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Integrated mining projects in underdeveloped territories of Russia: substantiation of implementation parameters

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Complex mining projects, as a rule, have significant economic and social impact on the territory, sometimes entire regions where they are implemented. Consumers of their implementation effects are population, government, buyers, lenders and other stakeholders. Therefore, development of transport infrastructure in integrated projects for development of mineral deposits should have state support, forms of which are very diverse. In Russia parameters of concession agreements for construction of transport infrastructure, carried out in conjunction with projects for development of mineral deposits, are not regulated or justified.

Aim of the work is to develop an organizational model and justify parameters of concession agreement for construction of the railway as a key element of transport infrastructure necessary for successful implementation of the project for development of a large coal deposit in a low-developed region. Research methods are: strategic, institutional, investment analysis, modeling and forecasting methods.

The article proposes an approach to justification of technical, economic and financial parameters of concession agreement implemented during realization of an integrated mining project. As a result of the study, a concession agreement model was developed for construction of railway section as part of an integrated mining project, including development of a deposit and construction of a mining and concentrating company.

***Key words*:** integrated mining project; underdeveloped regions; transport infrastructure; public private partnership; concession agreement; concession model

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Introduction. Currently, almost all major projects in the mineral sector of Russia are being implemented in underdeveloped regions. Such regions include Eastern Siberia, the Far East and Northern regions. Examples of projects being implemented in underdeveloped regions may include: construction of «Udokan» mining-and-metallurgical integrated works in the Trans-Baikal Territory, the Elga mining and concentrating company in the Republic of Sakha (Yakutia), development of the Elegest deposit in the Republic of Tyva, Boguchansk energy and metallurgical association in the Krasnoyarsk Territory, etc.

The lack of transport infrastructure complicates development of deposits, increases capital intensity of the project, or makes its development impossible.

Under the planned economy, a comprehensive approach was applied to underdeveloped territories, including development of production, transport and socio-economic infrastructures with financing from the state. Along with the financial burden, the state took all the risks in such large-scale projects. A vivid example is the industrial development of Vilyui diamond deposits on the territory of the Republic of Sakha (Yakutia). The project was implemented in the 1960s and 1980s and, in addition to construction of mining and processing plants, associated industrial and household infrastructure, included creation of a hydroelectric station and the Tynda-Berkakit (Neryungri) railway line connecting Yakutia with the Baikal-Amur Mainline and the Trans-Siberian Railway. At the same time, the state guaranteed the sale of products: contracts were concluded for the sale of diamonds part to the De Beers International Diamond Corporation, the rest was supplied to state-owned enterprises [11].

In the world, various mechanisms have been developed that reduce financial burden and risks of the state when transferring them to private business. One of the established mechanisms of inter-

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action between the state and private business is concession as a form of public-private partnership (PPP). Based on the practice of implementing concession agreements (CA), transport infrastructure among the objects of the CA is dominant [9]. The purpose of creating transport infrastructure is construction and operation of facilities to provide services to society, ensure the cohesion of the territory, save time, improve convenience and safety, etc. The methodology and practice of using CA for construction of transport infrastructure in complex mining projects has not been formed either in Russia or abroad.

Since field development projects in areas with underdeveloped infrastructure have a significant socio-economic impact on the region and the state, development of transport infrastructure should be carried out with state support.

Results and discussion. Implementation of complex mining projects in poorly developed regions of Russia, as a rule, is carried out in difficult organizational, technical and economic conditions and is accompanied by many problems (adverse climatic conditions, personnel problems, lack of financial resources, etc.) [13]. In Russia, one of the key problems in implementation of projects for development of new mineral resources is underdeveloped infrastructure. Many deposits are located in Eastern Siberia or the Far North regions – regions with huge underdeveloped territories, remote from energy and transport communications, not included in the Unified transport and energy system.

Under such conditions, rail transportation is the most economical way of transporting mining products to consumers, since road transport is efficient over short distances. The distance of deposits from railway lines is hundreds of kilometers. However, creation of railway infrastructure requires huge capital costs, so investors are trying to attract additional sources of financing and reduce risks.

Among variety of forms of interaction between the state and private sector to create infrastructure in foreign practice, the most widely used is concession as a PPP mechanism. Concessions represent transfer of an object of state or public property for construction, modernization, operation, management, maintenance on terms and conditions stipulated in the agreement to concessionaire [7]. Concession projects provide a rational ratio of public and private capital participation in exercise of property rights and have several advantages for the parties of CA [1]:

• long-term nature of relationship, allowing both state and company to carry out strategic planning of activities;

• investor has freedom to make managerial decisions;

• projects remove financial burden from the state and allow to use the most effective private sector management methods;

• the state has leverage over private sector in case of violation of contract terms or protection of public interests;

• distribution of risks between public and private partners helps to optimize the ratio of benefits and costs of project, and also helps to achieve increased financial sustainability of the project.

In transport sector, traditionally the number of CA is the maximum. On the one hand, the state is obliged to create normal conditions for transport communications and connectedness of territories. This is especially significant for countries with a large area with territories where transport accessibility is provided mainly by air. Highway construction in such conditions is a priority, with motorways prevailing. The number of railway concessions is significantly less. Based on the data presented on the World Bank website, it was revealed that out of 1,180 transport projects implemented on the basis of PPP, the number of railway projects in the world practice is 122 (10.4 %) [3].

On the other hand, when using CA, there must be a solvent consumer and sufficient traffic for constructed facilities. Solution to this problem is not always possible due to the lack of solvent retail demand, traffic, or both.

Concession agreements in construction of railways are widely used in China, Latin America, Africa, CIS and other regions of the world. The most common is construction of railways for com-

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mercial use, providing profitability due to traffic. Vale S.A., one of the largest metallurgical and mining companies in the world, which invests in railway concessions in Brazil and Malawi, is an example of building a railway for industrial use. So, in 2011 Vale signed a concession agreement with the Government of the Republic of Mozambique on the construction of a railway corridor (912 km) worth 4.4 billion dollars for transporting coal through the territory of the Republic of Malawi. Under the terms of this agreement, company pays government a concession fee for 30 years in amount of $ 8 million. per year [5].

In Russia, a significant part of railways at the end of the 19th – beginning of the 20th centuries was built using concessions, however today practice of using CA for construction of infrastructure within the framework of integrated project for extraction of mineral resources is only taking shape [2]. The Law No. 115-FL «On Concession Agreements» provides only for the BOT (Build-Operate-Transfer) type when the concessionaire constructs and operates infrastructure facility as a user during the concession period, after which facility is returned to the state [3]. Since 2016, Russia has signed three concession agreements for construction of railway infrastructure (see table).

Railway concessions in Russia

Subject of concession	Aim of the project	Investor	Terms	Cost, mln rub
Construction of the adjoining railway section	Cargo transportation to the port of Taman	CJSC «Tamanneftgaz»	2016-2020	362
Construction of the Elegest – Kyzyl – Kuragino railway line*	Coal concentrate removal from the Elegest field	«TEPK» JSC «Kyzyl – Kuragino»	2018-2048	126 000
Construction of the railway line Obskaya - Salekhard – Nadym (Northern latitudinal railway) **	Transportation of goods from deposits in Western Siberia to seaports	LLC «SSHH»	2018-2052	113 000

* Order of the Government of the Russian Federation of 04.17.2018 No. 687-r.
** Order of the Government of the Russian Federation of 08.08.2018 N 1663-r.

There are fundamental differences between these three CAs presented:

• the first two concessions are related to creation of traffic, i.e. concessionaire is the main generator of the cargo base;

• construction of the Northern latitudinal railway – an example of a classical (market) concession in which concessionaire is not connected with traffic generators, but provides services to railway transportation market;

• construction of the Elegest – Kyzyl – Kuragino railway line is focused primarily on transportation of coal by one consumer, operation of the main line is directly related to operation of the deposit and construction of the mining and processing complex, and other consumers may subsequently appear (development of other deposits).

Analysis of domestic and foreign practice of application of railway concessions revealed the main organizational and economic problems of their implementation [2, 8]:

• inconsistency between actual and design freight flows (in Kazakhstan, in 2004 the volume of freight traffic significantly decreased as a result of a decrease in China's exports);

• decrease in attractiveness of the project as a result of devaluation of national currency (during construction of road in Kazakhstan, due to the high level of inflation, concessionaire was forced to default on infrastructure bonds);

• unreasonable sharing of risks between grantor and concessionaire for the project, lack of state support. For example, in Kazakhstan, due to state's refusal to share risks and provide benefits, the Constitutional Court terminated construction of the Korgas-Zhetygen railway line, the road will be built at the expense of public funds;

• a significant difference between government tariffs and tariffs provided in the project, which reduces profitability of the project;

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• insufficient throughput of main railway line to the constructed railway in the framework of concession (for example, the Trans-Siberian and Baikal-Amur railways, presence of bottlenecks in Russia);

• lack of a clear mechanism of interaction with population of the territories, as a result of which project can be changed or even canceled.

These problems are typical for CA in construction of railways. At the same time, the greatest difficulty is created by economic problems and risks. As foreign experience shows, the concessionaire is far from always being able to completely neutralize risks that arise in the process of implementation of CA. This applies, first of all, to the risks of exceeding the expected construction estimate or lowering income when operating infrastructure facilities under the influence of various, poorly controlled factors. Traditional economic scenario-probability analysis should be complemented by an institutional analysis of external environment in terms of CA conditions in specific industries and countries [12].

In determining project parameters, the state partner primarily proceeds from public interests, seeks to minimize budget costs and assign the majority of project risks to private partner [13], who is not involved in development of key project initial parameters and can only partially ensure its commercial interest within the framework defined by government partner. In practice, this leads to unsustainable projects.

Concession grantor bears the following risks:

• All risks associated with the land provided to concessionaire (compliance of the land with requirements established by agreement, lack of archaeological sites on the land, lack of third party rights to the land, etc.).

• Political risks, including significant adverse government actions, if they make it impossible for the concessionaire to fulfill its obligations and (or) lead to additional costs (war, rallies, protests, terrorist acts, nationalization, expropriation, etc.).

• Risks associated with obtaining permits from a grantor, including from its authorities, in terms not specified by agreement.

• Violation of concessors` obligations under concession agreement, violation of such obligations by authorities of the concession is the basis for compensation for losses or additional expenses of the concessionaire.

• If a regulated tariff is set for the concessionaire, then its decrease below the level established by concession agreement is the basis for compensation.

• The grantor has the right to assume obligations to reimburse the concessionaire's lost income, especially in projects where there is no public funding of the grantor.

Such risks should be borne by concessor grantor represented by relevant state or municipal authority. However, compensation mechanism for such a risk has not yet been fully developed. In theory and practice, the prevailing approach is that task of compensating for risk is essentially replaced by the task of compensating the increased costs or lowering income. This approach does not correspond to essence of risk sharing, which should be aimed at reducing uncertainty in achieving the goals. In conditions when a grantor can evade fulfillment of obligations, concessionaire cannot be sure in full compensation for risks uncontrolled by it, which reduce economic efficiency of infrastructure projects. At the same time, concessionaire has incentives to transfer costs that he is able to control to the concessor, as well as lost profits, which concessionaire could manage [6]. Therefore, amount of compensation for increase in costs and decrease in income not related to actions of concessionaire should be determined at the stage of economic feasibility of the project.

With introduction of a new procedure for initiating projects, a potential concessionaire can carry out their pre-investment development. By developing the CA parameters, initiator ensures his commercial interest, but is limited by interests of the concessor. Correction of CA parameters and balance of interests will be carried out at negotiations of initiator and concessor [15].

The limit of guarantees for interests of the concessionaire (achievement of the return on investment and receipt of gross revenue in the amount of not less than initially determined by CA) is

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established. Moreover, by virtue of direct legislative prohibition, parties cannot reduce the costs of concessionaire by softening the requirements for quality and consumer properties of the object of concession agreement.

Accordingly, additional tools are needed to reduce the risks of concessionaire. In foreign practice, such main forms of payment exist [14]:

• direct collection of fees, including a revenue sharing mechanism and a minimum guaranteed income (MGI);

• payments for accessibility, often used in projects, if public partner carries a significant share of demand (traffic) risk;

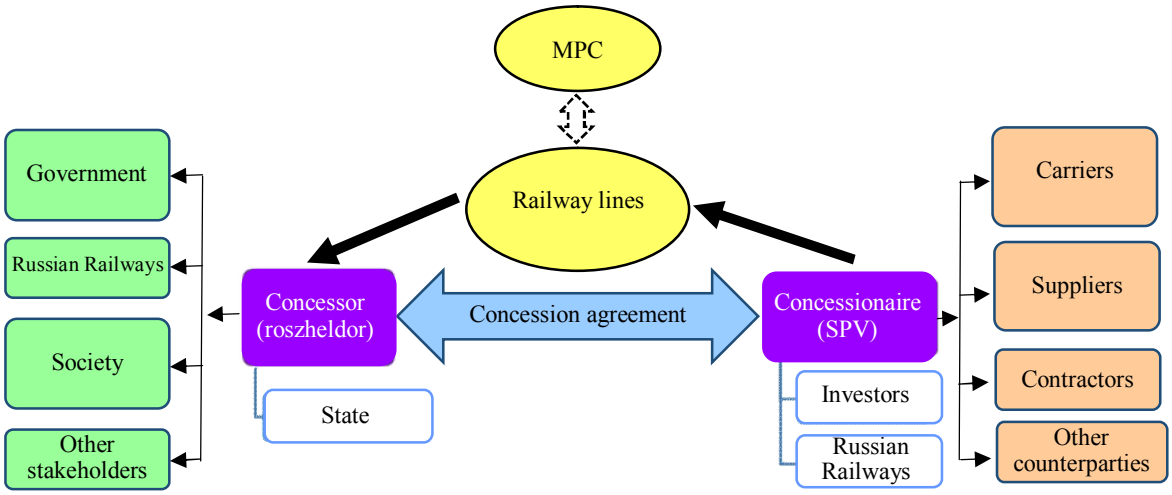
• a shadow toll mechanism is used instead of a direct toll mechanism when direct payments for the use of road are not possible due to social or political risks (that is, the road should be free for users);

• performance-based payments used in PPP road projects to create incentives for private sector to increase productivity and security.

Taking into account the listed problems of existing concessions, a CA model was developed for construction of a railway section and infrastructure, which ensures transportation of commercial product of mining and processing enterprise. Universality of the model is connected with condition that the object of the agreement - the railway - will be used by other carriers to transport goods from nearby fields. Organizational chart of the model is shown in the figure. According to this model, the state (the concessor, the Federal Agency for Railway Transport) and a special design company (concessionaire, SPV) enter into a CA to finance, create and operate infrastructure of the non-public railway line needed to remove the cargo base from mineral deposit, including providing infrastructure to carriers . Moreover, founders of the project company should include an operator (JSC «Russian Railways») for design and operation of the railway line. The carrier will also be JSC «Russian Railways» or other companies.

The main condition of CA is construction of a mining and processing complex (MPC) with a specific design capacity, cost and terms indicated in project documentation. The grantor, in turn, is obliged to provide land for creation of railway infrastructure. Responsibilities of the grantor include interaction with project stakeholders: regional authorities, public, Russian Railways and other companies interested in the project. It will ensure modernization of infrastructure facilities that are not part of the CA facility, but are necessary for its implementation. For example, cooperation with Russian Railways will increase throughput capacity of federal highway sections through which products will be transported, including export to consumers.

The project is financed at the expense of project initiator's own funds (project company) and borrowed funds (infrastructure bonds, credit funds) [11]. An important point is the state guarantees in adoption of regulatory legal acts in fulfillment of financial obligations (register of expenditure



Railway concession organization chart

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obligations of the Russian Federation), as well as guarantees for financing part of the costs for creating or operating a concession agreement object. In turn, private partner is obliged to provide bank guarantees to ensure fulfillment of its obligations, including guarantees for financial closure, construction, operation.

Any CA is designed for satisfying private investor indicators of economic efficiency. Financial model of CA is based on the following economic indicators.

The concession fee paid by concessionaire consists of a fixed concession fee and part of the excess income payable to concessionaire. Over-income is an amount equal to the share of excess of concessionaire income over the planned income fixed in financial model due to excess of the cost of transported raw materials. In addition, concessionaire pays rent for the use of land to concessor.

Payments of concessor for CA can be made in different ways. For example, concessor makes a grant in the form of subsidies, as a rule, after construction is completed in the amount of up to 75 % of capital costs to finance part of investor's costs for design and construction of the facility. In some cases, a capital grant is issued at design and construction stage.

In case of risks of planned revenues non delivery, conditions of CA include compensation for minimum guaranteed income – government payments to concessionaire in cases where the level of actual revenue is lower than stipulated in the agreement. In this case, reduction of actual tariff and (or) volume of transportation in relation to those established in the contract is condition for the payment of MGI. Thus, the state guarantees private party a certain level of load or income, thereby reducing the risk of traffic and increasing investment attractiveness of the project. One of the important factors in the model are tariffs for transportation of raw materials, determined by concessionaire taking into account cost and level of profitability and established by the Federal Antimonopoly Service.

In the absence of commercial results from operation of CA object, concessor pays an availability fee, which includes compensation for the costs of creating and operating facility, as well as providing a certain level of profitability and covering costs of servicing attracted financing.

The proposed concession model should also include technical and economic indicators necessary for efficient organization of product transportation:

• gross volume of transportation of raw materials – the total volume of cargo transported on specified railway line, it includes volume of the cargo base of the main consignor and other enterprises using railway line for transportation of raw materials;

• railway line capacity – the largest number of trains or a pair of trains of established mass that can be skipped per unit per day;

• carrying capacity of the railway line is the largest amount of cargo flow that can be mastered by line during the year;

• weight of trains – weight of cargo and wagons themselves, established for a given railway line according to the current train schedule, as well as type and propulsive effort, limiting grade, speed, etc.

Technical, economic and cost parameters of CA for construction of the railway in conjunction with development of mineral resource base are formed with account for joint implementation of construction projects of mining and processing complex and railway. Accordingly, indicators of economic efficiency of field development will change when input parameters in CA model change. For example, traditional macroeconomic (inflation, tax system, Central Bank of Russia (CBR) key rate, conditions for attracting credit resources), industrial (competition, sales volumes, prices, sales directions and others), mining and technical (mining and geological conditions, quality characteristics, technology, etc.) parameters determine effectiveness of implementation of a comprehensive mining project taking into account CA parameters.

In implementation of complex mining projects, including projects for construction of transport infrastructure for large industrial enterprises, especially in underdeveloped regions, the rationale for assessing their economic efficiency should be carried out according to a special method. The main difficulty is assessing the effectiveness of infrastructure project in conjunction with construction of

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mining and processing complex. The absence of such a technique does not allow to reliably determine the parameters of compensation for investment expenses or investor's lost income by the state.

Conclusion. As a result of analysis of railway concession projects, the main problems arising during their implementation were identified. They include discrepancy between actual indicators of the project specified in the agreement, financial problems, lack of a clear risk sharing scheme between the parties, problems with stakeholders.

A concession model was proposed for construction of a railway line for carriage of goods from a mining and processing enterprise located on underdeveloped territory, as part of an integrated mining project with the condition that other carriers use it to transport raw materials from deposits.

Developed CA model reflects the scheme of interaction between the state and private business with concession regulator, partners and other stakeholders of the project (contractors, suppliers, carriers, public organizations, etc.).

The model includes technical, economic parameters and financial conditions of the project (MGI, capital grant, excess profit, etc.).

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