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Formation of a Model of Sustainable Development of the Pipe Industry

A.N. Kutieva^a, A.V. Glotko^b

^a Novosibirsk State University of Economics and Management, Novosibirsk, Russia;

^b Siberian State University of Railway Engineering, Novosibirsk, Russia

ABSTRACT

Relevance: the article analyzes an alternative view of the model of sustainable development of the pipe industry. A comparative description of the classical and author's models is given. The following **methods** were used in the work: analysis of reliable sources, up-to-date data, as well as calculations of an integrated model of sustainable development using the example of the Chelyabinsk Pipe Rolling Plant. The **scientific novelty** of the research consists in the fact that the author's model of sustainable development of the pipe industry is proposed, justified, and substantiated on the basis of the interaction of the main areas of sustainability (on the example of the Russian Federation and the European Union). **The results and conclusions** of the article can be useful for the scientific community and pipe industry enterprises in the development of strategic economic development programs.

Keywords: pipe industry; pipe products; sustainable development; economic growth; integrated model

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INTRODUCTION

Foundations of the classical model and an alternative model of development sustainability. The main decisions concerning the concept of sustainable development were adopted in 1992 at the Second International Conference of the United Nations in Rio de Janeiro. This concept implies equally economic growth, social development, as well as satisfaction of people's needs and implementation of environmental programmes to preserve the environment and resources [1].

Presidential Decree No. 236 of 04.02.1994 "On the State Strategy of the Russian Federation for Environmental Protection and Sustainable Development" approved the Basic Provisions of the State Strategy of the Russian Federation for Environmental Protection and Sustainable Development.¹

The essence of this principle for each country and individual regions is to build an economy that meets the needs and legitimate desires of people, but at the same time does not exceed the ecological limits of the planet.

"In order to create a sustainable economy, to increase its adaptive capacity to changing conditions, certain factors are important. The concept of sustainable development is based on three main principles [2]:

- Ensuring a balance between the economy and ecology, i.e., achieving a degree of development where people in production or other economic activities will stop destroying the environment;

- ensuring a balance between the economic and social spheres taken in the human dimension, which means maximising the use of resources in the interests of the population;

- solving the tasks related to development, not only in the interests of the present, but also of future generations" [3].

Thus, the concept is a harmonious combination of social, economic, and environmental spheres, the intersection of which gives sustainable development [4] (*Figure 1*).

We propose to modify this model by including a fourth sphere — world order (or world stability), which leads to either stable development or chaos, affecting the country's economy,

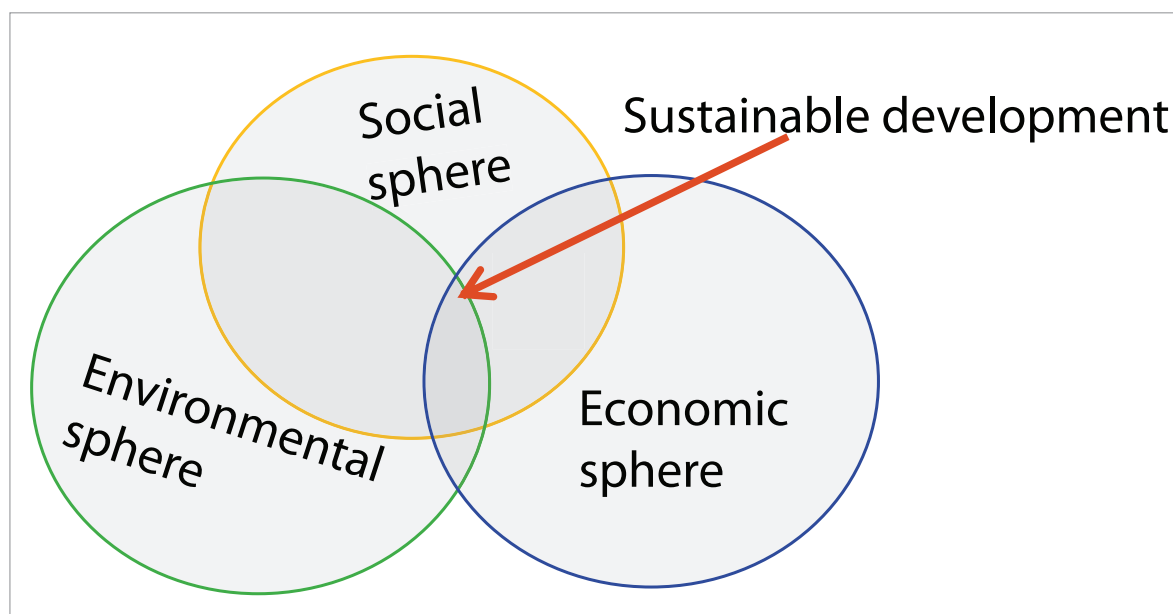


Fig. 1. Model of the concept of sustainable development

Source: compiled by the authors.

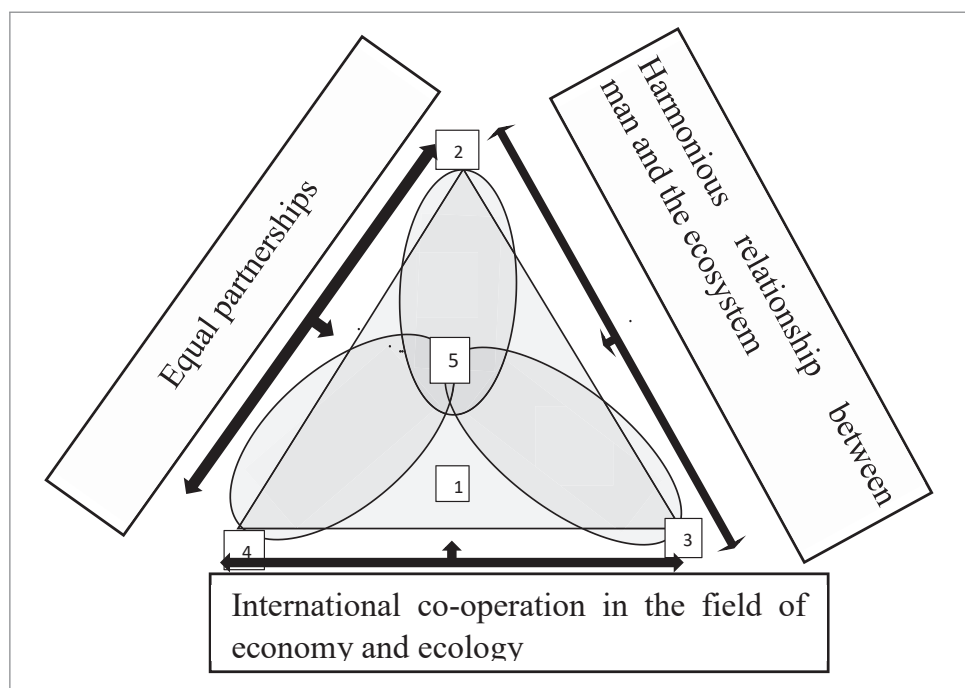


Fig. 2. Author's new model of sustainable development

Source: compiled by the authors.

Note: 1. Economic sphere. 2. Social sphere. 3. Environmental sphere. 4. World order; stability. 5. Sustainable development.

social development of society and the environment.

Figure 2 shows the author's model of sustainable development.

So, this model provides an opportunity to take a broader look at the underlying principles of sustainable development. The classical model included economic, social and environmental spheres. At the same time, the economic sphere was equated with the others and was considered as the optimal activity of creating raw materials, labour, financial, mental resources in order to optimize and effectively use them in technological processes for environmental safety and preservation of the ecosystem.

In the author's model, the economic sphere acts as a foundation — only with a stable and dynamic economy, the formation of social and environmental directions is possible. Equal angles of the triangle also indicate equal development of the economy in terms of economic (tax, banking) indicators of industry (metallurgy, machine-building, light industry, food industry, etc.).

The social sphere implies the creation of conditions for human life, health, work and leisure (pensions, benefits, housing programmes, support for large families, etc.).

Deterioration of the environmental situation is fraught with serious consequences for the country's economy as a whole. In a balanced development of all spheres, the environmental sphere is the most vulnerable, so it is important to preserve and increase natural resources.

Thus, the concept of sustainable development is closely linked to balanced economic growth and can help solve problems concerning the preservation of ecosystems and resources exploited to meet human needs.

As for the world order added by the authors to the sustainable development model, this is done because today all countries are linked by trade and financial relationships, and an imbalance in one affects the others, globally transforming the world's foundations.

Let us consider the interaction of the three spheres presented in Fig. 2:

1. World Order — Economic Sphere — Social Sphere. This combination implies equal partnership relations between countries in socio-cultural, political, economic, energy and financial aspects with observance of all norms, laws and requirements stipulated in international documents, decrees, resolutions, treaties, etc., without violating or infringing upon the legal rights of the parties and moral and ethical feelings of a person.

2. Social sphere — economic sphere — ecological sphere. This combination was presented in the classical model of sustainable development. It is applicable both to a single country and to the whole world, and is designed to ensure the harmonious coexistence of the ecosystem and human beings, as well as the economic development of the region. As already mentioned:

the richer the resources, the more dynamic the economy and the higher the well-being of the population.

3. Ecological sphere — economic sphere — world order. It is understood as global cooperation in the field of ecology (joint programmes and projects on environmental protection, environmental safety, environmental doctrines). For this purpose, various funds are created, membership fees are paid, i.e., each country contributes its share of financial payments. The economic sphere plays an important role here.

All these combinations can be implemented both together and separately. A change in one sphere affects the others.

Let us show how the sustainable development of the Russian Federation and the EU may look like (Fig. 3, 4).

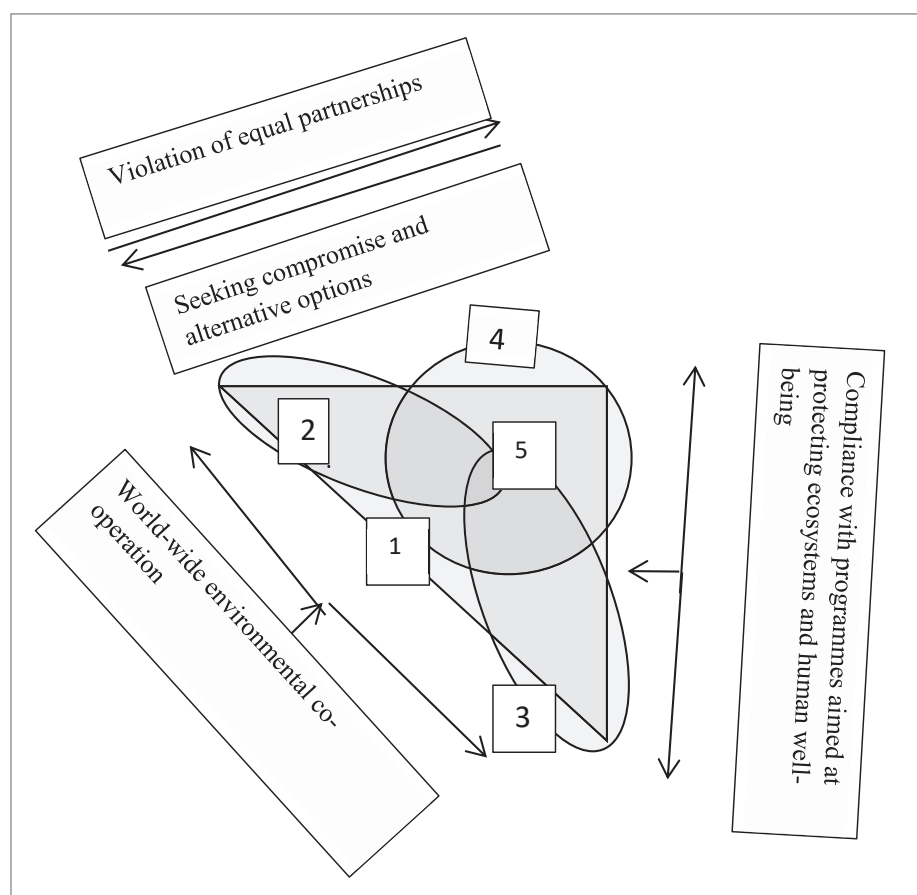


Fig. 3. Author's model of sustainable development of the Russian Federation

Source: compiled by the authors.

Note: 1. Economic sphere. 2. Social sphere. 3. Environmental sphere. 4. World order; stability. 5. Sustainable development.

Judging from *Fig. 3*, it can be noted that the imbalance is observed in relation to the world order, where external processes affect all spheres. The view of the model has changed, and the sharp corners indicate the acuteness of the problems of world stability and ecology (preservation or suspension of projects until the situation improves).

Overall sustainable development requires stability in the economic sphere as a foundation on which the social sphere holds. Let us consider this on a particular example. For example, the GDP of the Russian Federation for 2022 was \$ 2,240 billion with an annual growth rate of 4.9% (as of August 2023). The public debt for 2022 is 17.2%. At the same time, a number of draft bills were passed to support industry and private entrepreneurs, where the industrial production index for 2023 was planned at 5.4%.

At the same time, many programmes were envisaged to support the poor, large families, and young families, as well as employment and the development of private enterprise. As a result, according to state statistics, the unemployment rate in 2023 was only 3 per cent, but it would take considerable time to settle the world order sphere, as inflation at that time was 6 per cent.²

As for the environmental sphere, financing under the state programme “Environmental Protection” reached RUR 115.6 billion in 2021, RUR 125.9 billion in 2022, RUR 147.651 billion in 2023, and is expected (according to the plan) to reach RUR 112.364 billion in 2024. Within the framework of the national project “Ecology”, in 2022 the financing volumes amounted to

² URL: <https://take-profit.org/statistics/countries/russia/>; <https://www.gks.ru>

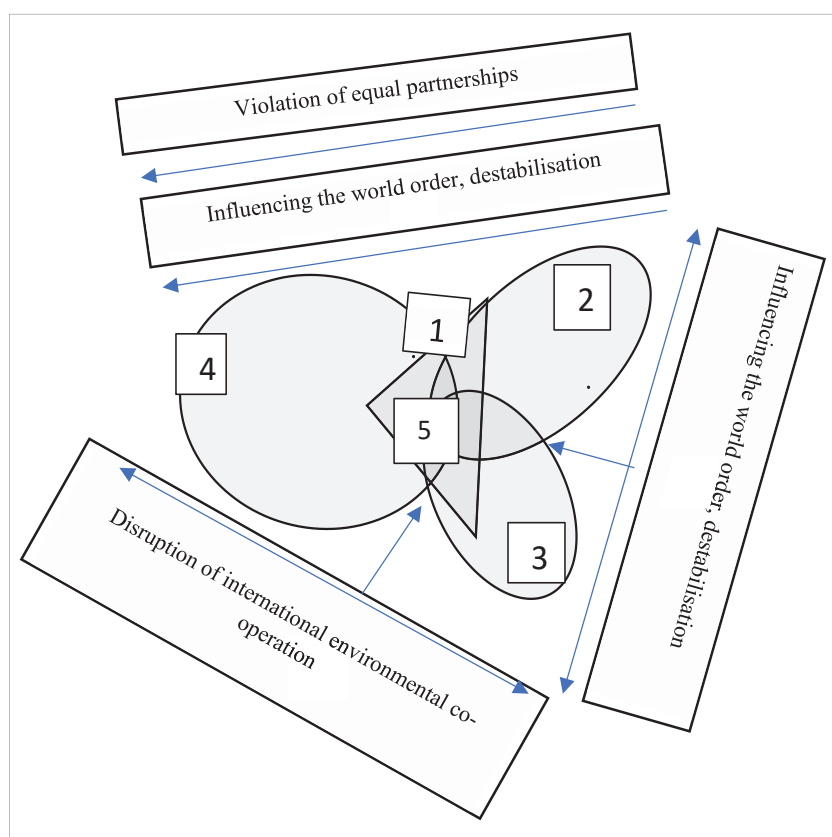


Fig. 4. The author's model of sustainable development of the EU

Source: compiled by the authors.

Note: 1. Economic sphere. 2. Social sphere. 3. Environmental sphere. 4. World order; stability. 5. Sustainable development.

RUR 115,561.3 million, in 2023 — RUR 125,225.3 million, and in 2024 the amount of RUR 99,544.7 million is planned (as planned).³

It is important to note that the combination “world order — economic sphere — social sphere” has been transformed: polarity has manifested itself, with one side — the EU — trying to disrupt equal partnership (by sanctions, restrictions of various kinds), which prevents equal relations in economic, political, financial, socio-cultural, sports and other aspects (Fig. 4).

This model of sustainable development of European countries is not balanced (sharp corners, “protrusion” of certain areas).

For example, in the social sphere there is a violation of the legal rights of the population: to work and receive a decent wage, to live in normal conditions, etc.

The environmental sphere has been left without financial support, and projects in it have been suspended.

But the most noticeable imbalance is observed in the foundation, i.e., in the economic sphere. Thus, the level of GDP in 2022 is down, compared to 2021: \$ 16,641 billion and \$ 17,177 billion respectively, and the annual growth rate in 2023 was only 0.4%. And the further this imbalance persists, the thinner is the foundation: in 2022, the public debt-to-GDP ratio was 85%, and the inflation rate rose by 5.9–6.5% in 2023. With a weak economic sphere, financial flows are actively channelled to maintain the world order, but instead of stabilisation, an imbalance on a global scale is created. In this case, the sphere of the world order resembles a huge balloon that can swallow all the others, destroying the economy. In 2023, the unemployment rate in the European Union was 5.9 per cent, with 14 per cent among young people; the industrial production rate was 2.4 per cent. In addition, there has been a strong reduction in funding for the Environmental Innovation Fund (from € 10 billion to € 1.5 billion), etc.⁴

³ URL: <https://take-profit.org/statistics/countries/russia/>

⁴ URL: <https://take-profit.org/statistics/countries/european-union/>

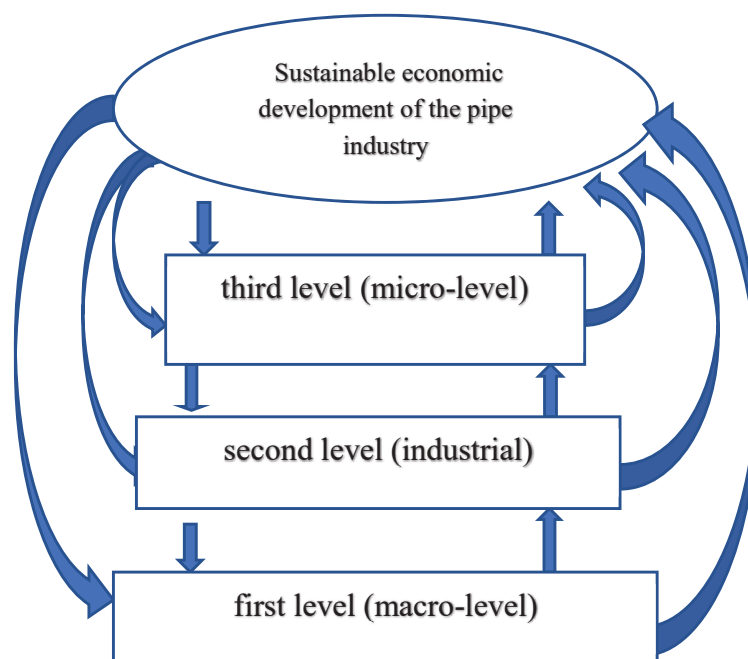


Fig. 5. Levels of sustainability of the pipe industry development

Source: compiled by the authors.

The combination “world order — economic sphere — social sphere” is transformed not towards mutual exchange and partnership relations, but towards destabilisation. This happens due to the violation of all international rights in the field of free trade, choice of partner, market prices, etc. and can lead to the collapse of the entire system of world order and the destruction of the economy of individual countries.

So, let us summarise the three models of sustainable development:

- Author’s model — an ideal and harmonious combination of all spheres (economic, social, environmental and world order), which provides

reliable and stable development of the country and the world as a whole.

- Author’s model (RF) — there is an imbalance in relation to the world order. The whole model has changed, but despite this, there is stability in the field of sustainable development, as the foundation is the economic sphere.

- Author’s model (EU) — sharply differs from the ideal model, with the appearance of sharp corners and the “bloated” sphere of the world order indicating that the economic sphere is weakening, destroying the economy, while the social sphere is also suffering, and the environmental sphere in general is in a deplorable condition.

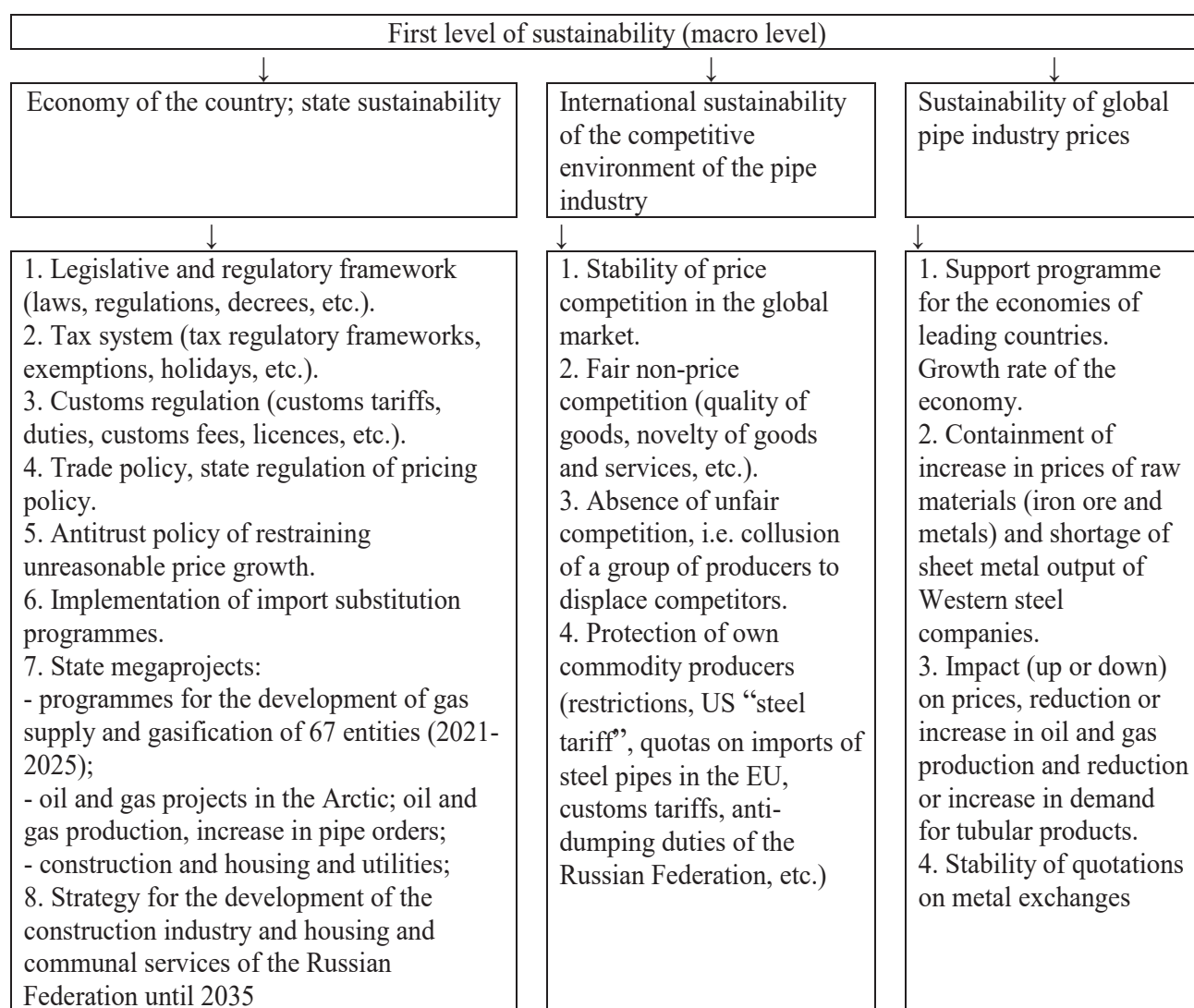


Fig. 6. The first level of sustainability (macro level)

Source: compiled by the authors.

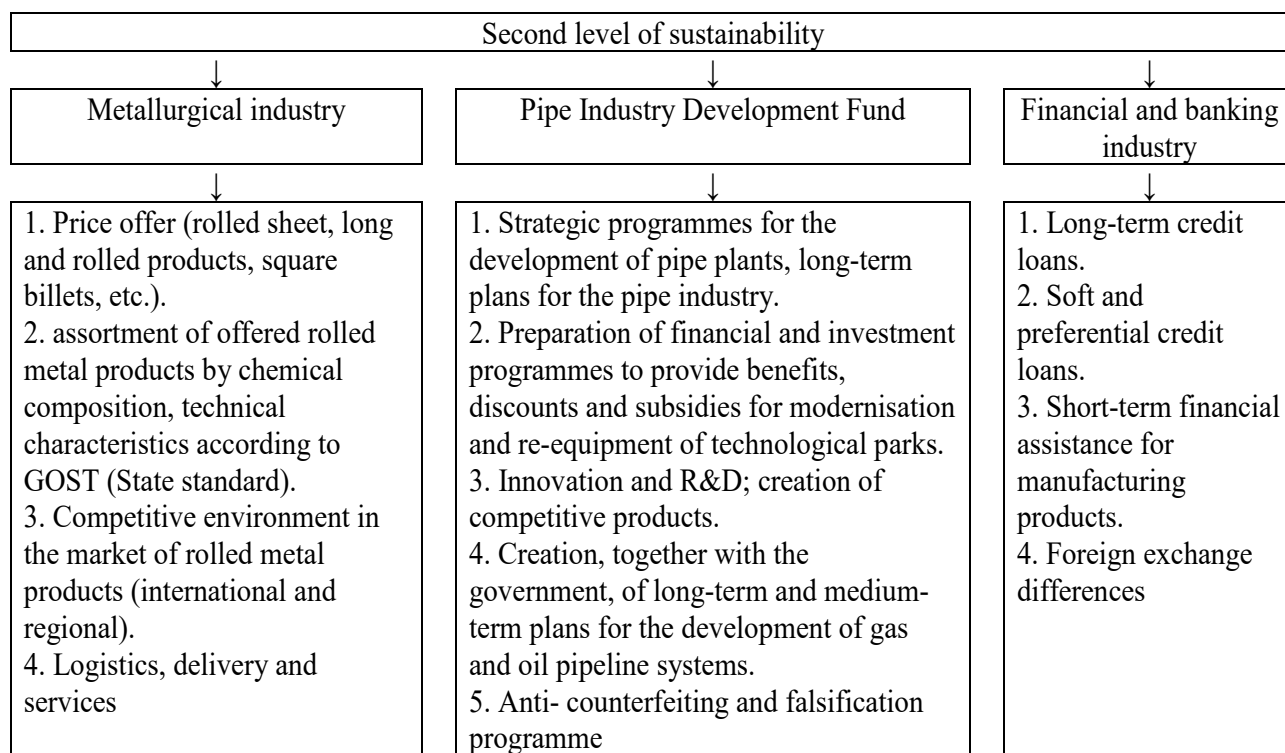


Fig. 7. The second level of sustainability (industry)

Source: compiled by the authors.

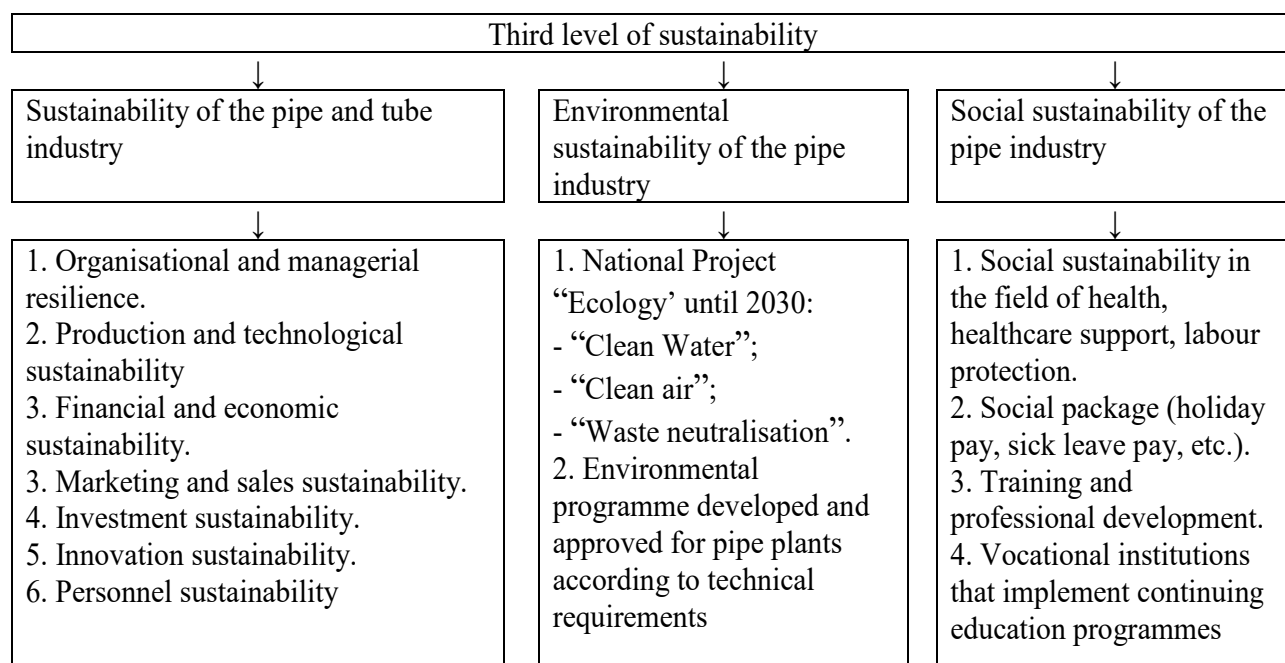


Fig. 8. The third level of sustainability (microlevel)

Source: compiled by the authors.

Thus, we can formulate the following definition: **Sustainable development** is the achievement of balance in the economic sphere by establishing harmonious relations in the social and environmental spheres, as well as in the world order to maximise benefits.

SUSTAINABLE DEVELOPMENT OF THE RUSSIAN PIPE INDUSTRY

Sustainable development of the pipe industry can be classified by levels: first (macro-level), second (industry), third (micro-level) [5–8] (Fig. 5).

Stability at all levels has a positive effect on the sustainable development of the economy as a whole (Fig. 6–8).

Judging from *Figures 6–8*, the ability of the enterprise to respond to changes in various factors contributes to the sustainability of its development and increase in profitability.

The activity of the enterprise is carried out in the conditions of constant struggle for the sales market, assortment renewal, etc. Therefore, it is important for the enterprise to react promptly to all changes, creating new strategic programmes, conducting constant analysis, and monitoring of the whole system.

Thus, sustainable development of the Russian pipe industry implies the interconnection of various processes that directly affect economic growth. Over time, it becomes more and more difficult to maintain sustainable development, which affects the efficiency of the company's operations.

DEFINITION OF AN INTEGRAL MODEL OF SUSTAINABILITY

On the example of Chelyabinsk Tube Rolling Plant, we will consider integral models of sustainability in the main spheres: economic, social, environmental and world order [9].

Economic sustainability

The tables show the calculated indicators of the specific weight of the integral level of financial, production and sales sustainability (*Tables 1–3*).

According to *Table 1*, the total value of the level of financial stability is 7.833. The weight coefficient of financial stability was determined experimentally — 63.83%.

As a result, the total value of the level of production stability is 6.7. Its weight coefficient is 74.62%, which indicates successful utilisation of production opportunities.

The total value of the level of sales stability is 5.89, the weight coefficient is 84.88%, i.e., strategic programmes to improve the sales policy of the enterprise have been developed correctly.

Sustainability of the world order

Next, we need to determine the indicators of the specific weight of the integral level of sustainability of foreign economic activity, financial independence and debt obligations (*Table 4*).

The total value of the level of foreign economic stability is 3.229, and the weight coefficient is 64.5%. That is, the foreign economic activity of the enterprise is stable, although in 2020–2021 there was a sharp decline in exports, especially to the EU and the U.S., but the new sales policy was able to reorient to the states of Asia, Africa and the CIS.

An important indicator of the stability of the world order is the level of financial independence (credit loans, subsidies, etc.) (*Table 5*).

The total value of the level of financial independence stability is 0.333, the weighting coefficient is 6.66%. This indicator is very low, i.e., dependence on external sources of financing is high. But starting from 2023 there is a decrease in dependence on external liabilities.

It is also important to determine the sustainability of debt burdens — debt liabilities excluding interest, taxes, and amortisation payments (*Table 6*).

The aggregate value of the level of debt sustainability is 1.68, the weighting coefficient is 33.6%, i.e., the enterprise covers its debt obligations.

Thus, the cumulative level of world order sustainability is: $3.229 + 0.333 + 1.68 = 5.242$, and the weighting coefficient is 95.3%. This indicates stability and smooth development in the field

Table 1

The share of the integral level of financial stability

Sustainability		Absolute indicators of sustainability, Coefficients	Indicator for 2021	Norms	Score value of the level, Vi	Specific weight of the integral level of sustainability, Yi
Economic sustainability	Financial sustainability	Manoeuvrability ratio	1.766	≥ 0.5	5	0.35
		Financial stability ratio	0.472	≥ 0.6–0.5	4	0.118
		Working capital ratio	–0.463	≥ 0.6	0	0
		Capitalisation ratio	14.735	≥ 1	2	7.365
Total value of financial stability level, Syi						7.833

Source: compiled by the authors on URL: www.chtpz.tmk-group.ru

Table 2

The specific weight of the integral level of production stability

Sustainability		Absolute indicators of sustainability, Coefficients	Indicator for 2021	Norms	Score value of level, Vi	Specific weight of integral sustainability level, Yi
Economic sustainability	Manufacturing sustainability	Profitability ratio	28.5	1–5% – low rate; 5–10% – medium rate; 20–30% – high rate	5	5.70
		Efficiency ratio /return on assets ratio	4.038	≥ 1	4	1
Total value of the level of production stability, Syi						6,7

Source: compiled by the authors on URL: www.chtpz.tmk-group.ru

Table 3

The share of the integral level of marketing sustainability

Sustainability		Absolute indicators of sustainability, Coefficients	Indicator for 2021	Norms	Score value of level, Vi	Specific weight of integral sustainability level, Yi
Economic sustainability	sales sustainability	Inventory turnover ratio	5.881	—	5	1.176
		Output volume ratio	0.51	≥ 1	4	0.12
		Market share by region,%	181.57–100%	100	5	–
		RUSSIAN FEDERATION	158.7 – 87	–	4	4.59
Total value of the level of sales stability, Syi						5.89

Source: compiled by the authors on URL: www.chtpz.tmk-group.ru

Table 4

The share of the integral level of foreign economic stability

Sustainability		Absolute indicators of sustainability, Coefficients	Indicator for 2021	Norms	Score value of level, Vi	Specific weight of integral sustainability level, Yi
Sustainability of the world order	sustainability of foreign economic activity	Export production ratio	0.125	–	3	0.041
		Currency earnings ratio	9.566	–	3	3.188
Total value of the level of external economic sustainability, Syi						3.229

Source: compiled by the authors.

Table 5

The proportion of the integral level of financial independence

Sustainability		Absolute indicators of sustainability, Coefficients	Indicator for 2021	Norms	Score value of level, Vi	Specific weight of integral sustainability level, Yi
Sustainability of the world order	sustainability of financial independence	Financial dependency ratio	0.936	≥0,6–0.7	3	0.312
		Autonomy ratio	0.063	≥0.5	3	0.021
Total value of the level of financial independence sustainability, <i>S_{yi}</i>						0.333

Source: compiled by the authors.

Table 6

The specific weight of the integral level of stability of debt loads

Sustainability		Absolute indicators of sustainability, Coefficients	Indicator for 2021	Norms	Score value of level, Vi	Specific weight of integral sustainability level, Yi
Sustainability of the world order	sustainability of debt burdens	Debt burden ratio	5.05	$\leq 3,0$	3	1.68
Total value of debt sustainability level, S_{yi}						1,68

Source: compiled by the authors.

Table 7

The specific weight of the integral level of social stability

Sustainability		Absolute indicators of sustainability, coefficients	Indicator for 2021	Score value of level, Vi	Specific weight of integral sustainability level, Yi
Social sustainability	Sustainability of material support	Cost per employee ratio	13.139	4	3.28
	Sustainability of staffing	Personnel stability coefficient	0.65	4	0.162
		Employee break-even ratio	3.746	5	0.749
Total value of the level of social sustainability, Syi					4.191

Source: compiled by the authors.

Table 8

The specific weight of the integral level of environmental sustainability

Sustainability		Absolute indicators of sustainability, coefficients	Indicator for 2021	Score value of level, Vi	Specific weight of integral sustainability level, Yi
Environmental sustainability	Sustainability of environmental activities	Cost coefficient for facilities and equipment	–	5	3.971

Source: compiled by the authors.

of foreign economic activity, the possibility of finding new potential foreign partners and the ability of the enterprise to reduce external debt and other obligations at the expense of profit. The total value in general for economic stability is not presented.

Social sustainability

Let us consider the indicators of social sustainability. The total value of the level of social sustainability is 4.191, its weight coefficient is 83.8%. This is an indicator of enterprise stability, which implies the presence of the production elite,

Table 9

The levels of the integral model of the stability of the Chelyabinsk Pipe Rolling Plant

Sustainability		Indicator
Economic	Financial	7.83
	Production	6.7
	Sales	5.89
World Order		5.24
Social		4.19
Environmental		3.97

Source: compiled by the authors.

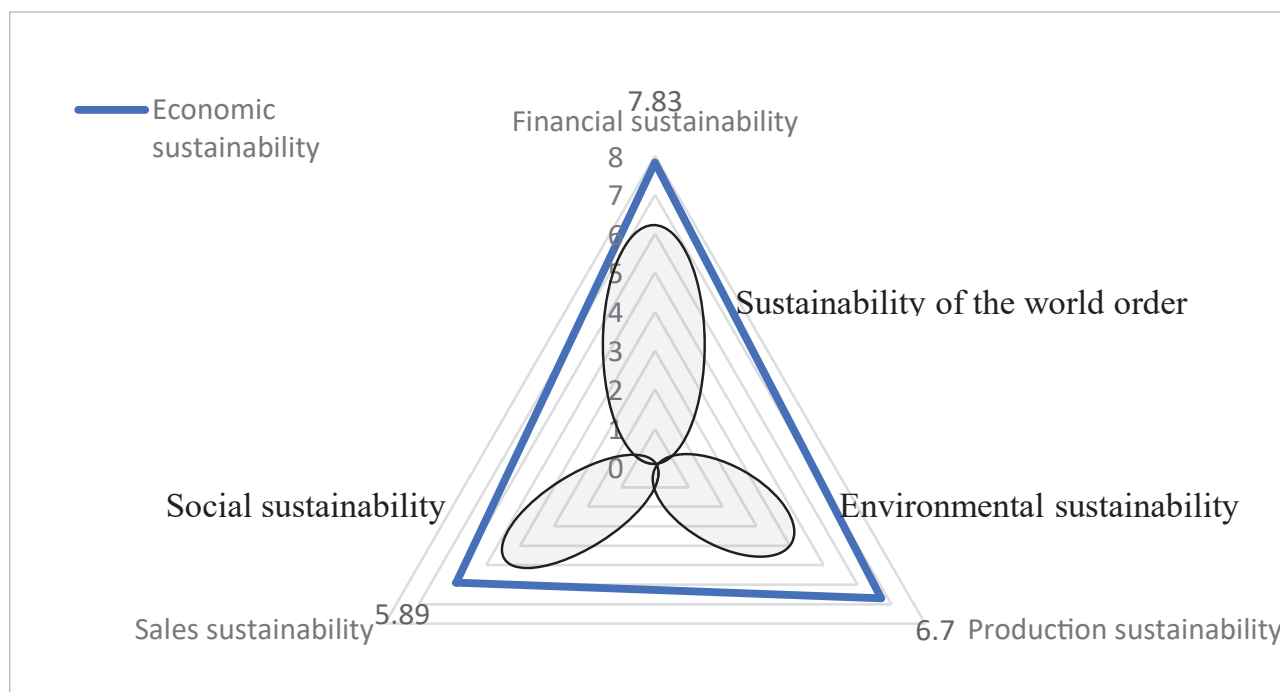


Fig. 9. Chelyabinsk Pipe Rolling Plant sustainability model for 2021

Source: compiled by the authors.



favourable working conditions, as well as wage growth, reduction of staff turnover, compliance with social programmes, training, and professional development of employees (Table 7).

Environmental sustainability

The total value of the environmental sustainability level is 3.971, and the weighting coefficient is 79.42%. This is a high indicator, i.e., the company invests in environmental programmes, actively introduces new equipment and technologies to protect the ecosystem of its region (Table 8).

Integral model of Chelyabinsk Pipe Rolling Plant sustainability

Based on the author's calculations, an integral model of Chelyabinsk Pipe Rolling Plant was compiled by levels of sustainability of the world order, as well as by economic, social, and environmental sustainability. (Table 9).

The obtained indicators by sustainability levels will be distributed in a petal (author's)

diagram, which will show how the Chelyabinsk Pipe Rolling Plant sustainability model will look like (Fig. 9).

This model is symmetrical, its form is close to the ideal one. The foundation of the enterprise development is economic sustainability, while social, environmental and world order sustainability are in direct dependence on it, as investment is necessary for successful operation of the enterprise, implementation of social and environmental programmes.

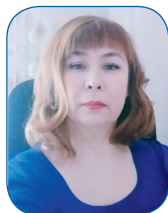
CONCLUSIONS

Thus, sustainable development of the pipe industry is a complex process, where both external and internal factors must be taken into account. All of them affect the financial and economic performance of the enterprise, social programmes to improve working conditions, recreation, and health, as well as environmental projects to conserve natural resources and protect the ecosystem (water, air and land) depend on them.

REFERENCES

1. Ursul A.D., Los' V.A., Demidov F.D. Conceptual foundations of sustainable development. Moscow: Russian Academy of Public Administration; 2003. 348 p. (In Russ.).
2. Klyuchnikova E.M. Sustainable development on the local level in the Northern regions of the Russian Federation – definition. *Sovremennye problemy nauki i obrazovaniya* = *Modern Problems of Science and Education*. 2013;(5):399. (In Russ.).
3. Moiseyev A.D., Narizhny I.F. Essence of sustainable development of economic systems. *Tsentral'nyi nauchnyi vestnik* = *Central Science Bulletin*. 2017;2(19):14–16. (In Russ.).
4. Svetun'kov S.G., Smol'kin V.P. Approach to the assessment of the industrial enterprise sustainable development. *Aktual'nye problemy ekonomiki i prava* = *Actual Problems of Economics and Law*. 2014;(2):89–94. (In Russ.).
5. Klevtsov S.M., Vertakova Yu.V., Klevtsova M.G. Sustainable development of industrial complexes based on the modernization of the mechanism of spatial distribution of economic resources. Moscow: RuScience; 2016. 244 p. (In Russ.).
6. Lavrentieva O.O. Strategic flexibility as a necessary condition of sustainable development of an industrial enterprise. *Problemy sovremennoi ekonomiki* = *Problems of Modern Economics*. 2015;(4):124–126. (In Russ.).
7. Romanovskaya E.A., Kozlova E.P. The content of the sustainable development mechanism of an industrial enterprise. *Vestnik Nizhegorodskogo universiteta im. N.I. Lobachevskogo. Seriya: Sotsial'nye nauki* = *Vestnik of Lobachevsky State University of Nizhni Novgorod. Series: Social Sciences*. 2018;(2):25–30. (In Russ.).
8. Hicks J.R. Value and capital: An inquiry into some fundamental principles of economic theory. Oxford: Oxford University Press; 1975. 352 p. (Russ. ed.: Hicks J.R. Stoimost' i kapital. Moscow: Progress; 1993. 488 p.).
9. Kutieva A.N. Actual problems of sustainable development of pipe industry enterprises. *Epomen. Global Scientific Journal*. 2023;(S 34):260–275. (In Russ.).

ABOUT THE AUTHORS



Aisulu N. Kutieva — a graduate student of the Novosibirsk State University of Economics and Management, Novosibirsk, Russia

<https://orcid.org/0009-0000-2331-2064>

Corresponding author:

Yuuss@mail.ru



Andrey V. Glotko — Dr. Sci. (Econ.), Professor of the Department of System Analysis and Project Management, Siberian State University of Railway Engineering, Novosibirsk, Russia

<https://orcid.org/0000-0001-9077-1578>

ganiish_76@mail.ru

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