The Economic Significance of the Implementation of a Large Resource Project in the Russian Far East. Multiplicative Effect

Yuliya A. Arkhipova*
Mining Institute of Far Eastern Branch of Russian Academy of Sciences
Khabarovsk, Russian Federation

Abstract. The article is devoted to the issues of assessing the social effectiveness of a large-scale investment project taking into account the multiplicative effect in the economy arising from intersectoral relations. Practice shows that currently the evaluation of the effectiveness of investment projects is carried out from the point of view of commercial and budgetary efficiency, which reflect the consequences of the project implementation only for the investor and the state budget and do not take into account public efficiency. The lack of a generally accepted mechanism for assessing the social effectiveness of a project from the standpoint of society and the national economy predetermines the relevance of the topic. The scientific novelty of the research consists in the development of the author's methodological approach to assessing the multiplicative impact of a large investment project of vertically integrated production (obtaining products with a high degree of processing) on the development of the region. The methodological approach is based on new principles: classifications of projects and effects, methods for assessing decision making, allows to substantiate the priority of projects, directions and organizational and economic regulators that increase the efficiency of regional development, taking into account the multiplier assessment of social efficiency.

The developed methodology takes into account: 1) technological intersectoral relationships that arise between enterprises during the implementation of the project; 2) the relationships that determine the transformation of costs or outflows of funds during the implementation of the project into the income of other participants in the economic system and the emergence of the effect of increasing final demand in the regional economy. The results provide an assessment of the scale of projects implementation from the perspective of society and the national economy, and also indicate the need to take into account the associated effect when evaluating large investment projects.

Keywords: mineral and raw material potential, mining industry, metallurgical complex, multiplicative effect, effectiveness.

* Corresponding author E-mail address: yuliya_arhipovas@mail.ru
ORCID: 0000-0002-9297-6056

Экономическая значимость реализации крупного ресурсного проекта на Дальнем Востоке России. Мультипликативный эффект

Ю.А. Архипова
Институт горного дела ДВО РАН
Российская Федерация, Хабаровск

Аннотация. Статья посвящена вопросам оценки социальной эффективности масштабного инвестиционного проекта с учетом мультипликативного эффекта в экономике, возникающего за счет межотраслевых отношений. Практика показывает, что в настоящее время оценка эффективности инвестиционных проектов осуществляется с точки зрения коммерческой и бюджетной эффективности, которые отражают последствия реализации проекта только для инвестора и государственного бюджета и не учитывают общественную эффективность. Отсутствие общепринятого механизма оценки социальной эффективности проекта с точки зрения общества и экономики страны предопределяет актуальность темы.

Научная новизна исследования заключается в разработке авторского методологического подхода к оценке мультипликативного воздействия от реализации крупного инвестиционного проекта вертикально интегрированного производства (получение продукции с высокой степенью переработки) на развитие региона. Методологический подход базируется на новых принципах: классификации проектов и эффектов, методов оценки принятия решений, что позволяет обосновать приоритетность проектов, направлений и организационно-экономических регуляторов, повышающих эффективность регионального развития, с учетом мультипликативной оценки.

Разработанная методика учитывает: 1) технологические межотраслевые связи, возникающие между предприятиями при реализации проекта; 2) отношения, определяющие превращение затрат или оттока средств при реализации проекта в доходы других участников экономической системы и возникновение эффекта увеличения конечного спроса в региональной экономике. Результаты дают оценку масштабов реализации проектов с позиций общества и народного хозяйства, а также указывают на необходимость учета попутного эффекта при оценке крупных инвестиционных проектов.

1. Introduction

One of the key areas of optimization of the state investment policy of the Russian Federation and the rational use of budgetary investments is the interaction between the state and business, which is called public-private partnership. However, the active development of the partnership is hindered by a number of unresolved problems. Among the most important is the absence of a standard generally accepted mechanism for quantifying projects, taking into account their effectiveness not only for the investor and the state, but also for society, which generally determines the relevance of the study.

When implementing investment projects, it is important to take into account not only direct economic effects, but also many indirect ones. It is necessary to consider the complex impact of the project being implemented on a range of indicators: gross domestic product (GDP / GRP), investment activity in the country (region), filling the state budget, employment, creation of new jobs, etc. Indirect effects arise due to the involvement of related industries, suppliers, contractors, service and transport companies in the project. Their participation will stimulate the emergence of additional macroeconomic ties, production chains and positive effects. The combination of direct and indirect effects will allow us to assess the full growth of macroeconomic indicators.

The main purpose of the article is to substantiate the position that the assessment of a socially significant investment project should be carried out taking into account: 1) the structural features of the regional system, 2) direct and indirect multiplicative economic effects that arise in the process of its implementation. The article presents the author's methodological approach to assessing the multiplicative impact of a large investment project of a vertically integrated mining and metallurgical complex, which provides for obtaining products of a high degree of redistribution along the value chain at each stage of its implementation, and assesses its impact on the development of regions and the country as a whole. Matrix multipliers are calculated to simulate the multiplicative economic effects resulting from different types of exogenous economic factors.

The Far Eastern Federal District (FEFD) of the Russian Federation (RF) has the richest mineral resources Fig. 1.

However, the FEFD is characterized by the unsatisfactory state of the productive forces of the mining industry of the region, as well as transport and energy infrastructure. These are significant factors of a considerable backlog of the FEFD in socio-economic development in comparison with other Russian regions, leading to an increase in the outflow of the population and the emergence of other systemic problems. The presence of large reserves of oil, coal, non-ferrous and rare earth metals, as well as the geographical proximity of the Russian Far East to the rapidly devel-

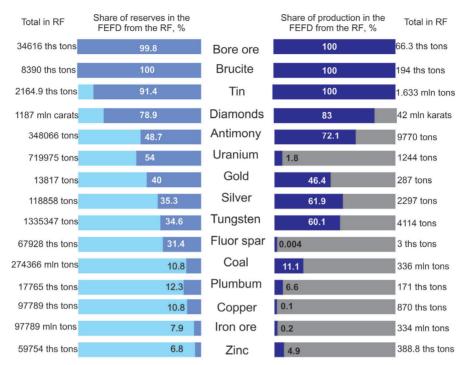| Total in RF	Share of reserves in the FEFD from the RF, %		Share of production in the FEFD from the RF, %	Total in RF
34616 ths tons	99.8	Bore ore	100	66.3 ths tons
8390 ths tons	100	Brucite	100	194 ths tons
2164.9 ths tons	91.4	Tin	100	1.633 mln tons
1187 mln carats	78.9	Diamonds	83	42 mln karats
348066 tons	48.7	Antimony	72.1	9770 tons
719975 tons	54	Uranium	1.8	1244 tons
13817 tons	40	Gold	46.4	287 tons
118858 tons	35.3	Silver	61.9	2297 tons
1335347 tons	34.6	Tungsten	60.1	4114 tons
67928 ths tons	31.4	Fluor spar	0.004	3 ths tons
274366 mln tons	10.8	Coal	11.1	336 mln tons
17765 ths tons	12.3	Plumbum	6.6	171 ths tons
97789 ths tons	10.8	Copper	0.1	870 ths tons
97789 mln tons	7.9	Iron ore	0.2	334 mln tons
59754 ths tons	6.8	Zinc	4.9	388.8 ths tons

Fig. 1. The state of the mineral resource base of the main solid minerals of the FEFD (2017).
Source: compiled by the author according to:
https://dvfo.rosnedra.gov.ru/page/425.html?mm=674&ml=666

oping countries of the Asia-Pacific region, including China, suggest that the further development of FEFD will be associated with the strengthening and intensification of its economic relations with these countries. However, it cannot be ruled out that the natural wealth of the Far East of the Russian Federation can become the main material, resource and financial base for the development of various sectors of its industry while reorienting the region's economy to the industrial path of development (Lomakina N., 2020).

2. Literature review
2.1. Natural resource wealth and economic growth

In recent years, various views have been formed on the influence of natural wealth, including mineral resources, on the economic development of countries. The most widely held view is that there is a negative relationship between the wealth of natural resources and the economic well-being of a country. Econometric studies supporting this thesis were first performed by J. D. Sachs and A. M. Warner in 1995 in the work "Wealth of Natural Resources and Economic Growth" (Sachs, 1995). So, the availability of rich natural resources is more a deterrent of country's economic growth than a growth factor. These conclusions contributed to the formation of the opinion that the economies of developing countries are adapted only for the development of natural resources, while the economies of developed countries are focused on high-tech sectors of the national economy. The term "the natural resource curse" even appeared in foreign economic literature (Bult, 2003).

Analysis of literature sources shows that countries with few natural resources have a higher rate of economic growth per capita than countries with rich resources (Yilanci, 2021, Rahim, 2021, ZhiQiang, 2021, Dell'Anno, 2020). The rate of economic growth per capita in countries more generously endowed with nature is 4.5 times lower than in countries with less rich natural resources. At the same time, countries with rich mineral resources have a

negative indicator of economic growth per capita (–0.2 %).

There are different points of view on the emergence of this logical contradiction between the richness of natural resources and economic growth. So, E. Bult, R. Damania and R. Deacon explain this by the following models: the model of the "Dutch disease" and the model of the rent economy and from the standpoint of institutionalism. T. Gylfason, in addition to models of the "Dutch disease" and the impact of economic rent, adds factors such as education, economic policy, etc. (Gylfason, 2001). But not all available data support the hypothesis of the negative impact of natural resources on economic development and they argue that natural resources also lead to increased incomes, which increases well-being.

2.2. Evaluation of the effectiveness of investment projects

The methodological foundations of evaluating the effectiveness of investment projects have been thoroughly and well studied. Most of the methods are based on the analysis of the cash flows of a particular project, which are presented to date using the discounting procedure (DCF). The main position of this approach was formulated by I. Fisher "… the value of an asset is equal to the future cash receipts from it, reduced to the present value based on the appropriate discount rate". Later this method became actively used. In 1938 J. Williams applied the DCF method to assess the value of financial assets (Williams, 1938). Further, G. Markowitz and W. Sharp, using this method, developed a methodology for making investment decisions. As a result, a fairly complete system of principles for assessing the effectiveness of investment projects was formed, which extends to the commercial and public sectors (Birman, 1997).

In the scientific literature, a number of approaches to evaluating projects in the public sector have been formed, most of which have been applied in practice. Among the main ones are the approaches based on the comparison of costs and benefits (cost-benefit analysis – CBA), the method of costs and effectiveness (cost-effectiveness analysis – CEA). In recent years, the cost-utility analysis (CUA) method has become widespread. The greatest difficulty in assessing the effectiveness of investment projects is the analysis of external and indirect effects. This makes it necessary to identify and measure them. When implementing the project, there are many indirect effects: benefits (use of products and creation of opportunities for the use of factors of production) and costs (when ensuring the supply of products and the use of resources).

2.3. About Multiplicative Effects

The term "multiplier" was first introduced in 1931 by the English economist Kahn R.F. (Kahn, 1931). He demonstrated that government spending on organizing public works not only leads to the creation of jobs, but also stimulates an increase in consumer demand, thereby contributing to the growth of production and employment in the economy as a whole. Later, JM Keynes formulated the theory of multiplier effects in the economy, highlighting, in addition to the employment multiplier, the income and investment multiplier (Keynes, 1935). In turn, the influence exerted on the economy as a result of the work of the multiplier is called the multiplier effect. The most common classification of multipliers is the form of presentation – scalar or matrix.

In accordance with the works of the founder of the theory of the multiplier J. M. Keynes, the practical calculation of multiplicative effects is carried out in a scalar form, i.e. according to a single formula for the whole economy:

$$M = \frac{1}{1 - MPS} \tag{1}$$

where M is multiplier coefficient; MPS is the ultimate propensity for consumption.

The value of the multiplier (M) is greater, the more economic agents spend from the newly obtained funds. The proportion, or part of the increase (reduction), of the income that is consumed is called the marginal propensity to consume (MPS).

An alternative to the scalar multiplier is the matrix multiplier, which, in turn, is subdivided into the multiplier of the input-output balance and financial flows (social accounts).

The matrix approach makes it possible to study multiplier effects in a sectoral context based on gross product indicators. The most common tool for assessing the matrix multiplier is the input-output balance (input-output tables), developed by V. Leontiev (Leontiev, 2006).

3. Methods

3.1. Methodology for assessing
the social effectiveness
of a large investment project

The methodology for assessing the effectiveness of socially significant investment projects generally coincides with the methodology for assessing financial efficiency, only tax revenues are included in the composition of incoming cash flows, and investments are included in the composition of outgoing ones. In addition, the incoming budget flow includes direct and multiplier tax revenues. Straight lines are understood as incomes received directly from the activities of the enterprise that produces the goods that the project is aimed at. The multiplier tax effect consists of two components – the effect at the stage of implementation (construction) and at the stage of operation.

The net present value (NPV) of a project is defined as the current difference between budget expenditures (in the form of investments, subsidies and other expenses) and income in the form of taxes and profits. But unlike the common approach, tax revenues, in addition to direct (directly related to the implementation of the project, calculated in a standard way on the basis of the project business plan and forecasted financial indicators), include indirect tax revenues. Thus, the NPV of the project is determined by the following formula:

$$NPV = \sum_{m-1}^{m}(-Cost_m + Rev_m Tax_{direct} + \\ + Tax_{indirect}) * \alpha_m \qquad (2)$$

where $Cost_m$ is the budgetary costs of the project at step m; Rev_m – income at step m; Tax_{direct} – direct tax revenue from the project; $Tax_{indirect}$ – indirect tax revenues resulting from the intensification of economic activity in the

territory in related industries and the consumer market; α_m – discount factor.

Indirect tax revenues (ITR) are derived from the following sources:

– ITR at the investment stage at step m (t_{Im});

– ITR from operating costs at the first stage of production at step m (t_{1m});

– ITR from operating costs at the next stage (n) of production at step m (t_{tm}).

The following formula is used to calculate indirect tax revenue:

$$Tax_{indirect} = t_{Im} + t_{1m} + t_{nm} \qquad (3)$$

Thus, formula (3) can be represented as follows:

$$NPV = \sum_{m-1}^{m}(-Cost_m + Rev_m Tax_{direct} + \\ + (t_{Im} + t_{1m} + t_{nm})) * \alpha_m \qquad (4)$$

3.2. Methodology for assessing
the macroeconomic effect
from the implementation
of a large investment project

The macroeconomic effect of the investment project is due to the involvement in the sphere of investment activities of related sectors of the economy, which provide the project's need for resources, personnel, investments, infrastructure. The implementation of the project stimulates the business activity of Russian companies (suppliers, contractors, service organizations). There is an additional demand for products and services. Additional tax revenues are provided to the state budget. The revenues that workers, companies and the budget receive directly from the implementation of the project initiate new additional consumption cycles, which in turn ensures subsequent real economic growth through a system of intra-and inter-industry relations. Increasing consumption stimulates growth and expansion of production, increasing the number and improving the quality of services provided, and expanding output creates a load of existing production capacities. The new production generates the new jobs necessary to ensure the

work of the increased production. As a result, a sustainable macroeconomic process emerges, giving rise to new and new economic activity of its participants.

The analysis of intersectoral relations and structural proportions in the economy is carried out on the basis of a symmetrical table "Costs – Output," representing the intersectoral balance of production and distribution of goods and services. The input-output balance establishes production links of the "product – product" or "industry – industry" type and is used to carry out forecast and scenario calculations of economic development based on the coefficients of direct and total costs (Leontiev, 2006). The study will use the basic tables "Costs – Output" for 2016 year (official website of the Russian Statistics[1]).

4. Study Object Selection, Investment Project Description

Since the development of resources in the regions of the Far Eastern Federal District is the main prerogative, it is necessary to maxi-

mize the use of the rich mineral and raw material potential of the territories, which will lead to their socio-economic stability. However, the main problems are the infrastructure provision of resource projects and the high costs of their implementation due to the remoteness and harsh climatic conditions. An iron ore base has been created in the Russian Far East, which is capable of meeting the demand for iron ore raw materials for a long time with a full-fledged ferrous metallurgy. It is possible to produce high quality concentrates (Arkhipova, 2020, 2014).

Proposed project provides construction of a metallurgical complex with two modules (with coke-blast furnace technology and direct extraction of iron) on the basis of Kimkano-Sutarsky and Garinsky mining and processing plants, with the term of its further work for 50 years as part of a single enterprise.

At this stage, an idea is formed of the most effective solution to the problem of steel in the region within the framework of vertically integrated mining and metallurgical production (Fig. 2). Initial data for calculating the economic efficiency of the project are shown in Table 1.
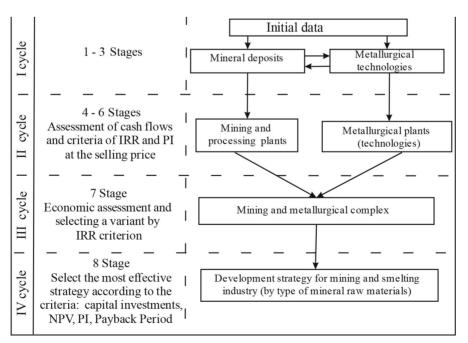
[1]   Basic input-output tables for 2016

Fig. 2. Scheme of formation and selection of the optimal integrated mining and metallurgical production at the conceptual stage. Made by the author

Table 1. Initial data for calculating the effectiveness of a publicly significant investment project

General characteristics of the object	Options
Construction dates	Construction of metallurgical module for direct reduction of iron – 2 years (capacity of 2 mln tons of metal per year); construction of metallurgical module on coke-blast technology – 4 years (capacity of 4 mln tons of metal per year).
Production cycle	1) Raw ore – 2) marketable ore or concentrate – 3) metal – 4) metallurgical products
Commercial discount rate	5 %
Environmental factor	Up to 15 % of total capital expenditures are provided for the purchase of environmental protection equipment, fines and compensations, etc.
Investment calculation (billion $)	
Creation of a concentrating plant, stage 1 (Garinskoe deposits)	0.784
Creation of a concentrating plant, stage 2 (Kimkanskoe, Sutarskoe deposits)	1.3
Construction of a full-cycle metallurgical plant with oxygen-converter metal production	1.43
Construction of modules of a metallurgical plant based on direct reduction of iron	0.91
Rolling equipment	1.288
Administrative expenses	0.003
Design, construction, purchase of equipment	0.0117
Total	5.727
Reserve, 10 %	0.572
Total	6.299
Contingencies 10 %	0.6299
Total investment costs:	6.929
including infrastructure costs	1.585

5. Algorithm of the study and obtained results

The author considers the mining and metallurgical complex, which is based on prospecting, exploration, mining, transportation and processing of ore, and the next operational stage of the project – the production of metal and metal products. The added value will be counted only for the final production process, as the previous steps will be intermediate and consumed in the production chain. The industry "Metallurgical production" is characterized by the creation of added value, so the implementation of the project is directly related to the growth of gross domestic product of the region.

Assessment of the social effectiveness of the project involves taking into account all the direct and indirect effects, the sum of which represents the full socio-economic effect. The ratio of the full effect to the direct effect allows you to calculate the multiplier. Which shows the size of the unit of effect, formed directly during the project, creates an effect in the national economy (taking into account the effects in the related industries).

As part of the assessment of public effectiveness, the author is invited to quantify the

multiplier in the classic view, as well as multipliers for each of the considered indicators of public efficiency (ratio of total increase to direct). In this context, the multiplier will reflect the magnitude of the indirect effects of indicators of macroeconomic effect. Magnitude – per unit of explicit (direct) effect arising directly from the implementation of the project. The calculated multiplier value will also make it possible to assess the scale of macroeconomic consequences of the project implementation, which remain outside the evaluation framework, in case of refusal to conduct an assessment of public effectiveness.

The income that budgets receive in the form of tax revenues, employee wages, and profits creates new cycles of consumption or investment. The aggregate of the effects forms the indirect macroeconomic effects of the project.

Based on the model developed by the author a quantitative analysis of indicators of the integral effect of the project. The project is characterized by high capital investments, involvement in the project production of a large number of labor and material resources. Calculations were made in 2019 prices for three options: 1) without incentives (all investment costs are covered by the investor); 2) tax benefits from the state are envisaged; 3) without privileges, but the creation of infrastructure (construction of a railway within the region, construction of electric power lines) at the expense of public funds (Table 2).

Calculations have shown that all three options are cost effective. Considering from the position of both the investor and the state, the third option is the most acceptable, which we take as the main one for calculating the multiplier effect. Thus, spending $ 1,589 billion

Table 2. Main economic indicators for the implementation of the project to create a vertically integrated mining and metallurgical complex

Indicator	Units	Variants		
		1	2	3
Annual volume of smelted metal	million tons	6	6	6
Price of 1 ton of metal	$/ tons	580	580	580
Work-out period	years	50	50	50
Revenues from sales, total	billion $	174	174	174
Annual sales revenue	billion $	3.48	3.48	3.48
Total investment:	billion $	6.92	6.92	5.34
including infrastructure costs	billion $	1.59	1.59	-
Net profit	billion $	79.5	83.61	90.96
Number of jobs created	persons	3047	3047	3047
Taxes, total:	billion $	33.9	29.79	35.95
incl. payments for environmental restoration	billion $	0.375	0.375	0.375
payment for the right to use mineral resources	billion $	1.74	1.58	1.74
mining tax	billion $	8.35	7.35	8.35
property tax	billion $	3.56	2.58	2.74
income tax	billion $	19.88	17.91	22.74
Net present value (NPV) at a rate of 5 %	billion $	23.13	26.45	28.68
Internal Rate of Return (IRR)	%	13	13.81	13.91
Profitability Index (PI)	units	4.34	4.82	6.38
Payback period	years	5	4	4

* Source: calculated by the author

of budgetary funds on infrastructure creation, the state will receive $ 35.95 billion in tax revenues for the entire period of the project. At the same time, at present, the state already partially finances such projects as the development of the Garinsky iron ore deposit and the construction of a mining and processing plant. In relation to the calculations performed, this is 25 % of the required investments for the creation of a full-scale ferrous metallurgy in the region with the receipt of products of a high degree of processing.

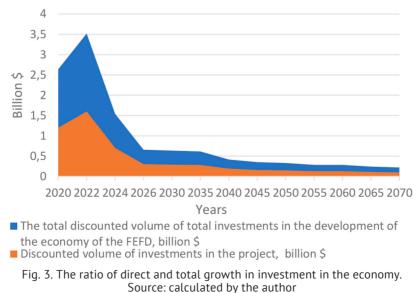Let us dwell on the step-by-step calculation procedure.

1 step. It is necessary to evaluate the increase in GRP generated by the direct participants of the project, suppliers, contractors, consumers of products, taking into account the added value created by counterparties. The resulting estimates are discounted. Then direct and indirect growth of GRP are calculated and on their basis full growth of GRP is calculated as the sum of direct and indirect growth. *The total increase in GRP of the region from the project amounted to 193.2 billion dollars.*

2 step. Evaluation of additional investments of project participants and contractors. The calculation is made taking into account the accumulation of fixed capital by sectors of the economy involved in the project. The increase

in investment of the participants is estimated on the basis of available project data. To calculate the investment of the project counterparties, the data of the inter-branch balance of gross capital formation are used, on the basis of which the annual growth of investment of suppliers and the total amount of investment in the development of production of the project consumers are calculated. The resulting estimates are discounted. The direct, indirect, and total incremental investments are calculated based on the results of the evaluation. *The total increase of investment in the economy is estimated at $ 8.4 billion.*

In order to visualize the part of investment, which is formed in the associated sectors of the economy due to the implementation of the project, a graph of the ratio of direct and total growth of investment in the economy (Fig. 3).

3 step. Estimation of income and tax deductions taking into account the multiplier effect. State revenues mean tax and other receipts of funds to the budgets of all levels, as well as contributions to regional development funds and contributions to off-budget funds.

Direct government revenues for assessing social efficiency are calculated on the basis of project documentation. The estimate of the indirect increase in taxes is calculated based on

Fig. 3. The ratio of direct and total growth in investment in the economy.
Source: calculated by the author

the share of taxes in the output of goods and the earlier estimate of the indirect increase in output. The total state income from the project is assumed to be equal to the increase in all taxes and other payments to the budget and extra-budgetary funds. Which arise from all types of economic activity caused by the project. *The total increase of taxes for the project amounted to $ 35.95 billion.*

4 step. The values of various multipliers (M) are estimated. We define them as the ratio of the total increase to the direct one according to the formula:

$$M = \frac{FULL\ growth}{DIRECT\ growth} \qquad (6)$$

Thus, making calculations, we obtain the following values of multipliers: for GRP – 3.8; for investment – 2.2; for taxes – 1.3 (Table 3).

We interpret the obtained data:

- 2.4 additional GRP units will be created per GRP unit of the region created by the project due to initiation of economic activity in related industries;

– an additional 1.2 investment units per investment unit of the project in related industries;

– per unit of tax deductions of the project – another 0.3 units of tax deductions to budgets at the expense of related sectors of the economy.

The insignificant value of the tax multiplier, according to the author, is explained by the fact that the full increase in taxes from the implementation of the project is formed mainly due to direct growth. Which is formed from significant tax deductions from mining and processing companies. The share of indirect growth in the total increase in taxes for the project, formed by related industries, is objectively much lower.

Multiplier expressing the ratio of GRP to investment. This is an integral indicator of macroeconomic assessment, reflecting the contribution of a specific project to the creation of GRP, as well as the effectiveness of investments in the project from the perspective of the national economy. This multiplier is actually an indicator of potential damage to the national economy in case of refusal to implement the project. In other words, the refusal to implement this project is tantamount to the state's loss of $ 1.6 GRP for every dollar of investment not invested in the mining and metallurgical complex.

As part of the integrated assessment of the social effectiveness of the project, it is important to create new jobs in the country's economy. *The direct growth of which is estimated at 8.5 thousand jobs.*

Estimating the ratio of the total increase in the number of jobs per project to the direct one, we find the value of the corresponding employment multiplier. Its value is 2.8. In other words,

Table 3. Indicators of social effectiveness of the project to create a vertically integrated mining and metallurgical complex

№	Indicator name	Result
1	Design capacity (metal production)	6 million tons / year
2	Investment in the project	$ 5335 million
3	The value of the average annual increase in GRP for the period of the project	GRP growth 6.6 % per year
4	GRP multiplier	3.8
5	Investment multiplier	2.2
6	Tax multiplier	1.3
7	Multiplier (GRP growth / investment)	MULT (GRP / Investment = 1.6)
8	Employment multiplier	2.8

* Source: calculated by the author

the essence of the manifestation of the multiplicative effect of employment for the mining and metallurgical complex in the Far Eastern Federal District is the creation of two jobs in related industries per employee employed in the project.

The first practical steps have already been taken towards the implementation of the project to create a Far Eastern steel industry: the rights to develop the fields were obtained by Peter Hambro Mining (which later changed its name to Petropavlovsk, with a subsidiary of Aricom, then transformed into IRC with Hong Kong participation). Currently, the company is engaged in the training, attraction and preservation of a skilled labor force.

By adapting the model to specific assessment tasks, it is possible to calculate and analyze GDP growth, investments on the scale of the economy of the state, region, city or region; taxes to federal, regional or local budgets; employment at the level of the state or region of implementation of the project; social development at the federal, regional or local level, etc.

The carried out qualitative assessment of the socio-economic efficiency of the project testifies to a pronounced cross-sectoral nature of investments in infrastructure projects (Syahrir, R., 2020, Rasmussen, L.V., 2021), which involve in their sphere many related-sectors of the national economy, give an impetus to the development of remote regions, increase the level and quality of life of the population of the regions (Luo, Yu., 2021, Karasmanaki, E., 2020), and in some cases – are of a city-forming nature and serve as a locomotive for the development of regional economies.

6. Conclusion

The proposed approach complements the traditional model of assessing the effectiveness of investment projects in terms of quantitative and qualitative assessment of all the consequences of large-scale investment projects arising in the national economy. The obtained results of economic modeling of the potential multiplier effect of investments in the project make it possible to assess the scale of the project implementation from the position of society and the regional economy, and also indicate the need to take into account the associated effect when evaluating large investment projects. Application of the described approach contributes to the creation of a set of economic instruments for more effective investment in projects and programs for the development of infrastructure and regional economies, as well as the development of proposals and recommendations for making rational investment decisions from the perspective of the investor, the state and society as a whole.

References

Arkhipova Yu. A. Organizing the production of pigmentedtitanium dioxide as part of the formation of the Far-East metallurgical cluster, *In Metallurgist*, 2014, 58 (1–2), 58–65. DOI: 10.1007/s11015–014–9868–4

Arkhipova Yu. A., Bardal A. B. The Minerals Potential of Far Eastern Region and Transport Limitations of Their Development, *In Geography and Natural Resource*, 2020, 41, 406–414. Available at: https://doi.org/10.1134/S 1875372841040125

Birman. G., Harold. S. *Ekonomicheskii analiz investitsionnykh proektov [Economic analysis of investment projects].* Moscow, Banki i Birzhi, 1997, 631 p.

Bult E. H., Damania R., Deacon R. Resource Abundance. Poverty and Development, 2003. Available at: https://www.researchgate.net/publication/46441520_Resource_Abundance_Poverty_and_Development

Dell'Anno R. Reconciling empirics on the political economy of the resource curse hypothesis. Evidence from long-run relationships between resource dependence, democracy and economic growth in Iran, *In Resources Policy,* 2020, 68, 101807. Available at: https://doi.org/10.1016/j.resourpol.2020.101807

Gylfason T. Natural resources, education, and economic development, *In European Economic Review*, 2001, 45, 847–859. Available at: https://notendur.hi.is/gylfason/_borders/pdf/eer2001.pdf

Investment portal of the Far Eastern Federal District, 2020. Available at: https://invest.minvr.ru/ru/projects/20 (accessed 03/20/2020).

Kahn R. F. The Relation of Home Invest to Unemployment, *In Economic Journal*, 1931, 41 (162), 173–198. Available at: https://www.jstor.org/stable/2223697?origin=crossref

Karasmanaki E., Ioannou K., Katsaounis K., Tsantopoulos G. The attitude of the local community towards investments in lignite before transitioning to the post-lignite era: The case of Western Macedonia, Greece, *In Resources Policy*, 2020, 68, 101781, available at: https://doi.org/10.1016/j.resourpol.2020.101781

Keynes J. M. The General Theory of Employment, Interest and Money. 1935. Available at: https://www.marxists.org/reference/subject/economics/keynes/general-theory/ (accessed 18/10/2020)

Leontiev V. V. *Obshcheekonomicheskie problemy mezhotraslevogo analiza [General economic input-output analysis of the problem].* Moscow: Economy, 2006, 407 p.

Lomakina N. V. Complex exploitation of the Far East mineral resources: effects "new model" of the macroregional development, *In E 3S Web of Conferences,* 2020, 192, 03006, available at: https://doi.org/10.1051/e3sconf/202019203006

Luo Yu., Salman M., Lu Z. Heterogeneous impacts of environmental regulations and foreign direct investment on green innovation across different regions in China, *In Science of the Total Environment,* 2021, 759, 143744 Available at: https://doi.org/10.1016/j.scitotenv.2020.143744

Rahim S., Murshed M., Umarbeyli S., Kirikkaleli D., Ahmad M., Tufail M., Wahab S. Do natural resources abundance and human capital development promote economic growth? A study on the resource curse hypothesis in Next Eleven countries, *In Resources, Environment and Sustainability,* 2021, 4, 100018, available at: https://doi.org/10.1016/j.resenv.2021.100018

Rasmussen L. V., Fold N., Olesen R. S., Shackleton S. Socio-economic outcomes of ecological infrastructure investments, *In Ecosystem Services*, 2021, 47, 101242, available at: https://doi.org/10.1016/j.ecoser.2020.101242

Sachs J. D., Warner A. M. Natural Resource Abundance and Economic Growth, 1995. available at: https://www.nber.org/papers/w5398

Syahrir R., Wall F., Diallo P. Socio-economic impacts and sustainability of mining, a case study of the historical tin mining in Singkep Island-Indonesia, *In The Extractive Industries and Society,* 2020, 7, 1525–1533, available at: https://doi.org/10.1016/j.exis.2020.07.023

Vigneau L. A micro-level perspective on the implementation of corporate social responsibility practices in multinational corporations, *In Journal of International Management*, 2020, 26, 100804. Available at: https://doi.org/10.1016/j.intman.2020.100804

Wiedmann T., Lenzen M., Turner K., Barrett J. Examining the global environmental impact of regional consumption activities – Part 2: Review of input-output models for the assessment of environmental impacts embodied in trade, *In Ecological Economics*, 2007, 61, 15–26. 10.1016/j.ecolecon.2006.12.003.

Williams J. B. *The Theory of Investment Value.* Harvard University Press, 1938, 613 p.

Yilanci V., Aslan M., Ozgur O. Disaggregated analysis of the curse of natural resources in most natural resource-abundant countries, *In Resources Policy*, 2021, 71, 102017 Available at: https://doi.org/10.1016/j.resourpol.2021.102017

ZhiQiang S., Wang Q. The asymmetric effect of natural resource abundance on economic growth and environmental pollution: Evidence from resource-rich economy, *In Resources Policy,* 2021, 72, 102085. Available at: https://doi.org/10.1016/j.resourpol.2021.102085