DOI: *10.18454/PMI.2017.2.247*

UDC 519.24

MODELS FOR ASSESSMENT OF PUBLIC-PRIVATE PARTNERSHIP PROJECTS IN SUBSURFACE MANAGEMENT

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Aims and goals of this paper. The article is devoted to analysis of issues related to development of public-private partnership (PPP) projects in mineral resources sector of Russia. The special emphasis is given to the most common PPP model in the field of industrial infrastructure construction using the Investment Fund of RF. We offer specific tools to be used with Russian models for assessment of PPP projects and forecasting of its efficiency for its participants. This model allows evaluating the results of the whole deposit development process, constructing graphs of all types of expenditures and revenues (by years), and having rent assessment of deposit NPV (net present value) and internal rent rate (IRR).

Methods and results. The iteration process at each step enables assessment of budget revenue forecast, living standards indexes, ecological parameters and performance indicators, as well as a certain variant of PPP project implementation for investors (direct government expenses on implementation of infrastructure objects and environmental activities, tax benefits). We have a set of tools for supporting the management decision making process in developing efficient PPP mechanism, balancing long-term government interests, private sector and local people interests arising during socio-economic development of mineral resources area. This method using the suggested tools for analyzing efficiency of a specific partnership mechanism is shown on the examples of projects of developing different deposits in Transbaikal region.

Key words: public private partnership, PPP project assessment model, partnership mechanism analysis, formation of mineral resources development, subsurface resources management

How to cite this article: Kalgina I.S. Models for Assessment of Public-Private Partnership Projects in Subsurface Management. Zapiski Gornogo instituta. 2017. Vol. 224, p. 247-254. DOI: 10.18454/PMI.2017.2.247

Introduction. The experience of polymetallic deposits development in the Eastern part of Russia shows that the task of re-industrialization at the up to date level of technology in this part of mineral resources sector is hardly ever possible without government support. The major problems connected with development of mineral resources at underdeveloped areas of Russian Federation lie within the framework of approval mechanisms for private sector investor and long-term government interests. This mechanism should provide investment attractiveness, budgetary receipts and adherence to ecological standards during socio-economic development of the region.

The PPP mechanism is used worldwide and became an efficient tool for finding mutual interests in different economic sectors [11, 12]. In mineral resources sector the public and private partnership enables to enlarge number of funding resources and get subsurface users interested in development of new deposits in hard-to-reach regions.

The growth and promotion of PPP projects in mineral resources in Russia should be accepted as unsatisfactory. The most common situation is when an investor cannot implement a project because he does not have required infrastructure and a government does not want to invest into infrastructure until it will be sure that it will be used in a full scale. The practical solutions for such cases are not so numerous in Russia and we need to find special economic-mathematical tools for supporting development of efficient PPP model.

This problem is a key element of this paper. The author's experience provides the basis for suggesting a method of creating PPP model using the mechanisms of finding a balance between different economic interests.

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Assessment of public-private partnership mechanism. Historically there are two main PPP models in the mineral resources development sector – production sharing agreement (PSA) and projects of establishing industrial infrastructure using sources from Investment Fund of RF. Industrial-infrastructure investment projects sponsored by Investment Fund of RF use the partnership model, which is not a classical one and was created due to Russian context.

What are the tools for developing such projects?

The lack of modern global patterns for Russian PPP industrial infrastructural projects sponsored by Investment Fund of RF creates the necessity of implementing specific economic-mathematical models for supporting management decisions in mineral resources development process, assessment and project administration.

Under conditions of underdeveloped resources area, a government could support the potential investor in three fields:

- establishment of required infrastructure;
- implementation of some environment protection activities;
- tax benefits.

During start up and implementation of mineral resources projects within the public and private partnership pattern the government mainly supports the infrastructure issues resolution (roads, electricity, etc.), because often the project economics of a private investor cannot cover the additional costs for «connecting» a project to the local area [7, 8]. The establishment of good infrastructure promotes attraction of future investors and other regional socio-economic projects [9]. On the other hand, the benefits for different partners of this project could be of unequal value – often the negative ecological footprint of mineral resources development exceed the expected socio-economic benefits. In this case, we need to find a balance between economic interests, which would stabilize this partnership and become a key condition for developing mutual plans.

The ecological rehabilitation of natural ecological systems is a very complex process of restoring the damage from mineral resources development projects. As a rule, this set of environment protection measures is of key interest for local people and government. The full-scale activities may require expenses equal to investment project and a private investor needs support from the government funds. The examples of such public and private partnership in environment protection issues implementation are described in papers [2, 6].

The tax benefits for an investor of PPP is an efficient tool for increasing his interest in completion of the project. When an investor is estimating the mineral resources development project economics, the tax budget line is a bottleneck, since a tax rate and operations are quite unstable. In such situation, the planned PPP tax benefits are additional tools for finding a balance between an investor and a government interests, which could even promote project feasibility under conditions of low prices.

In the underdeveloped areas the development of efficient PPP model is mainly about finding a good balance between those three fields: direct government investment in infrastructure development, funding of environment protection and restoration activities and provision of tax benefits. The specific combination of these tools and a fixed of project financial support greatly define the level of project feasibility for an investor and a share of mineral resources rent given to a government in a form of taxes.

Therefore, the assessment of PPP project is limited to assessment of impact from implementation of government and investor mutual project, when a government is responsible for establishing the required infrastructure, a predefined list of environmental activities and certain tax benefits for an investor. The partnership mechanism is efficient when there is a good bal-

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ance between government and investor's interests, which is when an investor reaches a desired level of feasibility and a government receives a major part of a rent as a part of value created by nature.

Generally, a government of a resourceful region deals with a set of deposits and a group of potential investors with specific technological projects implemented under certain conditions. In this situation, a PPP tool is a key element of a development program. The working out of this program assumes usage of models of areal planning and forecasting customized for specific mineral resources development processes [4].

Models of mineral resources development processes (fig.1) form a basic procedure for assessment of a given partnership mechanism as an element of general development strategy.

By presenting a development process as a range of investment projects for developing a given mineral resources sector, infrastructure establishment and environment protection activities we can consider a certain model of public-private partnership as a coordinator managing the

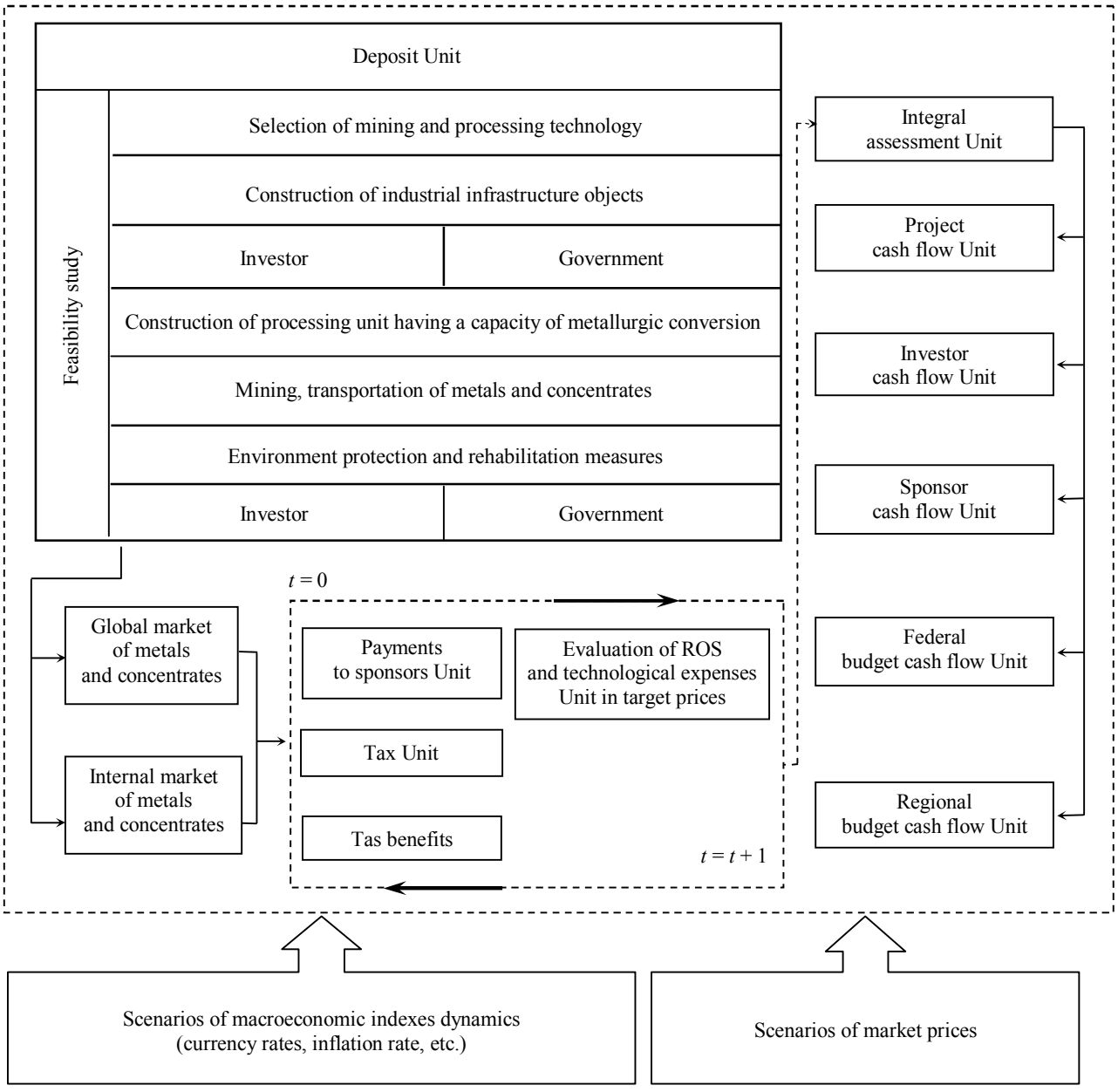


Fig.1. General flow chart of deposit development process

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intentions of participants, and see a development program as a set of investment projects connected through a given model of private-public partnership.

The corresponding model of PPP assessment (fig.2) is a basic tool for evaluating used partnership mechanism.

This model is based on mineral resources development processes grouped into units of oil and gas and mining-processing sectors [2] with variable number and position of technological conver-

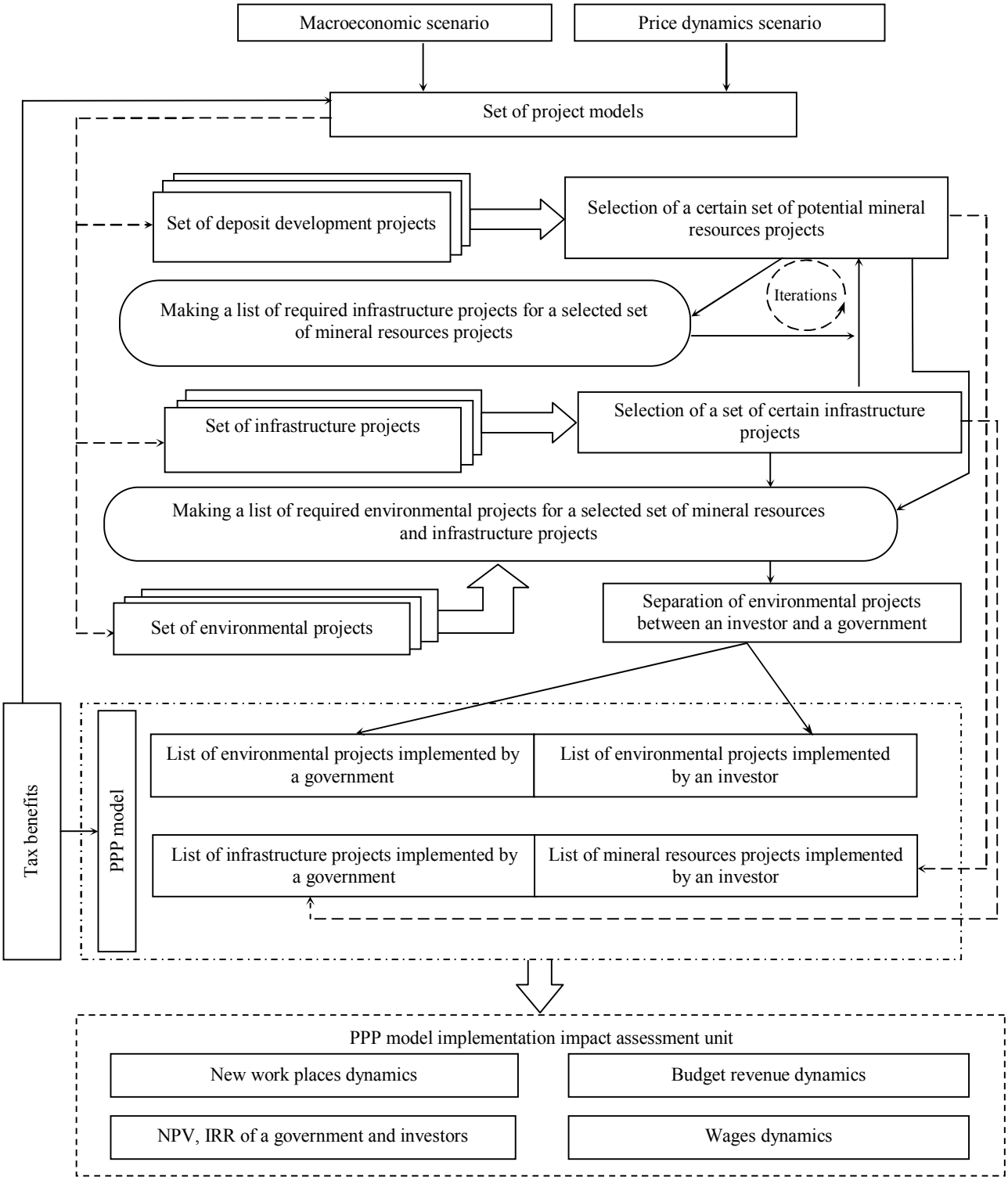


Fig. 2. PPP project assessment flow chart

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sions. A certain list of investment projects is selected by investors depending on what a government offers in the field of infrastructure construction.

A government selects a list of infrastructure projects to be implemented by it basing on efficiency from the long-term goals of this given region development point of view. A set of infrastructure projects has typical projects for construction of roads, ETL, HPP, HRPP, etc. The relevant models describe construction and functioning (maintenance, service) processes and use input data on financial sources defined on the analysis of project funding and model of public-private partnership.

The choice of investors and a government defines a list of environment protection projects needed for compensation of ecological damage during implementation of investment projects. The corresponding models of ecological unit are designed per a unified pattern [6] and take into account the fact that a certain list of activities is not attributed to an investor or a government for implementation and should be done as a result of selection of a certain mechanism of expenditures distribution within a PPP project.

The output data of assessment model is forecasts of dynamics of revenues and expenditures of private investors and a government during implementation of the whole set of projects within the framework of an evaluated revenue distribution mechanism. Local people receive information on new work places and additional revenues that can be used in model of regional forecast in creating dynamics of key indexes of society living standards [4].

The whole range of output data enables assessment of used PPP model efficiency from the point of view of finding a balance between interests, which formally is presented as positive NPV of a government and private investors as well as increase of living standards.

This is the general idea of PPP model assessment; its major selection parameters are infrastructure and environment expenditures distribution and amount of tax benefits. Since every single case requires its own specific set of three tools, the task of finding an efficient partnership mechanism can be solved through analysis of partners' efficiency indexes sensitivity to changes of each basic PPP model parameter.

Results and discussion. This method of analysis can be illustrated on the example of the project «Creation of transportation infrastructure for development of mineral resources of south-east of Chitinskaya oblast». Within the framework of this project a government planned to build a railway branch «Naryn-Lukogan» connecting an area with a great number of prospective mineral resources deposits, which were planned to be developed by a private investor (OAO «Norilsky nikel»). However, in 3 years after the beginning of the project a private investor stated that it would not implement all its duties of this project as it had been planned before. As a result, a government changed its duties too and builds only a part of the planned railway branch (to the station «Gazimurovsky zavod»). This infrastructure opens access only two deposits (Bystrinskoe and Bugdainskoe) from the originally planned.

How could we assess the efficiency of the implemented PPP project model?

To answer this question, we can use the PPP project assessment model, which enables estimating the prospects of this project implementation from the investors' point of view, as well as local and federal budgets under conditions of different implementation patterns just by using the first tool – construction of infrastructure objects.

To analyze the sensitivity of project efficiency indexes to changes of this tool we carried out several model experiments varying the share of government contribution to mutual funding of railway construction process. The government participation level could be from 0 to 100 %. The 0 % level of government expenditures is when the investor covers all expenses of this infrastructure construction – PPP object. The 100 % level of government participation means that the construction of infrastructure objects is done completely by the federal budget funds.

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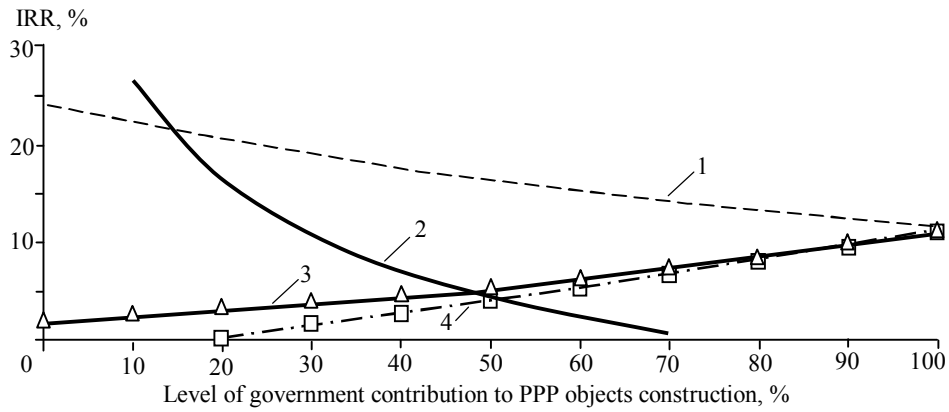


Fig.3. Internal rate of government and investor revenues
1 – government in general; 2 – federal budget; 3 – Bugdainskoe deposit; 4 – Bystrinskoe deposit

Fig.3 shows the results of corresponding calculations for «no change» scenario for market prices, built on retrospective analysis saving general price raise tendencies in mineral resources sector for 10 years. The internal feasibility of federal budget sponsoring the railway construction process abruptly falls with main PPP mechanism parameter increase – government contribution to capital investment of this infrastructure object. The general dependency of government feasibility on revenue level is almost obvious and does not involve complex model calculations. However, it is important to understand the point to which the government is ready to consider the requests of the investor having the efficient investment and reasonable balance of interests under different conditions. To know this point we need to use the abovementioned tools and a set of calculated project mechanism variants.

The government sensitivity to changes in expenditures is significantly lower – that is why the feasibility level of its contribution to infrastructure development is high even in the worst scenario case. However, the efficiency indexes of Bystrinskoe and Bugdainskoe deposits investor reach the minimal possible level for the mineral resources sector of Russia (10 %) only in case of full government funding of the railway construction process and the worst market performance case gives the investor a negative NPV.

It means that the balance between interests in constructing the railway branch cannot be reached in any case scenario and the implemented PPP model does not have clear socio-economic prospects.

Another practical example of using the partnership mechanisms is Noyon-Tologoiskoe deposit in Transbaikal region which is being developed by company «Baikalrud». The company management tried to contact local government several times to build ETL needed for development project and offered a PPP mechanism. The feasibility of those suggestions was tested through model analysis and it showed that having a wide range of scenarios Noyon-Tologoiskoe deposit investor can continue without government support in ETL building [3].

These examples of one tool used for assessment of project feasibility – government contribution to infrastructure construction process – show how we can improve the efficiency of management decisions making in this sphere.

The more complex partnership mechanism could be built on the additional tools including tax benefits and public funding of environmental activities. Thus, in accordance with the Federal law N 267 d.a. 30.09.2013 for several regions there exist additional tax benefits for mineral resources investment projects [10]. The general scheme of these benefits includes rules regulating the government and investor relationship in the field of profit tax payment to local and federal budgets.

These opportunities for the investor provide him additional options for finding a balance between interests. In case of Bystrinskoe and Bugdainskoe deposits the Federal law enables increasing the investor feasibility level using a new partnership mechanism including direct government support in building infrastructure objects and tax benefits.

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Fig. 4 shows computational experiments results of PPP project assessment in which we varied the amount of direct government contribution and income tax benefits. This figure helps to answer the key questions related to selection of a specific model of government and investor cooperation. Here we can see the possibility to increase investor's feasibility level basing on usage of both tools for having government support. The marked zone at fig. 4 is an area of reaching positive feasibility, and selection of efficient PPP model – combination of tax benefits and direct government expenditures – should be done within this range of solutions.

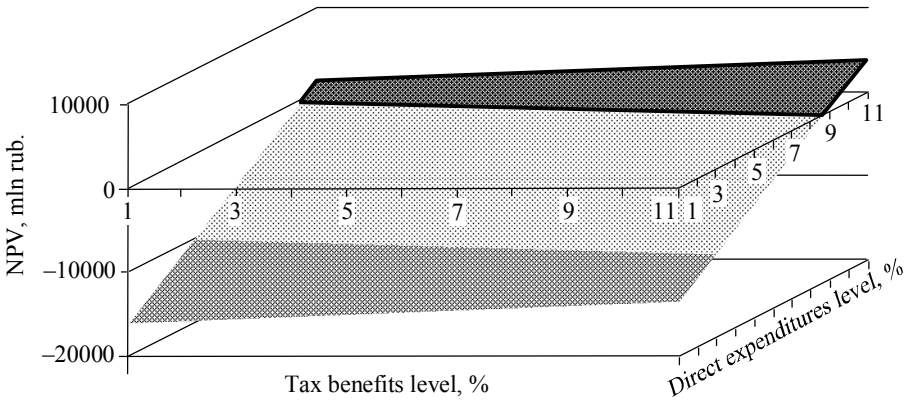


Fig.4. Net discounted income of Bystrinskoe deposit investor

The algorithm of finding this optimal solution could be based on expertise procedure of consequent improvement of partnership mechanism using the PPP model assessment mode at each step to find a balance of interests and discarding the variants worsening the government contribution efficiency. The general recommendations for this procedure are to select the levels of tax benefits and direct expenditures, providing each investor a small but positive NPV, and maximum possible NPV for the government.

The PPP model assessment using all three tools of government support is carried out in a similar way [6]. Therefore, the basis of the suggested method for assessing public-private partnership is a forecast model, in which the expert can estimate the mechanism and find its internal imbalances (negative NPV of several partners). The «manual» adjustment of expenditures distribution and further usage of PPP project assessment model give an opportunity for finding a partnership mechanism providing a balance between interests.

Conclusion. Basing on scenarios of model calculations for single deposits provided in paper [1] we concluded that PPP projects in mineral resources sector are not a simple and universal tool insuring positive results. It is a sensitive mechanism requiring complex attunement and individual approach. The given results of computational experiments support this conclusion.

The received results also confirm the eligibility of original assumptions of public-private partnership concept in the field of mineral resources, where the government acting rationally at the underdeveloped area is wisely uses all three tools of partnership including tax benefits and supporting the investor in creating the required infrastructure and implementation of necessary environmental activities. The obtained results allow assessing the government contribution in project funding that is necessary for solving tasks of re-industrialization of eastern parts of the country.

Acknowledgment. *The assessment of public-private partnership for Transbaikal deposits was carried out within the framework of RHSF project N 16-02-00102a «Prospects of re-industrialization at the boundary regions of eastern part of Russia».*

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The article was accepted for publication on 19 December, 2016.