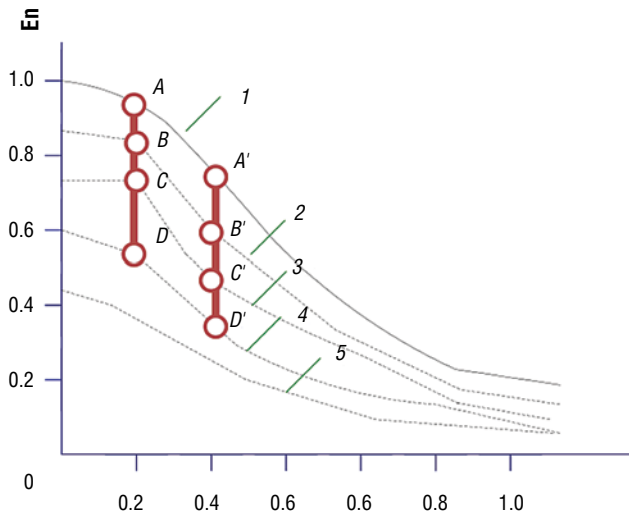


Fig. 4. The law of distribution of the level of economic reliability (E^s) of the production and construction system of industrial housing construction enterprises: 1 — integral coefficient of calculated effectiveness K_r ; 2–5 too, determined by risk; AB, AC, AD, A'B', A'C', A'D' — risks under the influence of factors of uncertainty and randomness

From the graph presented in Fig. 4, it can be seen that risks can fundamentally alter the financial state of the industrial-construction system. Their influence can both decrease the technical and economic indicators by 40–75 % (as shown by curves 1 and 2), and cause catastrophic damage [9]. Managing risk is further

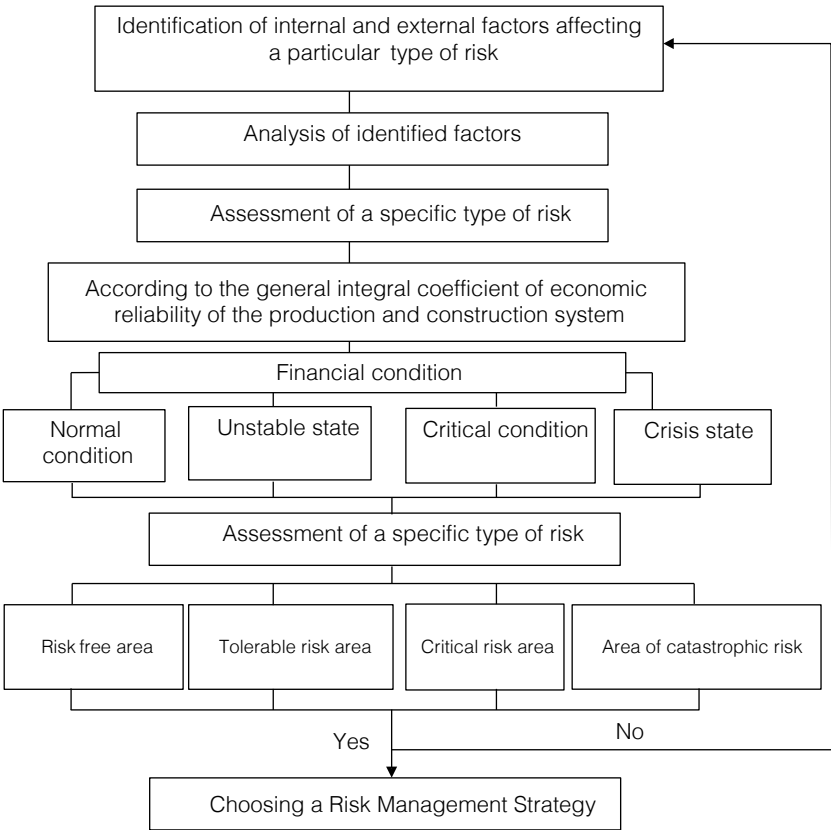


Fig. 5. Flowchart of risk analysis and methods for regulating the financial state of industrial housing construction enterprise

complicated by the fact that it is shaped by external factors of uncertainty and internal factors of randomness.

Fig. 5 shows a flowchart of risk analysis and methods for regulating the financial state of the company [4]. The main objectives of risk analysis should include determining the level of risk, i.e. the area of its operation on an assessment scale; establishing the magnitude of risk; comparing the magnitude of risk with the level of economic reliability of the industrial-construction system and regulating its value with the areas of financial state of the enterprises of industrial housing construction [10].

The concept of determining the impact of risk on the losses and benefits of the production and construction system is expressed in establishing the ratio of the probability of loss of profit and its increase, taking into account the results of the economic activity of industrial housing construction enterprises [11].

This ratio of obtaining possible results with risky actions is shown on the graphical model of the "butterfly of probabilities" (Fig. 6).

One wing of the "butterfly" OABCD — the area of probability of profit, which increases with increasing risk. The other wing — OA'B'C'D' — characterizes the area of possible losses in case of an increase in the degree of risk. Therefore, by taking risks, enterprises will have the same chance of both gaining and losing [12]. Thus, in order to make an optimal decision, it is necessary to justify and choose options with minimal risks, but with the possibility of obtaining maximum income (Table).

Degree of provision of industrial housing construction enterprises with necessary resources, rational use of internal reserves largely determines the required (planned) level of economic reliability E_r^d of the functioning of the production-construction system in areas of acceptable risk and its financial condition [13].

Resource and innovation potential is one of the most important parameters that industrial housing construction enterprises use to implement plans to produce and reduce the cost of finished construction products, increase profits and increase labor productivity [14].

The need to increase labor, material and technical resources for the production can be compensated both through an extensive method of development and through the intensification of production (rational use of available resources, reduction in the number of workers, introduction of innovative technologies, etc.).

The essence of assessing the resource and innovation potential, which consists of various groups of indicators (logistical, financial,

Determination of the economic reliability of the operation of an industrial housing construction enterprise (on the example of LLC Kazan House-Building Plant)

Planning and controlling system	Economic reliability				Note
	Recommended Risk Thresholds				
	Risk free area (1)	Tolerable risk area (2)	Critical risk area (3)	Catastrophic risk area (4)	
(O) Operational planning and management	> 0.75	0.5–0.75	> 0.75	0.5–0.75	> 0.75
(T) Tactical planning and control	< 1 > 0.75	1.00–0.75	< 1 > 0.75	1.00–0.75	< 1 > 0.75
(S) Strategic planning and management	> 0.75	0.75–0.5	> 0.75	0.75–0.5	> 0.75

economic and organizational), is to develop an integral indicator of economic reliability, taking into account acceptable risk areas [15].

Each assessment indicator, quantitative and qualitative levels, form the possibility of using the management, planning and controlling system in conjunction with the dynamics of existing trends in managing the organizational and economic sustainability of industrial housing construction enterprises [16].

In conclusion, it is important to note that in order to effectively build the potential of industrial housing construction enterprises, it is necessary to take into account all possible risks and uncertainties, conduct a thorough analysis of the market and resources, and identify potential opportunities for innovation. An integral assessment of the resource and innovation potential allows you to get a comprehensive idea of the capabilities of an industrial housing construction enterprise, its competitiveness and risks, and also contributes to making informed decisions on further business development. The need to take into account risks and uncertainty emphasizes the importance of continuous monitoring and analysis of the activities of enterprises, which is a necessary condition for ensuring their sustainable functioning.

REFERENCES

1. Grabovy P.G., Azhimov T.Z., Volkov R.V. The economic feasibility analysis of innovative megaprojects for the benefit of construction enterprises: the case of the Republic of Tatarstan. *Real Estate: Economics, Management*. 2021; 4:13-22. URL: <https://www.elibrary.ru/item.asp?id=48723905>

2. Grabovy P.G., Lunyakov M.A., Azhimov T.Z. Peculiarities of external environment influence on business and innovative activity of enterprises of investment-construction complex (by the example of the Republic of Tatarstan). *Forensic building-technical and value examination: problems and ways of their solution* : Collection of Materials of National Scientific-Practical Conference, Moscow, September 30 – October 1, 2021. Moscow, MGSU, 2021; 76-94. (rus.).

3. Bredikhin V.V., Bredikhina N.V. Strategy of the enterprise of the construction complex of the region in terms of interaction with external infrastructure. *BST: Bulletin of Building Technology*. 2022; 4(1052):36-38. (rus.).

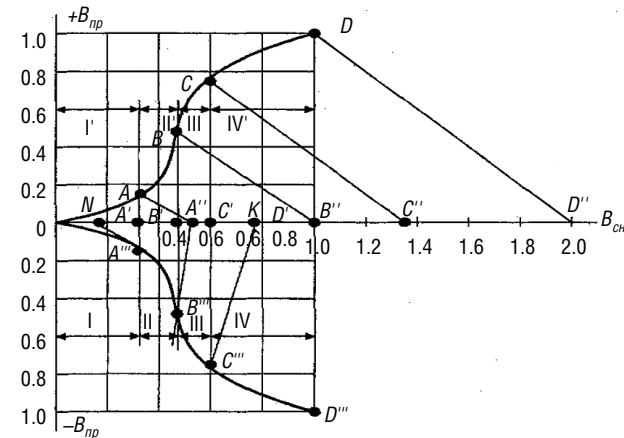


Fig. 6. Evaluation scale of the indicator (price) of risk depending on the probability of its manifestation ("butterfly of probabilities" of risk results)

4. Verstina N.G., Kisel T.N., Kulakov K.Yu. Innovative technologies implementation to the investment and construction industry: problems and determining factors. *E-Management*. 2022; 5(1):4-13. DOI: 10.26425/2658-3445-2022-5-1-4-13 (rus.).
5. Telichenko V., Benuzh A., Mochalov I. Landscape architecture and green spaces in Russia. *MATEC Web of Conferences*, Warsaw, August 19–21, 2017. Vol. 117. Warsaw, EDP Sciences, 2017; 00164. DOI: 10.1051/mateconf/201711700164
6. Bolshakov N., Plyako A., Celani A., Azhimova L., Akimov L. Digital asset in the system of real estate management. *E3S Web of Conferences*. Moscow, April 22–24, 2021. Moscow, 2021. DOI: 10.1051/e3sconf/202126304039
7. Mukharramova E.R., Fayzullin I.E., Ajimova L.I. Cost engineering: construction price formation. *Russian entrepreneurship*. 2017; 18(16):2317-2336. DOI: 10.18334/rp.18.16.38234 (rus.).
8. Grabovy P.G., Butyrin A.Yu., Verstina N.G., Volkov R.V., Godovnikov S.V., Grebenshchikov S.V. et al. *Risks in Modern Business*, Moscow, MGSU, 2017; 288. (rus.).
9. Dukhanina E.V., Kulakov K.Y., Khametova A.T. Analysis of approaches to define risk and to risk management. *Vestnik Eurasianova*. 2022; 14(1):24. URL: <https://www.elibrary.ru/item.asp?id=48447230> (rus.).
10. Khrustalev B.B., Antipov V.A., Lunyakov M.A. Principal development features of the investment and construction complex in the Russian Federation. *Real Estate: Economics, Management*. 2022; 2:6-10. URL: <https://www.elibrary.ru/item.asp?id=49750148>

11. Kostrikin P. The effectiveness of housing renovation programs in the Russian Federation. *MATEC Web of Conferences*, St. Petersburg, December 20–22, 2017. Vol. 170. Saint Petersburg, EDP Sciences, 2018; 01088. DOI: 10.1051/mateconf/201817001088
12. Kostrikin P.N., Le V.T., 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://www.elibrary.ru/item.asp?id=47121019>
13. Kuzmina T.K., Volkov R.V., Karnaukhova D.O. Comprehensive methodology of risk assessment of construction projects in current circumstances. *Construction production*. 2022; 2:37-41. DOI: 10.54950/26585340_2022_2_37 (rus.).
14. Grabovy P.G., Baronin S.A., Volgin V.V. Sustainability of industrial construction in the context of development life cycles of industrial parks. *Real Estate: Economics, Management*. 2022; 3:11-19. URL: <https://www.elibrary.ru/item.asp?id=50353389>
15. Grabovy P.G., Lunyakov M.A., Mottaeva A.B. Genesis and evolution of a multiprofile territorial cluster. Main directions of development of land and property complex of urban agglomerations. Moscow, ASV Publ., 2020; 240. (rus.).
16. Kirillova A.N., Balashov E.B. Features of the model of innovation-balanced reproduction of housing and communal services. *Bulletin of the Russian Academy of Natural Sciences*. 2022; 22(2):84-91. DOI: 10.52531/1682-1696-2022-22-2-84-91 (rus.).

Интегральная оценка ресурсно-инновационного потенциала предприятий индустриального домостроения: механизм формирования с учетом рисков и неопределенности

В статье освещена значимость ресурсного и инновационного потенциала предприятий индустриального домостроения в контексте быстро меняющейся глобальной экономической среды. Автор подчеркивает необходимость разработки механизма для комплексной оценки этого потенциала с целью обеспечения всестороннего понимания сильных и слабых сторон предприятия и выявления областей для улучшения. Предлагаемый механизм оценки ресурсного и инновационного потенциала учитывает как внутренние, так и внешние факторы, влияющие на предприятие. Автор предполагает, что такой подход может привести к более точной и надежной оценке потенциала предприятия, поскольку он учитывает как ресурсы, доступные предприятию, так и внешние факторы, которые могут повлиять на его производительность.

Также в статье отмечается важность управления рисками в процессе оценки потенциала предприятий. Предлагаемый механизм учитывает риски и неопределенности, связанные с деятельностью и развитием предприятия, что позволяет принимающим решения идентифицировать потенциальные риски и разрабатывать соответствующие стратегии для их управления. Исследование приводит к выводу, что предлагаемый механизм может быть использован как инструмент для принятия решений, связанных с развитием предприятий индустриального домостроения. Автор предполагает, что результаты исследования могут быть интересны специалистам в области управления инновациями, управления рисками и индустриального домостроения, а также владельцам бизнеса и государственным органам, занимающимся развитием данного сектора.

Ключевые слова: предприятия индустриального домостроения, риск и неопределенность, инвестиции, ресурсный потенциал, экономическая надежность

СПИСОК ИСТОЧНИКОВ

1. Grabovy P.G., Azhimov T.Z., Volkov R.V. The economic feasibility analysis of innovative megaprojects for the benefit of

construction enterprises: the case of the Republic of Tatarstan // *Real Estate: Economics, Management*. 2021. Vol. 4. Pp. 13–22. URL: <https://www.elibrary.ru/item.asp?id=48723905>

2. Грабовый П.Г., Луныков М.А., Ажимов Т.З. Особенности воздействия внешней среды на деловую и инновационную активность предприятий инвестиционно-строительного комплекса (на примере Республики Татарстан) // Судебная строительно-техническая и стоимостная экспертизы: проблемы и пути их решения : сб. мат. Национальной науч.-практ. конф., Москва, 30 сентября – 1 октября 2021 г. М. : МГСУ, 2021. С. 76–94.
3. Бредихин В.В., Бредихина Н.В. Стратегия предприятия строительного комплекса региона в условиях взаимодействия с внешней инфраструктурой // БСТ: Бюллетень строительной техники. 2022. № 4 (1052). С. 36–38.
4. Верстина Н.Г., Кисель Т.Н., Кулаков К.Ю. Внедрение инновационных технологий на предприятиях инвестиционно-строительной сферы: проблемы и определяющие факторы // *E-Management*. 2022. Т. 5. № 1. С. 4–13. DOI: 10.26425/2658-3445-2022-5-1-4-13
5. Telichenko V., Benuzh A., Mochalov I. Landscape architecture and green spaces in Russia // *MATEC Web of Conferences*, Warsaw, August 19–21 2017. Vol. 117. Warsaw : EDP Sciences, 2017. P. 00164. DOI: 10.1051/mateconf/201711700164
6. Bolshakov N., Plyako A., Celani A., Azhimova L., Akimov L. Digital asset in the system of real estate management // *E3S Web of Conferences*. Moscow, April 22–24, 2021. Moscow, 2021. DOI: 10.1051/e3sconf/202126304039
7. Мухаррамова Э.Р., Файзуллин И.Э., Ажимова Л.И. Стоимостной инжиниринг: формирование стоимости строительства // *Российское предпринимательство*. 2017. Т. 18. № 16. С. 2317–2336. DOI: 10.18334/rp.18.16.38234
8. Грабовый П.Г., Бутырин А.Ю., Верстина Н.Г., Волков Р.В., Годовников С.В., Гребенчиков С.В. и др. *Риски в современном бизнесе*. М. : МГСУ, 2017. 288 с.
9. Духанина Е.В., Кулаков К.Ю., Хаметова А.Т. Анализ подходов к трактовке понятия риска, его содержания и методов управления // *Вестник евразийской науки*. 2022. Т. 14. № 1. Ст. 24. URL: <https://www.elibrary.ru/item.asp?id=48447230>
10. Khrustalev B.B., Antipov V.A., Lunyakov M.A. Principal development features of the investment and construction complex in the Russian Federation // *Real Estate: Economics, Management*. 2022; 2:6-10. URL: <https://www.elibrary.ru/item.asp?id=49750148>
11. Kostrikin P. The effectiveness of housing renovation programs in the Russian Federation // *MATEC Web of Conferences*, St. Petersburg, December 20–22, 2017. Vol. 170. Saint Petersburg :

EDP Sciences, 2018. P. 01088. DOI: 10.1051/mateconf/201817001088

12. Kostrikin P.N., Le V.T., 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. Vol. 3. Pp. 6–10. URL: <https://www.elibrary.ru/item.asp?id=47121019>

13. Кузьмина Т.К., Волков Р.В., Карнаухова Д.О. Комплексная методология оценки рисков строительных проектов в современных условиях // *Строительное производство*. 2022. № 2. С. 37–41. DOI: 10.54950/26585340_2022_2_37

14. Grabovyy P.G., Baronin S.A., Volgin V.V. Sustainability of industrial construction in the context of development life cycles of industrial parks // *Real Estate: Economics, Management*. 2022. No. 3. Pp. 11–19. URL: <https://www.elibrary.ru/item.asp?id=50353389>

15. Грабовый П.Г., Луняков М.А., Моттаева А.Б. Генезис и эволюция многопрофильного территориального кластера. Основные направления развития земельно-имущественного комплекса городских агломераций. М. : Изд-во АСВ, 2020. 240 с.

16. Кириллова А.Н., Балашов Е.Б. Особенности модели инновационно-сбалансированного воспроизводства жилищно-коммунального хозяйства // *Вестник РАЕН*. 2022. Т. 22. № 2. С. 84–91. DOI: 10.52531/1682-1696-2022-22-2-84-91

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