UDC: 351.814.1-005.52:005334

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RISK-MANAGEMENT AS AN INSTRUMENT OF THE PUBLIC REGULATION OF RISK ASSESSMENT IN CONSTRUCTION AND OPERATION OF BUILDINGS

Abstract. The urgency of the article lies in the need of improving the mechanisms of public regulation of economic relations in the country. To date, there are many internationally recognized quantitative, descriptive, and imitative approaches to the managing the risk of an investment project in the real sector. Their choice requires taking into account the peculiarities of public regulation of the construction industry on the basis of risk management. Methods of risk assessment are considered in the works of domestic and foreign scientists, in particular such as S. Bolotin [3], N. Blanas, C. Syraculis and H. Pandemmenou [19], V. Koshelev [8], O. Kruzhilko [9], T. Morozova [11], I. Ptukhina [12], A. Snirov [13], S. Shulzhenko [14], S. Hendrickson [16]. The peculiarities of public regulation of the activity of the construction industry actors and a comprehensive understanding of all the advantages and disadvantages of various methods of risk assessment in construction are still insufficiently worked out. The main task of the investor's risk analysis is to construct the correct model (presentation) of the project, which is used to make a decision to finance the construction of a particular object. The basic groups of methods for analyzing the risk of financing a

project by an investor can easily be determined by the key subject of consideration — this may be either a scheme of financial flows that arise from its financing, or a project itself as a socio-economic phenomenon. The use of risk management in the management of investment and construction projects serves as a modern tool for the public regulation and risk management of construction companies.

Keywords: public regulation in the field of construction, risk management, risk assessment methods, investment and construction projects.

РИЗИК-МЕНЕДЖМЕНТ ЯК ІНСТРУМЕНТАРІЙ ДЕРЖАВНОГО РЕГУЛЮВАННЯ ОЦІНКИ РИЗИКІВ ПРИ БУДІВНИЦТВІ ТА ЕКСПЛУАТАЦІЇ СПОРУД

Анотація. Визначено актуальність і необхідність удосконалення механізмів державного регулювання економічних відносин у країні. На сьогодні існує безліч апробованих світовим досвідом кількісних, описових, імітаційних підходів до управління ризиком інвестиційного проекту в реальному секторі. Їх вибір потребує врахування особливостей державного регулювання будівельної галузі на засадах ризик-менеджменту. Методи оцінки ризиків розглядаються у працях вітчизняних і зарубіжних вчених, зокрема таких, як: С. Болотін [3], Н. Бланас, К. Сіракуліс та Х. Пандемменоу [19], В. Кошелев [8], О. Кружилко [9], Т. Морозова [11], І. Птухіна [12], А. Шниров [13], С. Шульженко [14], С. Хендріксон [16]. Зазначено, що недостатньо опрацьованими залишаються особливості державного регулювання діяльності суб'єктів будівельної галузі та комплексне розуміння усіх переваг і недоліків різних методів оцінки ризиків у будівництві. Обґрунтовано, що основним завданням аналізу ризику інвестором є побудова коректної моделі (подання) проекту, яка використовується для прийняття рішення про фінансування спорудження того чи іншого об'єкта. Базові групи методів аналізу ризику фінансування проекту інвестором легко визначити по ключовому предмету розгляду — це може бути або схема фінансових потоків, що виникають при його фінансуванні, або власне проект як соціально-економічний феномен. Зроблено висновок, що використання ризик-менеджменту в управлінні інвестиційно-будівельними проектами виступає сучасним інструментарієм механізму державного регулювання та управління ризиками організацій будівельного комплексу.

Ключові слова: державне регулювання у сфері будівництва, ризик-менеджмент, методи оцінки ризиків, інвестиційно-будівельні проекти.

РИСК-МЕНЕДЖМЕНТ КАК ИНСТРУМЕНТАРИЙ ГОСУДАРСТВЕННОГО РЕГУЛИРОВАНИЯ ОЦЕНКИ РИСКОВ ПРИ СТРОИТЕЛЬСТВЕ И ЭКСПЛУАТАЦИИ СООРУЖЕНИЙ

Аннотация. Определена актуальность и необходимость совершенствования механизмов государственного регулирования экономических отношений в стране. На сегодня существует множество апробированных мировым опытом количественных, описательных, имитационных подходов к управ-

лению риском инвестиционного проекта в реальном секторе. Их выбор требует учета особенностей государственного регулирования строительной отрасли на основе риск-менеджмента. Методы оценки рисков рассматриваются в трудах отечественных и зарубежных ученых, в частности таких, как: С. Болотин [3], Н. Бланас, К. Сиракулис и Х. Пандемменоу [19], В. Кошелев [8], А. Кружилка [9], Т. Морозова [11], И. Птухин [12], А. Шныров [13], С. Шульженко [14], С. Хендриксон [16]. Отмечено, что недостаточно проработанными остаются особенности государственного регулирования деятельности субъектов строительной отрасли и комплексное понимание всех преимуществ и недостатков различных методов оценки рисков в строительстве. Обосновано, что основной задачей анализа риска инвестором является построение корректной модели (представления) проекта, которая используется для принятия решения о финансировании строительства того или иного объекта. Базовые группы методов анализа риска финансирования проекта инвестором легко определить по ключевому предмету рассмотрения — это может быть либо схема финансовых потоков, возникающих при его финансировании, или собственно проект как социально-экономический феномен. Конкретизировано, что использование риск-менеджмента в управлении инвестиционно-строительными проектами выступает современным инструментарием механизма государственного регулирования и управления рисками организаций строительного комплекса.

Ключевые слова: государственное регулирование в сфере строительства, риск-менеджмент, методы оценки рисков, инвестиционно-строительные проекты.

Target setting. is analysis of the use of risk management in the management of investment and construction projects as a modern tool of state regulation in the field of construction through clarification of the suitability of risk assessment methods for use in the construction and operation of facilities (based on ISO 31010-2011). In the conditions of imperfection of mechanisms of state regulation of economic relations in the country, organizations of all types and sizes face internal and external factors and influences, because of which it is impossible to determine how and when they will be able to achieve their goals. Although there are many proven by international experience quantitative, descriptive, imitative approaches to the management of risk of the investment project in the real sector, but in practice the whole range of methods is not used widely. Often it is limited to the basic ranking of the riskiness of various projects and rules of the assignment of projects to particular risk categories.

When working with simple projects this methodology is justified, but with the growing complexity of projects, risk management is impossible without the involvement of a more detailed development. And this requires the account of features of state regulation of the construction industry and a compre-

hensive understanding of all of the advantages and disadvantages of different methods of risk assessment in construction. Therefore, in practice, such effective management tool as risk management is increasingly used.

Actual scientific researches and issues analysis. Through considerable uncertainties in investment in Ukrainian construction industry risk analysis plays an important role in pre-investment studies of firms operating in the Ukrainian market. Risk assessment techniques are discussed in the works of Ukrainian and foreign scientists, such as S. Bolotin [3], N. Blanas, K. Sirakulis, H. Pandemmenu [19] V. Koshelev [8], O. Kruzhylko [9], T. Morozova [11], I. Ptukhina [12], A. Shnyrov [13], P. Shulzhenko [14], S. Hendrickson [16]. Issues of state regulation of risk assessment for construction and operation of facilities, risk management and the concept of risk management are the subject of research of such scientists as. I.Azarov [1], K. Basenko [2], F. Vigbin [20], I. Vlasenko [4], O. Voskoboynik [5], N. Jill and B. Tesar [17], A. Kalashnikov [7], V. Melko [10].

The statement of basic materials. Currently, the Ukrainian economy is in a situation where the economy itself – the basic production assets, outdated technology, technical and technological system of construction projects is a source of risks of accidents and disasters. Objectively and fundamentally insurmountable uncertainty that occurs when making state-management, organizational, economic and design of the system-technical decisions leads to the fact that the risk of such decisions is never zero. Risk is inherent in every project, every process and every decision at all stages of the project life cycle. Therefore, the risk needs to be managed at each stage, and this is possible only under the condition of the integration of risk management into the management of construction and investment projects and the construction industry as a whole.

The process of risk management begins with identification. During the process organizations undertake communication and consulting with stakeholders, analyze risks and controls that modify it to ensure that further risk treatment is not necessary.

State regulation in this sphere has solid international normative basis. In particular, the standard (ISO 31010-2011) was developed, which describes in detail a systematic and logical risk management process. While all organizations manage risk to some degree, this Standard establishes certain principles under which risk management becomes more effective.

The mechanism of state regulation of risk insurance in the construction industry is also developed. As noted by V. Melko, world practice has developed two principle approaches to state regulation of risk in construction: ***continental*** (Germany, France, Italy, Spain, Sweden) and ***Anglo-American*** (USA, UK, Canada, Australia). The continental system is based on strict legislative regulation of activity of subjects of the market, the laws and codes in details regulate all aspects of activity of subjects of the construction sector and systematic monitoring of compliance with laws when conducting insurance operations. The continental model of state regulation is characterized by such forms as verification of implementation

of business plans, oversight of ongoing operations, regular inspections of insurance companies. In the Anglo-American system the majority of the parties of economic life are not codified. The legislation defines only the most general terms, the legal framework of state regulation of economic activities, without detailed regulation. Under this legal system a liberal model of state regulation is built, which focuses on the financial condition of companies based on consideration of their reports; [10, p. 47].

The above mentioned standard ISO 31010-2011 considers risk as the effect of uncertainty on achieving the objectives of the organization. The system of state regulation and enterprise risk management-building complex, according to K. Basenko, includes:

"1) the current regulatory, legal, programmatic, informational, logistical, staffing, organizational culture, within which the functioning of any system of controls is performed;

2) object management — risk, risky and economic investments and socio-risky relations arising in the process of risk implementation;

3) subject of management — a special group of people (a structural subdivision: Department, service, or Risk Manager, Financial Manager, etc.) that carries out purposeful functioning of object of management through various techniques and methods of managerial influence" [2, p. 57].

The researcher from Odessa I. Azarova, according to popular in foreign countries approach Construction Risk Management System (CRMS) offers the process of identifying risks to be considered as a sequence of six stages [1, p. 12]:

1. identification of uncertainties;
2. preparation of the preliminary checklist;
3. scenario of consequences;
4. reflection of risk;
5. systematic list of risks;
6. total risk.

The risk assessment may be performed with different degree of depth and detail using one or more methods of different level of complexity. The assessment form and its underlying data should be consistent with the risk criteria established when determining the application.

When choosing a risk assessment method one should consider that the method should:

– respond to this situation and the organization;

– provide results in a form that promotes awareness of risk and methods of its processing;

– ensure traceability, reproducibility and verification of process and results [8].

Thus, the primary task of a risk analysis by the investor is building a valid model (representation) of the project, which is used for making decisions about financing the construction of an object. Basic groups of methods of risk analysis of the project financing by the investor can be easily determined according to the key consideration — it may be either the scheme of financial flows, difficulties in its financing, or the actual project as a socio-economic phenomenon.

The state provides oversight and regulation of construction activities in the country, the state control in this

field lies with the Ministry of Regional Development, construction and housing and communal services of Ukraine, the Cabinet of Ministers of Ukraine directs and coordinates the activities of other Central Executive Authorities, in particular the State architectural and construction inspection of Ukraine, which is monitoring compliance with legal requirements, building codes, standards and regulations in construction. The Ministry of Regional Development carries out monitoring of risks during the construction and operation of facilities and puts forward legislative and other normative-legal submissions on the improvement of state regulation in the field of construction.

It should be noted that the processes of the construction has characteristics defining the species, the degree of influence of risk factors, as well as a set of methods and diagnostic tools. Construction risks appear as the result of the construction of and cause deviations of progress from plan targets. The types of risks encountered in project implementation are various. In general they can be divided into internal and external. The main external risks are natural, economic, technical, and administrative risks. These include in particular risks of force majeure, changes in the political environment, currency exchange rates, inflation, changes in interest rates.

Internal risks are subdivided into resource risks, they are classified by the types of resources consumed in the construction process, the loss of which can occur at different stages of construction, and partner risks, including contractual, object, risks of interaction between the contractors of the supply chain and risks of stream processes' management. Partner risks include the risks of shortage of raw materials and components, supply of substandard materials and components, violation of delivery dates, lack of funding. Technological risks in construction include preconstruction (technical specifications, layout, construction, testing and commissioning) and postconstruction (operation and maintenance of their serviceability).

The attention of bodies of state regulation of construction activities is paid to this special group of internal risks that characterize public product character of building activities, as the risk of possible failure. Accounting for the actual risk of failure (inability to use an object or its component part on a functional purpose) is a basis for differentiating between the degree and methods of state regulation in relation to construction projects.

Since the external risks are not easily influenced, the main focus is on the management of internal risks [9].

Based on the nature and objectives of management of construction and investment projects, to assess and manage the risk of design and construction, as well as financial relations arising in the course of resource provision for construction projects a system of risk management is used. Identification of the features of application of risk management in investment and design construction requires the analysis of algorithms of risk assessment and management. It should be noted that the developed to date total risk management approaches do not consider the specifics of their application in specific sectors of the economy, and in particu-

lar in investment-construction sphere. The problem of evaluation of uncertainty and risk in managing construction and investment projects to date has not received proper solution. This is largely due to the fact that risk assessment methods that are used in the feasibility study of objects of construction and reconstruction, do not fully take into account the specifics of construction activities and operation characteristics of construction projects. The main disadvantage of methods of determining issues of risk management in investment and construction activities, include: the lack, as a rule, of quantitative measurements and therefore assess the degree of uncertainty and risk of the basic conditions for the implementation of construction projects; the random nature of the definition (without holding the appropriate qualitative and quantitative analysis) of possible changes in the parameters of investment projects during their implementation; the absence of any substantiation of expediency of use in the given conditions of a method to assess the impact of risk factors on the parameters of the investment project in the construction activities; the use of only monoparametric approach to risk assessment, despite often available in practice interdependence of the basic parameters of investment and construction projects; the absence of any recommendations for monitoring risks in the process of implementation of investment construction projects.

In this regard it is necessary to consider that the entire risk management process (see Figure) in the course of realization of investment construction of the project should be defined as a sequence of organizational-technical and economic decisions and actions aimed at regulating the probability of successful implementation of the project. Thus, it is necessary for the successful implementation of the project to be implemented within the planned time and within the defined budget and with appropriate quality, which ensures the necessary level of safety of a construction project during its construction and further safe operation of structures.

Risk analysis allows decision-making in risky situations to determine the trends of future uncertainties [2]. There are various risk assessment methodologies, each of which has both positive and negative aspects (see table).

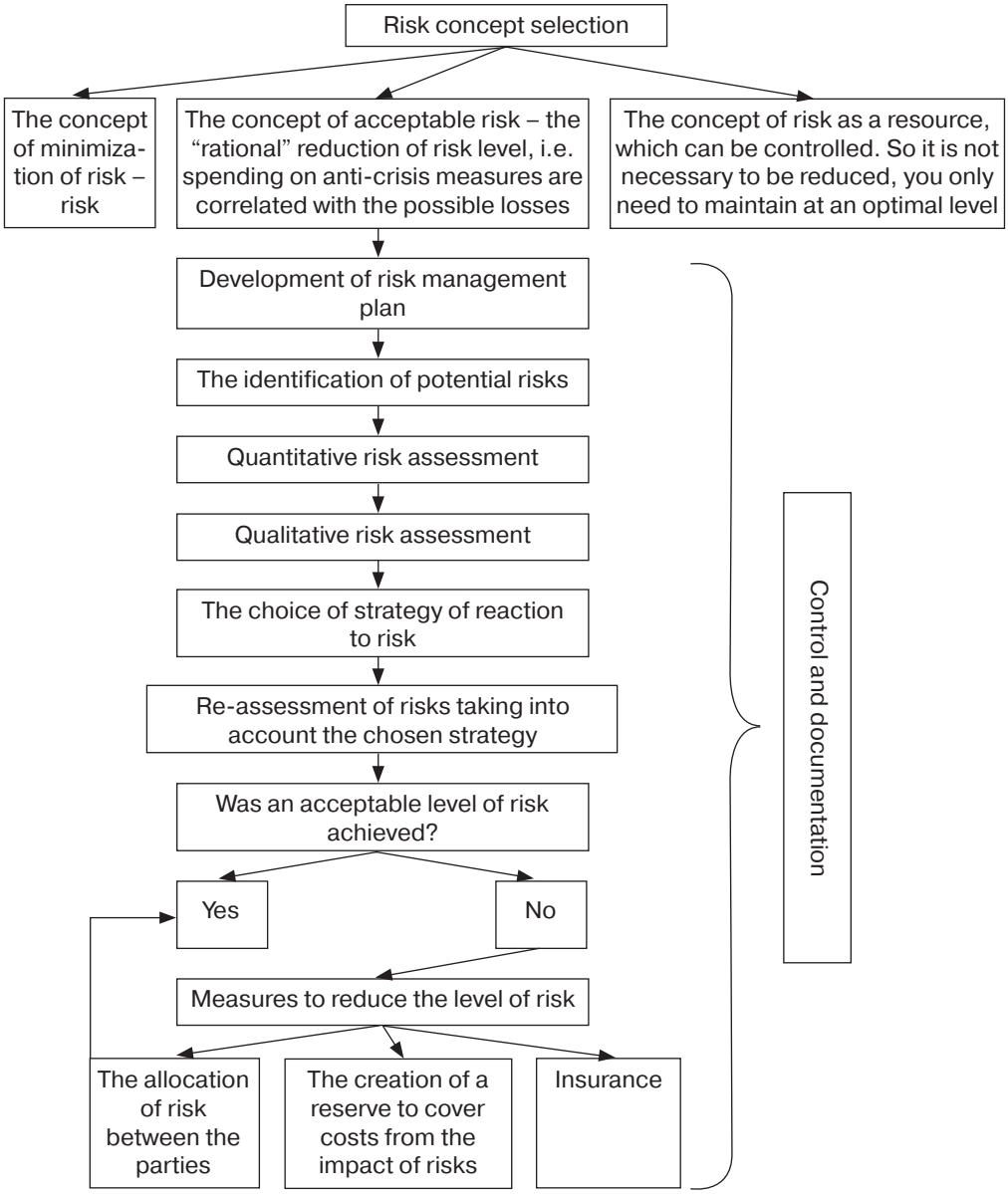
We can distinguish four large groups of methods of risk assessment, in particular:

1. Theoretical financial methods — the assessment of the required provision in case of failure of the project (the amount of the provision can be reliably estimated), the amount of estimated damages and lost profits that may the investor suffer.

2. Modification of the abstract methods — computer modeling of the project that allows to calculate the exact financial flows. However, the impact of all, especially of specific factors cannot be taken into account.

3. Expert methods — description of the risk with expert assessments. They include general quantitative or ranked assessment of the riskiness of the project, and a description and ranking aspects of the project that are sources of risk.

4. Modifications of the expert's methods — trying to bring expert opinions to more abstract with financial



General algorithm of risk management of investment construction project

* Compiled by the authors.

performance. There one can use, for example, the cumulative build rates, the allocation of groups of the least risky projects on the basis of a list of objects of potential funding.

The sensitivity analysis allows to assess the influence of various factors on key indicators of project implementation. For housing such factors include changes in input prices, stable performance of technical means, ensuring the continuity of construction materials provision, quality of execution of obligations by contractors. In the process

The advantages and disadvantages of the main groups of methods of risk analysis

Group of methods	The basic principle of development	Advantages	Disadvantages
Abstract financial methods	Evaluation a sufficient amount of additional collateral that a potential investor should have	If there is sufficient collateral the risk of participation in the project minimizes	The range of available types of provision in Ukraine is very limited, assessment of the quality of collateral is also a challenge
Modification of financial practices	The value of the real cash flows of projects for a potential investor	Benefits and risks of participation in different projects can be easily compared	Consideration of all aspects of risk a priori is not possible
Expert methods	Systematization of the views of specialists on the implementation of similar projects	Using these methods it is possible to more fully cover all project risks	Expert views of different experts are difficult to correlate with existing financial terminology
Modification of expert methods	The replacement of the expert evaluations with certain values of the financial variables on the basis of existing practices	Ideally it is possible to get financial risk assessment, which is based on the representation of a wide range of specialists	The influence of aspects of risk on the income of a particular investor usually cannot be standardized and normalized

*Compiled by the authors.

of analysis marginal values of risk factors are estimated. Overall, sensitivity analysis helps to identify the factors that carry the maximum influence on the project results, and to choose the most risk-resistant variant of implementation of the project [13]. However, this technique is not amenable to correlation analysis of the relationship and interdependence between the indicators and fails to explore the possibility of alternative solutions.

By analyzing the probable distribution one analyze the risk with the time, but there is a negative side — the subjectivity of the obtained values of return and probability of implementation.

The simulation model allows to analyze, to estimate the variants of the decision, and simultaneously take into account several risk factors. A weakness of this methodology is that in a risk situation it is difficult to find alternative solutions, but if an analysis is made concerning to the the situation, which is unique, then it is difficult to apply this technique.

Using the risk assessment methodology based on expert method, and also the analysis of the credit quality, one can find substantial and medium risks probability of occurrence, but the results will be subjective.

Thanks to the model based on the Markov chains application, one can define the behavior of the production system at any period remote from the initial one. The drawbacks of it are mathematical difficulties when building the transition matrix in the analysis of economic objects, as well as complex selection of reliable information.

The technique based on an integrated measure of risk takes into account the most important factors of all production activity of the enterprise allows to analyze the impact of the factor indicators on the resulting one in their interdependence and to identify the factors that affect the risk most [3].

In our view, for risk assessment to differentiate the regulatory influence of the state in the construction and operation of buildings and structures, this methodology is the most appropriate because it allows to comprehensively evaluate the risk of their possible failure, which is determined depending on the potential danger to the health and lives of people who permanently or periodically are located at the facility or outside; the amount of potential economic losses; the loss of cultural heritage; the termination of functioning of objects of engineering and transport infrastructure. A particular disadvantage of using this method is some generality and averaging of approaches that insufficiently reflects the specific features of projects and the dynamics of change of risks throughout their life cycle.

However, it should be noted that in the management of construction and investment projects there are some general approaches that allow us to determine the sequence of actions in the study of risk in the investment and construction sphere:

1) the risk that has the greatest importance for the project is highlighted;

2) the cost overruns are calculated, taking into account the probability of occurrence of an unfavorable situation in the implementation of the investment construction project;

3) a set of organizational-technical and economic measures is developed providing for the reduction of the probability of a risk event;

4) the additional costs of the implementation of anti-risk measures is calculated

5) a comparison of costs needed for implementation of the proposed activities with possible cost overruns due to the onset of a risk situation is performed;

6) the decision on implementation or rejection of anti-risk measures is taken;

7) next in importance to the risk is selected, for which the process of mapping the likelihood and impact of risk events with cost measures to reduce them is repeated [2].

Existing methods of risk assessment in the design, construction, reconstruction, repair and maintenance of buildings and structures require further development. This is especially true for the management of investment risk in construction activities. The reason is the volatile prices of building materials and construction, transportation and operation of construction vehicles, machinery and equipment, transportation of workers to construction projects, travel expenses when performing work in other regions and at remote sites. New types of costs appear (payment for land, new types of taxes and fees, different types of insurance, the costs of obtaining the initial data, technical conditions and approvals, interest on loans, etc.). All of this suggests that the probabilistic nature of building production requires the development of management theory for construction and

investment projects in conditions of risk.

Conclusions. Thus, the use of risk management in the management of investment and construction projects is the modern tool of the mechanism of state regulation and risk management of construction industry organizations. According to the international standard ISO 31010-2011, risk assessment during the risk management is carried out with varying degrees of depth and detail and using one or more methods of different level of complexity. However, applying any method, it is always necessary to consider both its positive and negative sides.

Now in modern Ukraine there are some limitations to using traditional methods of risk analysis, which requires the improvement of state regulation of the construction industry in general and the risk management organizations of the construction complex in particular. Among the issues that require government resolution, it is possible to call rather narrow range of types of provision, problems of assessing the quality of collateral, the impossibility of accounting for all available aspects of risk, the ratio of the expert concepts and financial terminology, standardization and regulation of the impact of aspects of risk for a particular investor. To compensate for deficiencies in the abstract financial and expert risk assessment methods in the construction it is possible to consider an extended list of risk factors that affect participation in the project of a particular investor, more precise use of the expertise and qualitative assessments in taking administrative, project, financial, technological decisions.

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