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Karaganda University of Kazpotreboysuz, Karaganda, Kazakhstan.

* E-mail: smurat @yandex.ru

SOURCES AND FEATURES OF INVESTMENT RISKS IN SUBSOIL USE

Koppayeva Aliya — doctoral student, Karaganda university of Kazpotreboysuz, Karaganda, Kazakhstan,

E-mail: aliya.koppayeva@mail.ru, ORCID: <https://orcid.org/0009-0000-1954-4727>;

Sikhimbayev Muratbay — Doctor of Economic Sciences, Professor, Karaganda university of Kazpotreboysuz, Karaganda, Kazakhstan,

E-mail: smurat@yandex.ru, ORCID: <https://orcid.org/0000-0002-8763-6145>;

Sikhimbayeva Dinar — Doctor of Economic Sciences, Professor, Karaganda university of Kazpotreboysuz, Karaganda, Kazakhstan,

E-mail: sdinara2007@yandex.ru, ORCID: <https://orcid.org/0000-0003-3822-6200>.

Abstract. The theoretical and methodological foundations of the work consist in the consideration of classical scientific concepts for assessing the risks of investing in the country's subsurface use; research of theoretical and methodological developments of domestic and foreign authors presented in monographs and articles on issues of investing in subsurface use and reducing investment risks. The object of research is the subsurface use market of the country. The subject of the research is the mechanisms and relationships of the processes of forming and assessing the risks of investing in the mineral resource sector of the country's economy. The purpose of the study shows its relevance and consists in improving the mechanism of sustainable development of the country's subsurface use market, its formation and assessment based on determining the risks of investing in the country's subsurface use facilities and reducing investment risks. In the course of the study, the analytical method, statistical and mathematical data analysis and other basic research methods were used, which are well-known methods for analyzing the current situation regarding the mechanism for receiving and using rent payments in the subsurface use of Kazakhstan. The key hypotheses are to develop a methodology for assessing the risks of investing in subsurface resources in the country in order to reduce them when determining their assessment. The results of the study can be used in practice and are as follows: - the theoretical basis for assessing the risks of investing in the country's subsurface use has been studied; - the factors determining the investment risks of the

value of subsurface use objects in the country and the principles of their assessment are developed; -the sources and features of risks of investing in the mineral resource sector of the national economy are studied in order to develop ways to reduce the risks of investing in subsurface use objects of the country.

Keywords: risks, investment, subsoil use, investment attractiveness, mineral resources sector of the economy

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Қазтұтынуодағы Қарағанды университеті, Қарағанды, Қазақстан.

* E-mail: smurat@yandex.ru

ЖЕР ҚОЙНАУЫН ПАЙДАЛАНУДАҒЫ ИНВЕСТИЦИЯЛЫҚ ТӘУЕКЕЛДЕРДІҢ КӨЗДЕРІ МЕН ЕРЕКШЕЛІКТЕРІ

Алия Коппаева — PhD докторант, Қазтұтынуодағы Қарағанды университеті, Қарағанды, Қазақстан,

E-mail: aliya.koppayeva@mail.ru, ORCID: <https://orcid.org/0009-0000-1954-4727>;

Муратбай Сихимбаев — э. ф. д., профессор, Қазтұтынуодағы Қарағанды университеті, Қарағанды, Қазақстан,

E-mail: smurat@yandex.ru, ORCID: <https://orcid.org/0000-0002-8763-6145>;

Динар Сихимбаева — э. ф. д., профессор, Қазтұтынуодағы Қарағанды университеті, Қарағанды, Қазақстан,

E-mail: sdinara2007@yandex.ru, ORCID: <https://orcid.org/0000-0003-3822-6200>.

Аннотация. Жұмыстың теориялық және әдіснамалық негіздері елдің жер қойнауын пайдалану саласына инвестициялау тәуекелдерін бағалаудың классикалық ғылыми тұжырымдамаларын талдауға негізделеді. Бұл ретте монографиялар мен ғылыми мақалаларда баяндалған отандық және шетелдік авторлардың жер қойнауын пайдалануға инвестициялау және инвестициялық тәуекелдерді азайту мәселелері бойынша теориялық және әдіснамалық тұжырымдамалары зерттелді. Зерттеу нысаны – елдің жер қойнауын пайдалану нарығы. Зерттеу пәні – ел экономикасының минералдық-шикізат секторына инвестициялау тәуекелдерін қалыптастыру және бағалау процестерінің механизмдері мен өзара байланыстары. Зерттеудің мақсаты – елдің жер қойнауын пайдалану нарығының орнықты даму тетігін жетілдіру, яғни жер қойнауын пайдалану объектілеріне инвестициялау тәуекелдерін анықтау және оларды азайту негізінде бағалау жүйесін қалыптастыру. Зерттеу барысында Қазақстандағы жер қойнауын пайдалануда ренталық төлемдерді алу және пайдалану тетіктеріне қатысты қалыптасқан жағдайды талдауда кеңінен қолданылатын аналитикалық, статистикалық және математикалық талдау әдістері, сондай-ақ басқа да негізгі ғылыми тәсілдер пайдаланылды. Зерттеудің негізгі гипотезасы – елдің жер қойнауын пайдалану объектілеріне инвестициялау тәуекелдерін бағалау әдістемесін әзірлеу арқылы оларды төмендету мүмкіндігі бар деген болжамға негізделеді. Зерттеу нәтижелерін тәжірибеде қолдануға болады және келесідей қорытындылар алынды: елдің

жер қойнауын пайдалану саласына инвестициялау тәуекелдерін бағалаудың теориялық негіздері зерделенді; жер қойнауын пайдалану объектілерінің инвестициялық тәуекелдерін және оларды бағалау қағидаттарын айқындайтын факторлар айқындалды; минералдық-шикізат секторына инвестициялау тәуекелдерінің көздері мен ерекшеліктері зерттеліп, оларды төмендету жолдары ұсынылды.

Түйін сөздер: тәуекелдер, инвестициялау, жер қойнауын пайдалану, инвестициялық тартымдылық, экономиканың минералдық-шикізат секторы

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Карагандинский университет Казпотребсоюза, Караганда, Казахстан.

*E-mail: smurat@yandex.ru

ИСТОЧНИКИ И ОСОБЕННОСТИ РИСКОВ ИНВЕСТИРОВАНИЯ В ОБЪЕКТЫ НЕДРОПОЛЬЗОВАНИЯ

Коппаева Алия — докторант, Карагандинский университет Казпотребсоюза, Караганда, Казахстан,

E-mail: aliya.koppayeva@mail.ru, ORCID: <https://orcid.org/> <https://orcid.org/0009-0000-1954-4727>;

Сихимбаев Муратбай — доктор экономических наук, профессор, Карагандинский университет Казпотребсоюза, Караганда, Казахстан,

E-mail: smurat@yandex.ru, ORCID: <https://orcid.org/0000-0002-8763-6145>;

Сихимбаева Динар — доктор экономических наук, профессор, Карагандинский университет Казпотребсоюза, Караганда, Казахстан,

E-mail: sdinara2007@yandex.ru, ORCID: <https://orcid.org/0000-0003-3822-6200>.

Аннотация. Теоретические и методологические основы исследования заключаются в анализе классических научных концепций, посвящённых оценке рисков инвестирования в сферу недропользования, а также в изучении теоретических и методологических разработок отечественных и зарубежных авторов, представленных в монографиях и научных статьях по вопросам инвестиций и управления рисками в минерально-сырьевом секторе. Объектом исследования является рынок недропользования Республики Казахстан. Предмет исследования – механизмы и отношения, формирующие процессы оценки и управления рисками инвестирования в минерально-сырьевой сектор экономики. Цель исследования состоит в совершенствовании механизма устойчивого развития рынка недропользования страны на основе определения, анализа и минимизации рисков инвестирования в объекты недропользования. В ходе исследования применены аналитический, статистический и математический методы, а также другие общепринятые подходы, использующиеся при анализе механизма формирования и распределения рентных платежей в недропользовании Казахстана. Ключевая гипотеза исследования заключается в необходимости развития методологии оценки рисков инвестирования в объекты недропользования с целью их последующего снижения и обеспечения устойчивости инвестиционной деятельности. Практическая значимость

исследования заключается в возможности применения полученных результатов для совершенствования механизмов управления инвестиционными рисками в минерально-сырьевом секторе. В частности: изучены теоретические основы оценки рисков инвестирования в сферу недропользования; выявлены и систематизированы факторы, определяющие инвестиционные риски и стоимость объектов недропользования, а также принципы их оценки; исследованы источники и особенности инвестиционных рисков в минерально-сырьевом секторе, определены пути их минимизации для обеспечения устойчивого развития недропользования в Казахстане.

Ключевые слова: риски, инвестирование, недропользование, инвестиционная привлекательность, минерально-сырьевой сектор экономики

Introduction. The transition of Kazakhstan's economy to an innovative path of development should be accompanied by a reduction in the risks of investing in the country's subsurface resources. The country's subsurface use market, due to its significant influence on the socio-economic situation in the country and in the presence of a significant share of state ownership, requires the use of special methods of state regulation.

The mineral resource sector market is characterized as an industry market, which has its own dialogical relations between producers (subsurface users) and consumers (investors, buyers). Market development trends are influenced by relationships with other markets through a system of risks, expectations and prices, as well as macroeconomic and institutional factors.

Falsification of the real value of assets on the stock markets, biased assessment of subsurface use objects, deformed structure of the cost of products, suggests that creating favorable conditions in the field of investment, with transparent mechanisms for implementing capital investments and an objective assessment of the country's subsurface use projects remains the main problem of this sector.

Of particular importance is the analysis of trends in the development of the country's subsurface use market and its impact on the practical and theoretical foundations of regulation, which makes it possible to provide scientific justification for the proposed methods of reducing its investment risks as a key factor in its functioning and determines the choice of research topic, its relevance and practical significance.

In recent decades, the need to create favorable conditions in the field of investment in subsurface use, with a transparent mechanism for implementing capital investments and an objective assessment of the country's subsurface use projects, activates the expediency of scientific analysis in this sector, using modern theoretical developments in the field of attracting investment in subsurface use are under special attention of both foreign and domestic economists.

Materials and basic methods. During the research, we used analytical and mathematical methods, statistical data analysis, and other basic research methods.

Analytical and mathematical methods are current, widespread, well-known

methods for analyzing the current situation regarding the mechanism for receiving and using rent payments in the subsurface use of Kazakhstan.

Statistical data analysis in research is used to justify processes and phenomena based on existing statistical data.

Mathematical methods of research were applied in the process of developing mathematical formulas for economic processes.

Literature review. Many issues in the field of subsurface use assessment of the country are covered by the works of foreign scientists: Mun J. (2006), Samis M., Laughton D., Poulin R. (2003). Numerous works of such Russian scientists as Bukhalkov V.I. (2010), Vilensky P.L., Livshits V.N. (2006), Konoshenko M.V. (2007), Ronova G.N., Osorgin A.N. (2008), Smolovik G.N. (2007) are devoted to the study of investment as a special factor of economic development. Smolyak S.A., Mikerin G.I. (2007), Suraeva M.O. (2005), Faltsman V.K. (2006), Khomkalov G.V. (2001), Chernova G.V. (2008).

The basics of the need to take into account investment risks, including the conceptual framework and their classification, are presented in the works of the following Kazakhstani researchers: Shugaipova Zh. (2017), Sikhimbayev M., Sikhimbayeva D. (2019), Beisembekova S. (2022). However, despite numerous studies of theoretical and practical problems of the formation and development of the investment sphere, domestic economics has not developed a holistic approach to developing a specific mechanism for sustainable development of the country's subsurface use market and reducing the risks of investing in its facilities.

Thus, insufficient and unsystematic studies devoted to the development of mechanisms for reducing the risks of investing in the country's subsurface use make it necessary to conduct this study.

Research results and discussion. A characteristic feature of the mineral resources market is the relatively high level of risks. Risk is the uncertainty of receiving / not receiving income. The expected level of risk is taken into account in the rate of return on invested capital. It is assumed that the higher the level of expected risk, the higher the rate of return on invested capital should be. This traditional approach to determining the required rate of return is common for both investments in financial assets and investments in non-mining fields.

Figure 1 shows that assuming the acceptance of one risk and one source of income, there is only one such combination - point E.

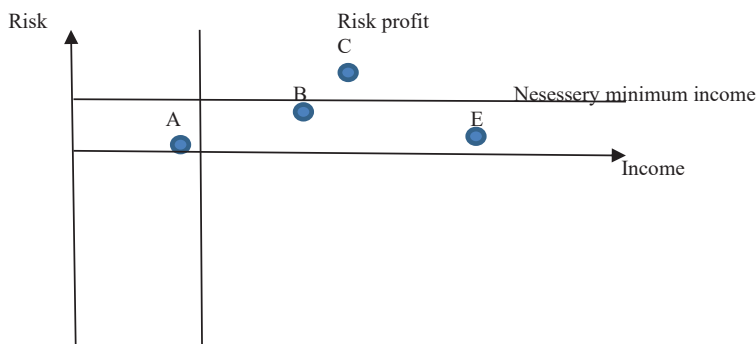


Figure 1 - Risk-return relationship

In practice, investment activity is associated with the use of various resource sources and risks, and the number of optimal ratios increases. The implementation of investment activities involves first of all providing a certain income, and not just accepting risk.

If we assume that the minimum risk corresponds to the minimum required income, then we can distinguish several sectors characterized by a certain combination of income and risk: A, B, C.

Sector A shows investments in which the minimum required income is not provided and can be considered as an area of insufficient profitability.

Sector C is defined as an area of high risk, since operating in this sector entails taking a high risk that reduces the possibility of obtaining expected high incomes. Making investments in sector B ensures that the investor achieves income with acceptable risk, so sector B is the area of optimal values of the ratio of profitability and risk. The risks inherent in the mineral resources market can be divided into three groups: systematic, unsystematic and random risks. These groups are described in table 1.

General risks, which in the theory of investment analysis are called systematic, are determined by factors that the investor cannot influence when choosing investment objects.

Table 1 - Risks inherent in the mineral resources market

Systematic risks	Unsystematic risks	Random risks
- do not lend themselves to diversification and reflect the relationship between the level of risk of investment in non-mining deposits and the average market level of risk; - they are determined by such factors as low asset liquidity, instability of tax legislation, changes in the level of competition in the mineral and raw materials market and the capital market, the duration of the business cycle in the market of mineral and raw materials industries, demographic characteristics, employment trends, inflation, and changes in interest rates on the capital market	- can be diversified by forming a portfolio of mineral deposits, i.e., by allocating capital between different types of profitable mining facilities; - Risks specific to different types of mineral deposits and different regions	are associated with possible unpredictable and social consequences. natural phenomena and may be associated with inefficient management of mineral resources market objects

As can be seen from Table 1, investment activity is associated with various types of risks.

Like investments in securities, investments in non-mining companies are subject to such risks as: interest rate risk, currency risk, credit risk, and business risk.

There are also additional specific risks that must be taken into account when assessing them due to the peculiarities of the functioning of the mineral resources market. The profitability of investing depends on the quality of management of the subsurface use object, due to its uniqueness, and requires detailed study of the legal, financial and technical aspects of each investment object.

The risks depend on the specifics of the investment project, profitability and stability in this market, and reflect the possibility of deviation of the actual final data from the expected planned results.

A general classification of the most significant and investment-specific risks is shown in Figure 2.

Specific risks are purely individual for each investor, in contrast to general risks, and may be associated with unprofessional investment policies, irrational structure of invested funds, and other similar factors, the negative consequences of which can be avoided by improving the efficiency of investment management.

Let's take a closer look at each type of risk:

- foreign economic risk-arises in connection with changes in the situation in the foreign economic activity of the country and region;
- internal economic risk-related to changes in the internal economic environment;
- socio-political risk-with changes in the political system and political instability of the country and region, and the investor assumes this risk;
- environmental risk-associated with the occurrence of negative changes in the natural environment;
- risks associated with government regulatory measures-related to changes in economic regulations, currency regulation, interest rate policy, taxation and legislation;
- market risk – is associated with unfavorable changes in the general economic situation or the situation in individual markets and arises as a result of changing stages of the economic cycle of the country's development or the investment market;
- inflationary risk – in case of high inflation, the amount of money invested in the property may not be covered by income. This risk is almost entirely borne by the investor (lender), so when studying the investment qualities of the proposed objects and drawing up the project, it is necessary to lay down the forecast inflation rates;
- other risks-arise in connection with economic crimes, fraud, poor performance of obligations assumed by partners, etc.

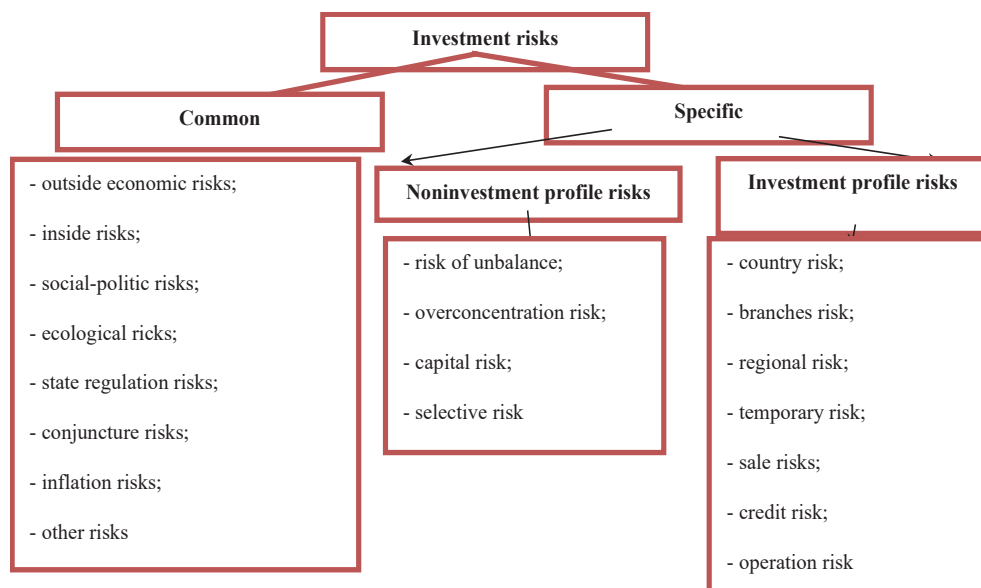


Figure 2 - Types of investment risks

The most significant of them include the following types of risks:

- the risk of unbalance arises due to a violation of the correspondence between investment investments and their sources of financing;

- the risk of excessive concentration (insufficient diversification) is associated with a narrow area of investment objects, a low degree of diversification of investment assets and sources of their financing, which, in turn, leads to the investor's dependence on one industry or sector of the economy, region or country;

- capital risk – the risk associated with a general deterioration in the quality of the investment portfolio, which makes it possible to see possible losses when investing in comparison with other types of assets;

- selective risk is associated with an incorrect assessment of the investment qualities of a particular investment object when selecting an investment portfolio.

In addition to these types of risks, we can distinguish risks inherent to varying degrees in various types of investment objects in the investment portfolio, which are taken into account both when evaluating individual investments and the investment portfolio as a whole:

- country risk includes economic, political, geographical, environmental and other risks that take into account the possibility of losses caused by placing funds and conducting investment activities in a country or region with an unstable economic and social situation;

- branches risk is associated with changes in the situation in a particular industry and takes into account the cyclical development of the industry, the reorientation of the economy and changes in market demand.

- regional risk related to the unstable state of the regional economy;

- temporary risk is associated with economic losses due to incorrect determination of the time of investment and the time of project implementation;
- liquidity risk is associated with economic losses due to changes in the assessment of the investment quality of the object;
- credit risk is associated with the loss of funds of the original quality of the object and the cost due to non-compliance with obligations on the part of the borrower and the issuer;
- operational risk is related to the activity of the investment entity itself. It implies violations in the technology of investment operations, malfunctions in computer information processing systems, etc.

In the work of M. O. Suraeva (2005), considerable attention is paid to the assessment of the impact of possible risks on the investment attractiveness of the project. The interrelation of the nature of uncertainty and methods of assessing the corresponding risks is emphasized. Depending on the type of risk, available information about its manifestation in the past, the directions of risk reflection in economic efficiency calculations are considered.

Let's note the most important aspects of the approach to risk factor accounting:

- * taking into account the probabilistic nature of risks;
- * the cash flow adjustment makes it possible to take into account the impact of a particular type of risk at the exact moment of its occurrence in the corresponding cash flow component;
- * using the risk ratio instead of adding a risk premium to the rate of return, which is also noted as incorrect by Konoshenko M. V. (2007), Samis M., Laughton D., Poulin R. (2003), avoids the dependence of risk on time and makes it possible to discount negative flows at a risk-free discount rate.

The risk premium for an investor is assumed to be determined after calculating the net present value, taking into account the risk coefficient. This indicates the advantages of this approach over the most common methods of taking risk factors into account when evaluating projects, which usually consist of adjusting the discount rate. This is primarily due to the fact that it is necessary to take into account the impact of risk on the positive and negative cash flows of the project in different ways.

By adding the risk premium to the discount rate, we adjust both positive and negative cash flows downwards during the discounting process. There is a contradiction here, since the occurrence of risk events, as a rule, leads not to a decrease in the volume of costs, but to an increase in it. For this reason, some authors recommend using different discount rates for positive and negative cash flows. In addition, by adding a risk premium to the discount rate, we make the corresponding risks time-dependent. This is not entirely correct, since uncertainty increases over time, but the level of risk remains constant. It may change, but due to other factors, such as the transition to a new phase of the project lifecycle. The discount rate is determined by the following formula:

$$k_{dm} = 1/(1 = E_{\min R})^t * R, \quad (1)$$

where K_{dm} is the modified discount factor.

$E_{\min R}$ – the rate of income without taking into account inflation and the risk component.

t – step number of the billing period.

R is the risk factor to be taken into account in the discount rate, which in turn will be equal to:

$$K = L_{abs} / S_{eval} + 1, \quad (2)$$

where L_{abs} - quantity of losses in absolute determination;

S_{eval} – stream for project evaluation effectiveness.

There are some difficulties in applying this approach to accounting for risk factors, which consist in the need to determine the amount of damage caused by the occurrence of a risk event, taking into account its probability. This is especially difficult to do when a project is evaluated at an early stage of its life cycle. Such an assessment will require a thorough and detailed analysis at each step of the project implementation, however, when it comes to the pre-project stage of mineral resource development, it is not always possible to obtain sufficient detailed information, given the complex multi-component nature of mineral resource development.

Quantitative risk analysis is necessary to assess how the most significant risk factors may affect the performance indicators of an investment project. The analysis allows to find out, for example, whether a small change in the volume of sales will lead to a significant loss of profit or whether the project will be profitable even if 40% of the planned volume of sales is realized.

The standard method of quantitative analysis is sensitivity analysis, which consists in changing the values of critical parameters (in our case, the physical volume of sales, cost and selling price), substituting them into the financial model of the project and calculating the performance indicators of the project for each such change.

Table 2 - Changes in project performance indicators (as of the last stage of the project) depending on changes in product sales prices (absolute and relative).

Efficiency coefficients	Factor – change in the selling price (as a percentage of the planned level)								
	-40%	-30	-20	-10	0	10	20	30	40
NPV, thousand US dollars	-529	61	639	1208	1764	2313	2851	3386	3905
NPV, %	137	94	33	67	0	35	61	95	124
IRR	14	19	27	33	34	40	45	51	55
PB	5.33	4.90	4.28	4.27	3.88	3.86	3.37	3.24	3.25
DPB	doesn't pay off	6.46	5.88	5.26	4.88	4.27	4.43	3.83	3.87

Note: Compiled by the authors

Thus, the result of the project under consideration is most strongly influenced by the selling price, followed by the production cost, and finally by the physical volume of sales.

Although the selling price has a significant impact on the NPV, its volatility is likely to be very low, making it a low-risk factor. First, based on expert opinions, the first-level probability is determined — the probability that the actual price will change, i.e. become greater, less, or equal to the planned price (in our case, these probabilities are 30, 30, and 40%), and then the second-level probability is determined — the probability of deviation by a certain amount. Thus, if the price is still less than the planned price, then with a probability of 60%, the deviation will be no more than -10%, with a probability of 30% — from -10 to -20%, and with a probability of 10% — from -20 to -30%. Deviations in the positive direction are analyzed in a similar way. Experts considered deviations of more than 30% in either direction to be impossible.

The final probability of a deviation in the selling price from the planned value is calculated by multiplying the probabilities of the first and second levels, so the final probability of a 20% decrease in the price is quite low at 9% (30% x 30%).

The total risk for NPV in our example is calculated as the sum of the products of the final probability and the risk value for each deviation, which is equal to 6.59 thousand tenge ($1700 \times 0.03 + 1123 \times 0.09 + 559 \times 0.18 - 550 \times 0.18 - 1092 \times 0.09 - 1626 \times 0.03$). In this case, the expected NPV value adjusted for the risk associated with changes in the selling price will be equal to 2,758,000 tenge (2,765,000 (planned NPV value) – 6,590 (expected risk value)) (table 2).

Thus, the risk of a change in the selling price reduces the NPV of the project by 6.59 thousand tenge. As a result of a similar analysis of the other two critical factors, it was found that the most dangerous risk is the risk of a change in the physical volume of sales: the expected value of this risk was 201.878 thousand tenge, and the expected value of the risk of a change in the cost of production was 122.89 thousand tenge. This means that the change in the retail price is not the most important risk for the project under consideration, and it can be neglected in favor of managing and preventing other risks.

Sensitivity analysis is very visual, but its main drawback is that it only analyzes the impact of one factor, while the others are assumed to be constant. In practice, several factors usually change simultaneously. Scenario analysis helps to assess this situation and adjust the NPV of the project to account for the risk.

Conclusion. The considered concept of a mineral resource deposit from an economic position as an object of economic space, extractive deposits can act as a commodity, a source of income for the owner, a source of financial stability, a consumer item, a factor (means) of production, which has a number of features that determine the specifics of turnover and functioning as a real or financial asset.

The analysis of research on concepts and techniques, the main existing approaches to assessing the risks of investing in a mineral resource deposit has contributed to the development of the definition of "investment attractiveness", which is proposed

to understand the characteristics of an investment object that reflects its potential to achieve the investor's economic goals, taking into account the risk.

Based on the study of the properties of a mineral resource field as an object for investment, the specifics of the mineral resource field development project and the investor's expectations, the main factors affecting the investment attractiveness of the mineral resource field development project are identified and classified, each of which, to varying degrees, affects either the course of development of a mineral resource field, or on its future profitability and compliance of the result with the interests of the investor, i.e. investment attractiveness.

An important step before starting investing in the raw materials industry is to recognize the possible occurrence of risks, since the profitability of investment depends on the quality of management of the subsurface use object. The risks also depend on the specifics of the investment project, profitability and stability in this market. To reduce the probability of risk occurrence, a thorough study of the financial, legal and technical aspects of each investment object is required, for which a classification of the directions of risk accounting in calculations of economic efficiency and methods of their assessment are given.

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