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Formation of the Mechanism of Risk – Oriented Management of the Regional Investment – Construction Complex on the Basis of Forecasting

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Abstract — **Modern conditions for the functioning of the investment and construction complex are characterized by a high level of competition, an intensively changing market situation, an increase in the level of requirements for construction products. In this regard, it is urgent to address the challenges associated with improving the management of the regional investment and construction complex, based on forecasting its development, taking into account the impact of risk factors. To solve these problems, a mechanism for risk-based management of a regional investment and construction complex based on forecasting has been developed. An integral indicator is proposed that takes into account the production, financial, social, innovative and ecological efficiency of the regional investment and construction complex, taking into account the impact of risk factors. Approbation of the proposed mechanism is presented on the example of the investment and construction complex of the Republic of Crimea. The practical significance of this mechanism is the possibility of developing a strategic program for the development of the regional investment and construction complex of the Republic of Crimea on the basis of forecasting the dynamics of the integrated indicator of the management effectiveness of the regional investment and construction complex, taking into account the impact of risk.**

Keywords— regional investment-construction complex, risk – oriented management, mechanism, financial efficiency, production efficiency, innovative efficiency, social efficiency, environmental efficiency

I. INTRODUCTION

The regional investment-construction complex (RICC) is one of the most important sectors of the domestic economy. This complex should update on a modern technical basis production assets, development and improvement of the social sphere, reconstruction, modernization, technical re-equipment of production of material goods.

The state of the regional investment-construction complex determines the level of society development and productive forces. Accomplishment of these purposes requires new tasks of economic, production and organizational character, also requires forming the new management mechanism for the investment-construction complex of the region. From the effective activity of the investment-construction complex depends the results of economic activity the subjects of the complex, also depends the creation of conditions for the development of other sectors and complexes of the region's economy.

In this connection, it is urgent to solve the problems associated with risk-oriented management of the regional investment-construction complex, based on forecasting the effectiveness of its development.

The results of research on the theory and practice of management of investment-construction complex are quite fully studied in the works of V.K. Ivanets, V.S. Reznichenko [1], S.S. Uvarov [2], V.K. Sevek [3], A.N. Asaul [4,5], L.A. Kaverzina [6]. Features and problems of assessing the effectiveness of management of the investment-construction complex are presented in the works of G.Yu. Novikova [7], M.I. Berkovich, K.A. Golubkina [8], V.K. Sevek [9]. The solution of the problems of effective management taking into account the risk factors is presented in the works of B. Scott [7], V.D. Rudashevsky [10], T.F. Morozova, L.A. Kinayat [11], P.N. Lapin [12], O.S. Sukharev [13], Artamonova AA [14], Kozina M.N. [15].

Rather large number of scientific publications confirms high scientific interest and practical interest in development of the adequate, reasoned, reasonable, low-cost and effective management system for the regional investment and construction complex.

On the one hand, such abundance of scientific works is a consequence of lack of a consensus among scientists on the methodological and methodical principles and features of creation of an effective and efficient management system for a regional investment-construction complex based on a risk-oriented approach. On the other hand, the noted scientific publications are devoted to the study of the particular components of the development management system of the regional investment-construction complex.

So, the object of research in these studies is the strategy of enterprises development in the construction industry, assessing the sustainability of the development, assessing the effectiveness of enterprise management, classifying and assessing the impact of risk factors in construction, assessing the quality and effectiveness of management decisions in the

development system, etc. Scientific statement on the justification, development, formalization and practical testing of a special mechanism for risk-oriented management of the regional investment- construction complex on the basis predicting, based on the analysis of domestic and foreign scientific publications, was not put. From this it is necessary to draw a conclusion that the current problem of scientific and practical justification of the mechanism of risk-oriented management the regional investment-construction complex on the basis of forecasting requires systematic study and detailed scientific study. In this regard, the purpose of the article is to form a mechanism for risk-oriented management of the regional investment-construction complex and its approbation on the example of the Crimean investment-construction complex.

Analysis results of scientific literature show that the management system of regional investment-construction complex is open system and consists of the interconnected dynamic and static subsystems. At the same time, its effective operation is determined by the effective use of all RICC subsystems: financial, innovation, production, social and environmental. Based on this, the effectiveness of risk-oriented management of the regional investment-construction complex should be assessed using the combination of qualitative and quantitative indicators that characterize both efficiency of functioning of a complex in general, and influence of risk factors and uncertainty.

The proposed approach provides for the possibility of implementing a mechanism for risk-oriented management of the regional investment-construction complex, based on forecasting the effectiveness of its development, by calculating an integrated indicator that takes into account the industrial, financial, social, innovative and environmental efficiency of RICC functioning, taking into account the impact of risk factors (Fig.1).

The implementation of this risk-oriented management mechanism of the regional investment-construction complex involves the following stages.

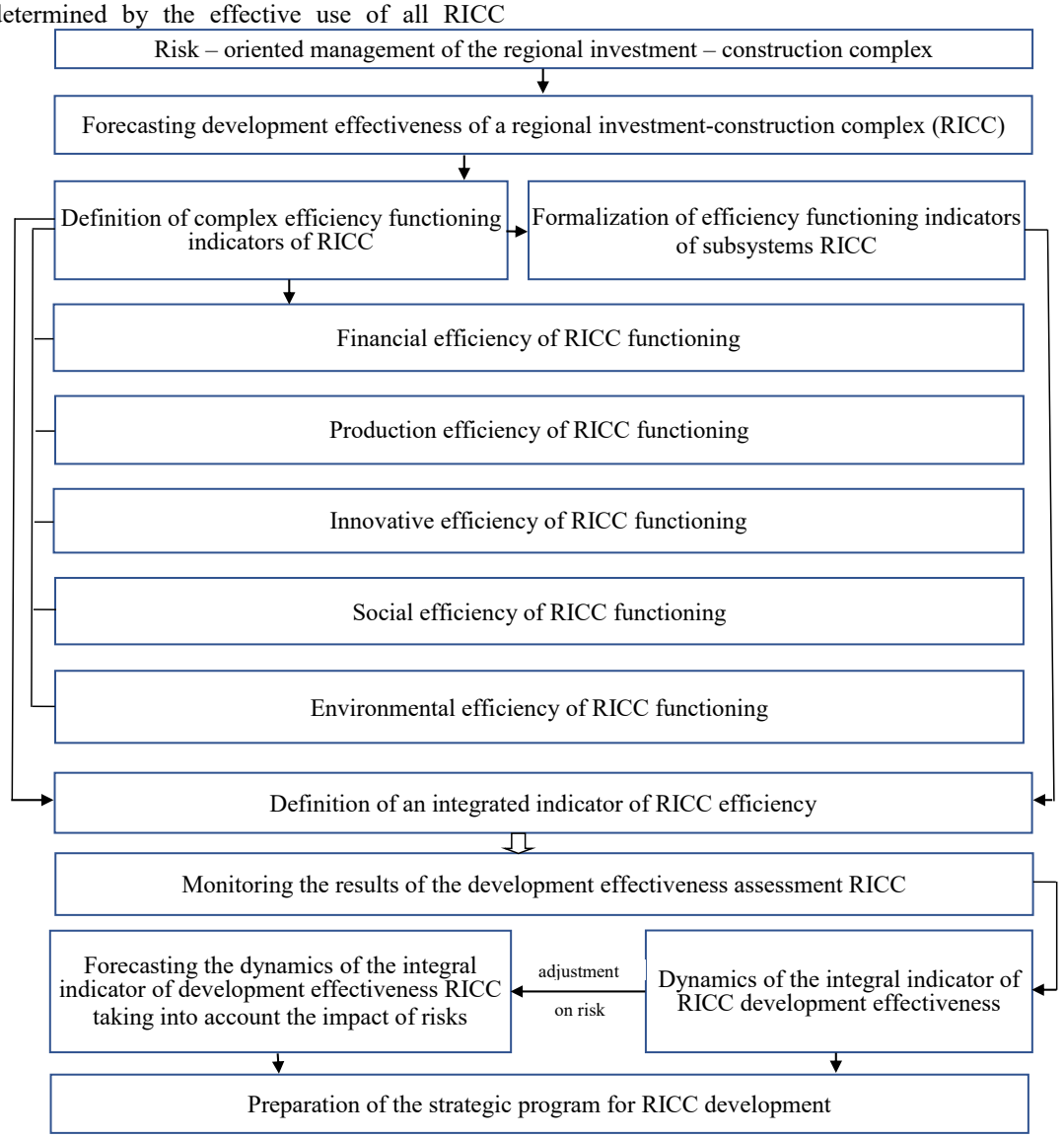

Fig.1. Risk – oriented management mechanism of the regional investment – construction complex on the basis of forecasting

At the first stage, complex indicators of the effectiveness of the functioning of all indicators of the complex development efficiency are defined and are presented in the form of a linear function reflecting the nature of the influence of complex performance indicators of the RICC control subsystems:

$$IIED = f(FE, PE, IE, SE, EE), \quad (1)$$

where IIED is the integral indicator of RICC development effectiveness;

f - the function that determines the type of model in assessing the effectiveness of RICC development;

FE- financial efficiency of RICC functioning.

PE - production efficiency of RICC functioning.

IE - the innovative efficiency of functioning RICC.

SE - social efficiency of RICC functioning.

EE - environmental efficiency of RICC functioning.

The information base, reflecting the efficiency indicators of RICC, are forms from the state statistical observations, reports of state bodies, as well as data from official websites of state authorities of the complex [16].

The second stage involves formalizing the efficiency indicators of the RICC subsystems.

The first group indicators of effectiveness assessment represent financial effectiveness of functioning of RICC and include:

- enterprises financial results of the operating activity in the region by the type of activity "Construction" for all forms of ownership (million rubles);
- profitability of the operating activity of the region's enterprises by type of activity "Construction" (%);
- the share of gross value added created by RICC enterprises of all forms of ownership, in the total volume of gross value added by region in actual prices and in percentage to the total volume;
- volume of investments in the fixed capital of RICC enterprises of all forms of ownership (million rubles);
- the amount of funds that are allocated under the federal targeted development programs of RICC (million rubles).

The second group indicators of effectiveness assessment represent the production effectiveness of the RICC and include:

- scope of works that were made by enterprises of the investment-construction complex of the region of all forms of ownership by the type of activity "Construction" (million rubles);
- commissioning of residential and non-residential buildings (thousand square meters);
- commissioning of social and cultural facilities (thousand square meters);
- average cost of 1 square meters of the total area of residential buildings (million rubles);
- average supply of RICC construction organizations with orders (%).

The third group indicators of effectiveness assessment represent the innovative efficiency of RICC functioning and includes:

- the renewal ratio of the fixed assets of RICC enterprises (%);
- wear factor of fixed assets of RICC enterprises (%);
- average level of use of production capacities of construction organizations RICC (%);
- index of change in the availability of small mechanization funds used in construction (%);
- production of innovative building materials (million rubles).

The fourth group indicators represent the social effectiveness of the functioning of RICC and include:

- the growth rate of the average monthly wage for the regional investment- construction complex (%);
- average number of employees of RICC enterprises, in the equivalent of full employment (thousand people);
- total area of residential premises per 1 inhabitant of the region (square meters);
- total area of residential premises commissioned for one year, an average of 1 inhabitant of the region (square meters);
- the number of apartments received by unprotected citizens in the region (unit).

The fifth group of indicators represented the ecological efficiency of RICC functioning and includes:

- current costs of RICC enterprises for environmental protection (million rubles);
- ecological innovations of RICC enterprises (million rubles);
- the area of disturbed land in relation to the area allocated for building (%);
- ratio of growth rates of emissions and building and construction works volumes (%);
- investments in fixed assets aimed at protecting the environment and rational use of natural resources (million rubles)

At the second stage of mechanism count private indicators of functioning efficiency of RICC using correlation analysis tools. Further, the rates of change in the financial, production, innovation, social and environmental efficiency indicators of the RICC functioning are determined by the formula:

$$CIE_m = a + \sum_{z=1}^{n_m} r_{x_j x_z} \cdot I^u_{p x_z}, \quad (3)$$

where CIEm is the complex indicator of the m-th element of the RICC operational efficiency;

nm - the number of efficiency indicators of the RICC m-th group;

a - is the free term of the regression equation;

$I^c_{p x_z}$ - chain index, representing the growth rate of the corresponding efficiency indicator of RICC:

$$I^c_{p x_z} = \frac{x_z \; i}{x_z \; i-1} \quad (4)$$

where $x_{z\ i}$ - is the value of the indicator of the corresponding group of RICC efficiency indicators in the i-th period ($i = \overline{1,n}$);

n - is the number of time periods.

Calculation of complex indicators representing the financial, production, innovative, social and environmental efficiency of the RICC (CIEm), taking into account the constraint> 0.68, established on the basis of the properties of the Gaussian distribution for the most representative value of the coefficients of pair correlation.

In the third stage, the integrated indicator of the development effectiveness of RICC (IIED) is determined taking into account correlation coefficients and complex indicators (CIEp, CIEin, CIEc, CIEe) using the formula:

$$IIED = a + \sum_{l=1}^{m} CIE_l \cdot R_{CIEf,CIE_l}, \quad (5)$$

The fourth stage involves monitoring the results of the RICC development effectiveness assessment by predicting the value of the integral indicator taking into account the impact of possible risks on the managerial decision-making process.

Forecasting the integral indicator of the development effectiveness of RICC is carried out using Microsoft Office Excel tools through the construction of a trend line, the selection of which type involves the determination of the value of the reliability of the approximation R2> 0.95.

In order to take into account the impact of risks on the process of making effective management decisions on the functioning of the RICC, it is necessary to adjust the value of the predicted integral indicator of the development effectiveness assessment by the complex by the amount of risk, using the formula:

$$IIED_R = IIEDpr \cdot 1 - R, \quad (6)$$

- the predicted value of the integrated indicator of the development effectiveness assessment of RICC, adjusted for risk;

- the predicted value of the integral indicator of the RICC development effectiveness assessment;

R - an indicator of the level of risk, representing the probability of occurrence of a risk event (0 <R <1).

Approbation of this risk-oriented management mechanism of the regional investment- construction complex on the basis of forecasting was made on the example of Crimean investment-construction complex. This RICC is a typical socio-economic entity, and is a set of managed and control subsystems whose operation is aimed at creating competitive services in the sphere of construction.

In accordance with the proposed mechanism of risk-oriented management of the regional investment-construction complex, calculations of complex efficiency indicators and an integral development efficiency indicator of the investment-construction complex of the Crimean Republic for the period 2014-2017 were carried out. (Table 1, Fig. 2).

TABLE 1 DYNAMICS OF COMPLEX AND INTEGRAL DEVELOPMENT INDICATORS OF THE INVESTMENT-CONSTRUCTION COMPLEX OF THE CRIMEAN REPUBLIC FOR THE PERIOD 2014-2017.

Indicators	2014	2015	2016	2017
Complex indicator of financial efficiency (CIE_f)	1,8535	1,8761	2,2979	3,9716
Complex indicator of production efficiency (CIE_p)	3,3799	3,2695	3,2305	3,9434
Complex indicator of innovative efficiency (CIE_{in})	2,3967	2,4561	2,4601	2,6675
Complex indicator of social efficiency (CIE_c)	1,8839	1,8662	1,8176	2,3512
Complex indicator of ecological efficiency (CIE_e)	1,7440	1,6234	1,8112	1,8270
Integral indicator effectiveness of development RICC(*IIED*)	3,8796	3,8834	3,9954	5,8765

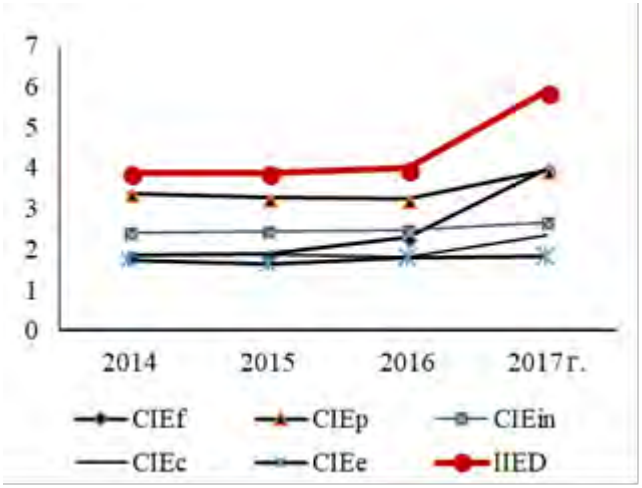

Fig. 2. Dynamics of the complex and integral development indicators of the investment-construction complex of the Crimean Republic for the period 2014-2017.

In the figure 2 results of change complex and integral development indicators of the investment-construction complex of the Crimean Republic for the period during 2014-2017 are presented. We can draw a conclusion that all indicators show positive dynamics. It says about stable development of the investment- construction complex of the Crimean Republic in the conditions of the social and economic and legal framework of the Russian Federation.

At the same time a significant increase in the integral indicator of development effectiveness is observed in 2017 and is 150% compared to the indicator of 2014, which is explained by the implementation of a number of federal programs in the field of road and housing construction.

Within the framework of the next stage of implementation of the proposed mechanism for risk-oriented management of the regional investment-construction complex, a forecast was made of the change in the value of the integral indicator of the development efficiency of the investment-construction complex of the Crimean Republic, taking into account the impact of risk factors.

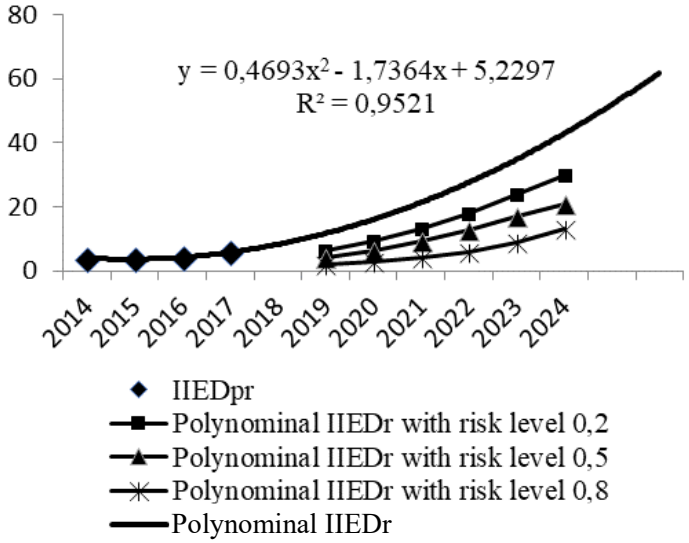

Fig. 3. Forecasting the dynamics of the integral indicator of the development efficiency of the investment-construction complex of the Crimean Republic until 2024, taking into account the impact of risks

RESULTS

Thus, the results of the assessment and forecasting the development efficiency of the investment-construction complex of the Crimean Republic, taking into account risks, can be the basis for making managerial decisions regarding the functioning and development of the investment-construction complex of the region, and the development of strategic programs for the socio-economic development of the region. Proceeding from this, the main strategic directions of development of the Crimean investment-construction complex are:

- providing optimal conditions for attracting investments by creating a unified database of documents necessary for locating federal, regional and local facilities on the territory of the Republic of Crimea, as well as to take into account the necessary requirements and restrictions on the use of territories in the construction of facilities;

- development of evidence-based assessment of degree of long-term seismic danger and risk of the territory at the different large-scale levels;

- introduction of a dynamic method for calculating seismic loads in practice with the use of accelerograms modeled for local seismotectonic conditions of the Republic of Crimea;

- scientific and methodological justification for the design of new earthquake-resistant objects, taking into account the improved design seismicity and predictive estimates of seismic impacts;

- scientific and methodological support of integrated monitoring of the seismic situation in the region for the medium-term forecast of seismic activation for the near future;

- necessary of investment attraction for modernization and technical re-equipment of existing production facilities, introduction of new capacities and their effective operation;

- providing state support to investment projects aimed at implementing measures to modernize and develop the production of building materials;

- creation of new resource-saving, cost-effective and environmentally safe production of building materials, products and structures;

- preservation of shore protection facilities in a technically working condition and preventing the reduction of beach areas of the Black Sea coast of the Crimean Republic of;

- implementation of measures for the construction of facilities in the part of hydraulic engineering and anti-landslide structures, taking into account the preservation of the land structure, the coastline and the natural conditions of the Crimean Republic;

- measures to survey the state of coastal protection and landslide structures;

- coordination of measures for the integrated solution of problems of protection of the coast and territories.

The implementation of these measures will ensure a stable growth of the investment-construction complex of the Crimean Republic in the long term.

References

[1] Ivanec, V.K. Sovershenstvovanie normativno-pravovogo i metodicheskogo obespechenija upravlenija investicionno- stroitel'noj dejatel'nost'ju v Rossijskoj Federacii/V.K. Ivanec, V.S. Reznichenko // Jekonomika stroitel'stva. – 2000. – № 5. pp. 14 -29.

[2] Uvarova, S.S. Koncepcija organizacionno-jekonomicheskih izmenenij sistemy upravlenija investicionno-stroitel'nym kompleksom /S.S.Uvarova // Jekonomicheskoe vozrozhdenie Rossii– 2012. – № 1(31). pp. 143-148.

[3] Sevek, V.K. Teoreticheskie aspekty formirovanija sistemy upravlenija razvitiem stroitel'nyh organizacij / V.K. Sevek // Jekonomicheskoe vozrozhdenie Rossii. – 2012. – № 4 (34). pp.88-92.K. Elissa, “Title of paper if known,” unpublished.

[4] Asaul, A.N. Napravlenie razvitija regional'nyh investicionno-stroitel'nyh kompleksov v RF / A.N. Asaul // Uspehi sovremennogo estestvoznanija. – 2011. – № 2. – S. 124-127.Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, “Electron spectroscopy studies on magneto-optical media and plastic substrate interface,” IEEE Transl. J. Magn. Japan, vol. 2, pp. 740-741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].

[5] Asaul, N.A. Institucional'nyj podhod k razvitiju investicionno-stroitel'nogo kompleksa / N.A. Asaul. – 2005. pp. 37-43.

[6] Kaverzina, L.A. Optimizacija funkcionirovanija regional'nogo investicionno-stroitel'nogo kompleksa / L.A. Kaverzina // Izvestija IGJeA. – 2008. – №. 1. pp. 38-42.

[7] Novikova, G. Ju. Ocenka jeffektivnosti upravlenija predprijatijami regional'nogo stroitel'nogo kompleksa/ G.Ju. Novikova // Nauchno-tehnicheskie vedomosti SPbGPU, Jekonomicheskie nauki. – 2009. – № 4(81). pp. 140 – 145.

[8] Berkovich, M.I. Investicionno- stroitel'nyj kompleks regiona: sostojanie, problemy, ocenka jeffektivnosti / M.I. Berkovich, K.A. Golubkina. – M.: Izd-vo KGTU, 2010 – 110 p.

[9] Sevek, V.K. Metodologicheskij podhod k intensifikacii i klassifikacii faktorov rosta I razvitija stroitel'noj organizacii / V.K. Sevek // Sb. nauch. tr. Vol'nogo jekonomicheskogo obshhestva Rossii. – № 1. – T. 168. – 2013. pp.277-296.

[10] Skott, B. Upravlenie bezopasnost'ju i riskom / B. Skott, M. Krimpli; per. s angl. // Metody menedzhmenta kachestva. – 2012. – № 10.pp. 32- 39.

[11] Rudashevskij, V.D. Risk, konflikt I neopredelennost' v processe prinjatija reshenij i ih modelirovanie / V.D. Rudashevskij // Voprosy psihologii. – 2010. – № 2. pp. 23-25.

[12] Morozova, T.F. Ocenka riskov v stroitel'stve /T.F. Morozova, L.A. Kinajat // Internet-zhurnal «Stroitel'stvo unikal'nyh zdanij i sooruzhenij. – 2013.– № 5. pp. 68-76.

[13] Lapin, G. N. Metodologicheskij podhod k raschetu pokazatelja riska stroitel'nogo proizvodstva / G.N. Lapin // Jekonomika

[14] Artamonov, A. A. Funkcii upravlenija riskami v processe realizacii investicionnyh stroitel'nyh proektov: dis. … kand. jekon. nauk: 08.00.05 / Artamonov Aleksej Aleksandrovich. – SPb,2003. – 124 p.

[15] Kozin, M.N. Formirovanie jekonomicheskih modelej upravlenija riskami v dejatel'nosti stroitel'nyh predprijatij: dis. ... kand. jekon. nauk: 08.00.05 / Kozin Mihail Nikolaevich. – M., 2000. – 190 p.

[16] Kozin, M.N. Formirovanie jekonomicheskih modelej upravlenija riskami v dejatel'nosti stroitel'nyh predprijatij: dis. ... kand. jekon. nauk: 08.00.05 / Kozin Mihail Nikolaevich. – M., 2000. – 190 p.