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Assessment of the Contribution of the Arctic Zone to the Economic Development of the Country

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ABSTRACT

The scientific study examines the ways and methods of assessing the contribution of the Arctic zone to the level of economic development of the subjects of this zone and the country as a whole through the process of ensuring national security. The relevance of the study is due to the relationship between the indicators of territorial development of the subjects of the Russian Federation belonging to the Arctic zone and the indicator of the gross domestic product as a whole as the main indicator for assessing the level of economic development. **The aim** of the research is to improve the mechanisms for assessing the contribution of the Arctic zone to the level of economic development. The authors apply dialectical scientific cognitive **methods** based on a set of recognized private scientific and general scientific methods: formal logic, comparative law, statistics, and cross-sectoral legal analysis. The scientific novelty of the research lies in the identification of major risks that affect the processes of national security assurance in the Arctic zone, as well as their impact on national economic development and private business. The authors conclude about the potential of the Arctic zone for the formation of innovative projects with the growth of spatial risks, considering the peculiarities of the economy of the North. The results of this study may be used in practical activities by the state executive authorities of the Arctic zone in order to adjust existing regulatory documents, as well as to develop new directions of state policy in the field of ensuring national security in this region.

Keywords: Arctic zone; national security of Russia; Northern Sea Route; risks and threats of the Arctic zone; assessment of financial and innovative potential; the resource potential of the Arctic

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INTRODUCTION

Currently, the world community is showing increased attention to the Arctic zone. This is due, firstly, to the changed geopolitical factor of countries both bordering the Arctic (the United States, Denmark, Canada, Norway, claiming to secure the legal status of this territory for them), and located in other parts of the world (primarily China, for which the Arctic is both a potential source of resources and a convenient transport corridor to Europe). Secondly, economic factors, in particular the presence of minerals, since the total territory of the Arctic zone is 27 million square kilometers. For comparison, the total area of united Europe is only 10.5 million square kilometers.[1] According to expert estimates, about a third of the world's natural gas reserves and up to 13% of oil are concentrated in the Arctic zone, reserves of platinum, gold, nickel, coal and other minerals have been discovered. Consequently, these factors directly affect the territorial development of Russia, and there is an objective need to consider the specifics of the Arctic zone [1, p. 132–147]. The complexity of the development of the Arctic zone require the adoption of effective measures to stimulate investment activity on the basis of public-private partnerships, the provision of tax incentives for the exploration and production of hydrocarbons and minerals, which will ultimately contribute to the rational and efficient use of the raw materials, logistics and social potential of this territory [2, p. 62]. The efficiency and effectiveness of the development of the Arctic zone also depend on the integrated development of the Northern Sea Route as a driver of economic growth [3, p. 113–120]. Analysis and assessment of risks in the implementation of transport and logistics projects involves consideration of the processes of spatial development, considering the territorial features of the region. All these factors require an urgent solution in ensuring the national security of Russia.

SPATIAL RISKS OF THE ARCTIC ZONE

In accordance with the adopted regulatory documents in Russia, the following regions belong to the Arctic zone:

- Murmansk region.
- Nenets Autonomous Okrug.
- Chukotka Autonomous Okrug.
- Yamalo-Nenets Autonomous Okrug.

In accordance with the spatial development, part of the territories of the Republic of Karelia, the Republic of Komi, the Republic of Sakha (Yakutia), the Krasnoyarsk Territory and the Arkhangelsk Region are also assigned to the Arctic zone [4, p. 135]. The law of the sea also includes internal sea waters, territorial seas, and the Arctic continental shelf.

Based on the results of geological exploration in the Arctic, Russia has applied to the UN Commission to expand the boundaries of the continental shelf by joining the Lomonosov Ridge and other continental formations. According to international rules, each country has the right to expand this territory, with the exception of the coastal 200-mile zone. According to Arctic researchers, the Lomonosov and Alfa-Mendeleev ridges were connected with the margin of the Barents Sea 120 million years ago, then began to crawl away from it as a result of deep processes in the bowels of our planet.

The total land area of the Arctic zone is 5 million square kilometers with a total population of 2.5 million people. It should be noted that each subject of the Arctic zone has territorial and sectoral risk factors that directly or indirectly affect the level of economic development of the country. In this regard, the successful development of the Arctic zone of the country is possible only if both external and internal threats and risks are identified.

As the main external threats, one can single out the political statements of the states of Northern Europe that these countries belong to part of the Arctic territory [5, p. 210].

[1] Reference point. The development of the Arctic is a matter of Russia's national security. URL: http://orientir.milportal.ru/osvoenie-arktiki-strategicheskij-vopros-natsionalnoj-bezopasnosti/ (accessed on 31.05.2021).

These claims are based on their geopolitical and economic ambitions as global warming makes the Arctic more accessible to economic activity and transportation opportunities. A real prospect is opening up not only to significantly reduce many trade routes, but also to begin active mining. Another threat to Russia's national security is the lack of an international treaty that would fully regulate the economic activities of stakeholders in the Arctic. Currently, this activity is regulated by the national legislation of the states located in the northern territories, as well as international treaties.

One of the internal threats to the socio-economic development of the region is the outflow of the able-bodied population to the central regions of the country [4, p. 210]. By 2031, about half a million people are expected to leave Pomorie (now the population of the region is 1.3 million people) [5, p. 212]. The main reason for the outflow of the population from Primorye is the economic decline of the region, as well as the poor development of infrastructure facilities, including the inability to obtain quality medical care.

Today, one of the territorial risks that negatively affect the successful development of the Arctic zone is the uneven development of its subjects [6, p. 80]. The main reason for this is insufficient financing of infrastructure facilities both from the state and from private investors.

Industry risks include a high degree of deterioration of transport equipment, low return on investment due to the long process of implementing design solutions, and other risks.

In existing scientific studies, many authors recommend using not only the mechanisms of strategic management of the Arctic zone, but also qualitative and quantitative methods for assessing the economic contribution [7, p. 78].

Thus, the assessment of the contribution of the Arctic zone to the economic development of the country can only be carried out with an integrated approach based on taking into account all significant risk factors.

METHODS

The methodological basis of this study is the strategic regulatory documents that determine the state policy,[2] and regulate economic activity in a given territory.[3]

It should be noted that the organization of an effective system of financial control over the implementation of the main provisions of strategic documents in the field of innovative development of the Arctic zone of Russia, including on issues related to the organization of diagnostics and monitoring, the assessment of the economic contribution of each subject of the country, is an urgent task of public administration. The regions of the Russian Federation are territorial units of the upper level, but their characteristic feature is a high differentiation in terms of the level of economic development, which exacerbates the influence of both global and interregional risk factors [8, p. 72].

Applied economic research considers various methods for assessing the level of economic development of the constituent entities of the Russian Federation using a system of indicators consisting of various subsystems, each of which characterizes one of the sides of expanded reproduction, ranked by the level of innovative development, according to the standard of living of the population, etc. [9, p. 92]. In this regard, the existing methods for assessing the level of economic development of the constituent entities of the Russian Federation do not fully meet the modern requirements of state policy due to the lack of statistical studies in them, on the basis of which alternative management decisions can be designed to produce an end

[2] Decree of the President of the Russian Federation of October 26, 2020 No. 645 "On the Strategy for the Development of the Arctic Zone of the Russian Federation and Ensuring National Security for the Period until 2035". URL: https://www.garant.ru/products/ipo/prime/doc/74710556/ (accessed on 31.03.2021).

[3] Regulation of the Government of the Russian Federation of March 18, 2020 No. 297 "On Approval of the Rules for the Selection of Investment Projects Planned for Implementation in the Arctic Zone of the Russian Federation" (with amendments and additions). URL: https://base.garant.ru/73765723/ (accessed on 31.03.2021).

Table 1

Calculation of the correction factor for the subjects of the Russian Federation in the Arctic zone

Subjects of the Russian Federation belonging to the Arctic zone	Composition (number of ATUs related to the Arctic zone)	Percentage of ATUs related to the Arctic zone (correction factor)
Murmansk region	All ATU	1
Nenets Autonomous Okrug	All ATU	1
Chukotka Autonomous Okrug	All ATU	1
Yamalo-Nenets Autonomous Okrug	All ATU	1
Republic of Karelia	6 ATU out of 18	0.333333333
Komi Republic	4 ATU out of 20	0.2
The Republic of Sakha (Yakutia)	13 ATU out of 36	0.361111111
Krasnoyarsk Region	4 ATU out of 57 (exclud. 3 closed cities)	0.070175439
Arhangelsk Region	9 ATU out of 28	0.321428571

Source: compiled by the authors.

result that meets the criteria for efficiency and effectiveness.

This study uses a methodology for assessing the economic contribution based on economic and statistical methods (regression analysis), which allows us to assess the economic contribution of the Arctic zone to the overall economic development of the country. The result of statistical analysis is the selection of stimulating and destructive factors, on the basis of which certain measures are developed to accelerate the development of the country's economy [10, p. 23].

RESULTS

Regression analysis as a statistical research method allows us to trace the degree of influence of one or more independent variables *X* on the dependent variable *Y* and includes several stages.

At the first stage, through the correction factor, the values of indicators for the subjects of the Russian Federation included in the Arctic zone are determined, since not all subjects are entirely included in it [11, p. 67]. The correction factor will be determined by the percentage ratio of the number of administrative-territorial units (ATU) included in the Arctic zone to the total number of ATU of the subject.

The results of calculations of the correction factor are presented in *Table 1*.

At the second stage, a list of indicators is determined that most fully characterizes the economic development of each subject of the Russian Federation. But these indicators can have different units of measurement [12, p. 335]. In this regard, the implementation of this stage is associated with the solution of various problems noted below:

- uneven development of territories;
- low level of labor productivity [13, p. 115];
- outflow of the able-bodied population;
- low standard of living;

Table 2

Initial data for regression analysis

Year	GDP at current prices, billion rubles	GRP per capita, thousand rubles	Average monthly nominal accrued wages of employees for a full range of organizations in the economy, RUB	Cargo turnover of motor vehicles, million tons/km	Internal research and development costs, mln rubles	Number of unemployed aged 15–72 years, thousand people	Turnover of medium-sized organizations, million rubles
	Y	X_1	X_2	X_3	X_4	X_5	X_6
2011	60 114.0	8834.2	36 500.6	6264.0	6936.4	137.6	114 660.6
2012	68 103.4	9201.0	41 357.3	7194.2	8085.7	121.4	139 814.6
2013	72 985.7	10 006.5	45 892.5	7662.6	8200.4	124.9	128 341.7
2014	79 030.0	11 277.2	49 775.0	7448.9	10 144.5	122.3	126 936.1
2015	83 087.4	12 963.5	52 487.2	6339.9	10 776.9	132.5	136 680.4
2016	85 616.1	14 409.0	55 892.9	5115.4	10 710.7	132.6	208 567.5
2017	91 843.2	15 529.3	59 092.9	4979.8	10 288.7	121.1	141 936.5
2018	103 861.7	19 131.0	65 183.0	4020.7	12 709.3	111.7	151 094.1
2019	109 241.5	20 075.6	69 890.0	4167.6	14 218.9	99.9	128 568.4

Source: compiled by the authors according to the Federal State Statistics Service. Russian Statistical Yearbook 2020. Moscow: Rosstat; 2020. 700 p.

- underdeveloped infrastructure;
- lack of efficient transport communication, etc.

To conduct a study to assess the economic contribution, the following economic indicators for 2011–2019 were selected, which, according to the authors, most fully characterize the features of the development of territories:

- gross domestic product, billion rubles;
- gross regional product per capita, thousand rubles;
- average monthly nominal accrued wages of employees across the entire range of organizations, rubles;
- cargo turnover of motor vehicles, million tkm;
- internal costs for R&D, million rubles;
- number of unemployed aged 15–72, thousand people [14, p. 10];
- turnover of medium-sized organizations, million rubles.

In our model, the above indicators will be the independent variable X, and the dependent variable Y will be the country's GDP. For each indicator (except for GDP), the total value for the entire Arctic zone was calculated for each of the 9 years of observations. The calculation was made by summing the values of individual subjects using the correction factor from

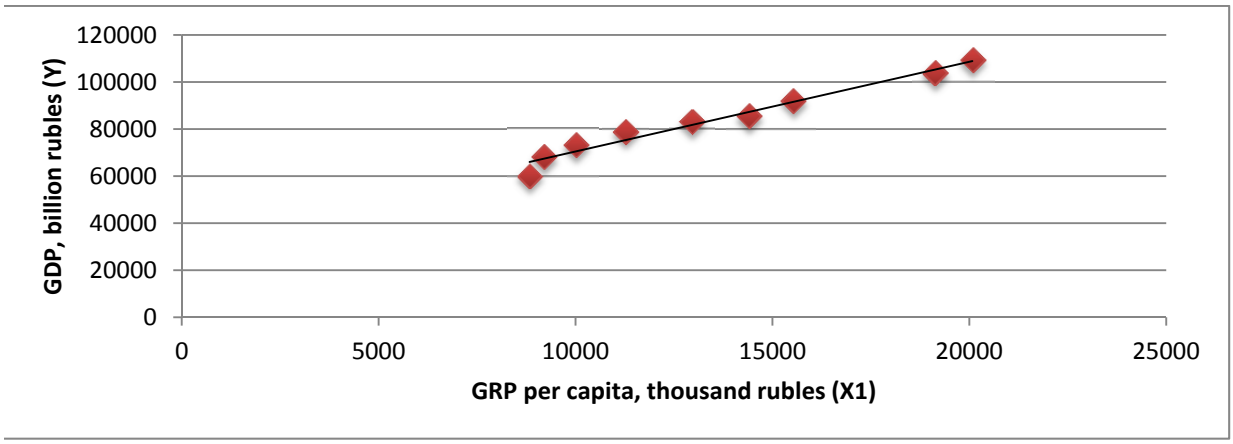

Fig. 1. **Correlation of Y and X_1 indicators (GDP and GRP per capita)**

Source: compiled by the authors.

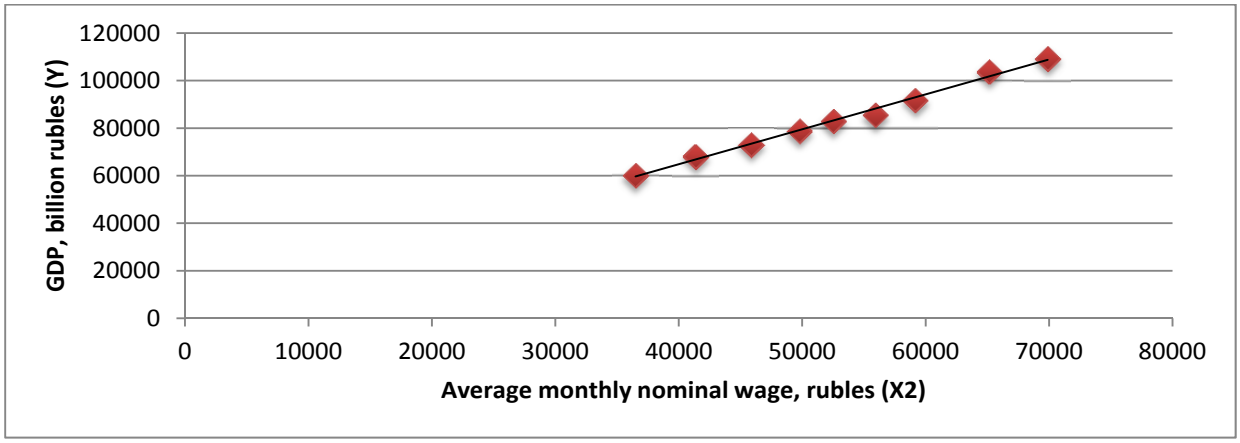

Fig. 2. **Correlation of *Y* and X_2 indicators (GDP and average monthly nominal wage)**

Source: compiled by the authors.

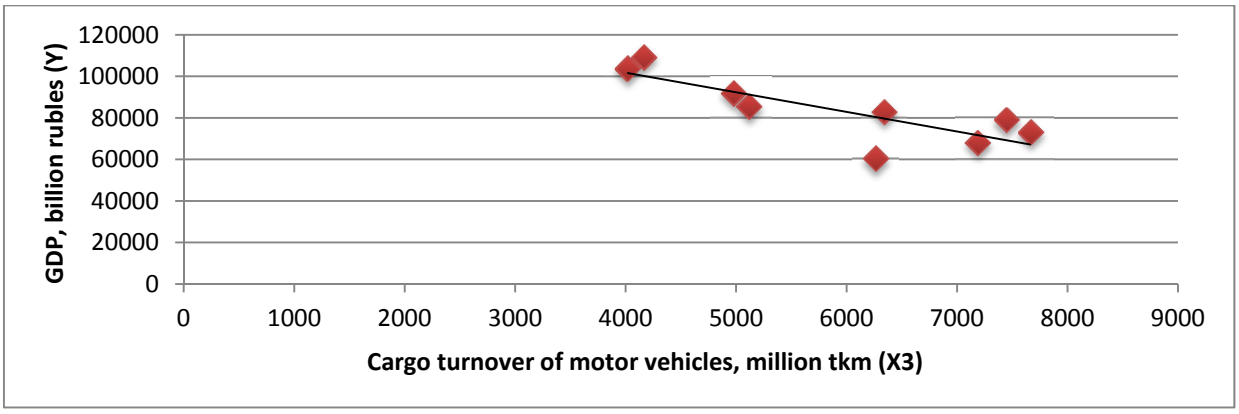

Fig. 3. **Correlation of *Y* and *X3* indicators (GDP and cargo turnover of motor vehicles)**

Source: compiled by the authors.

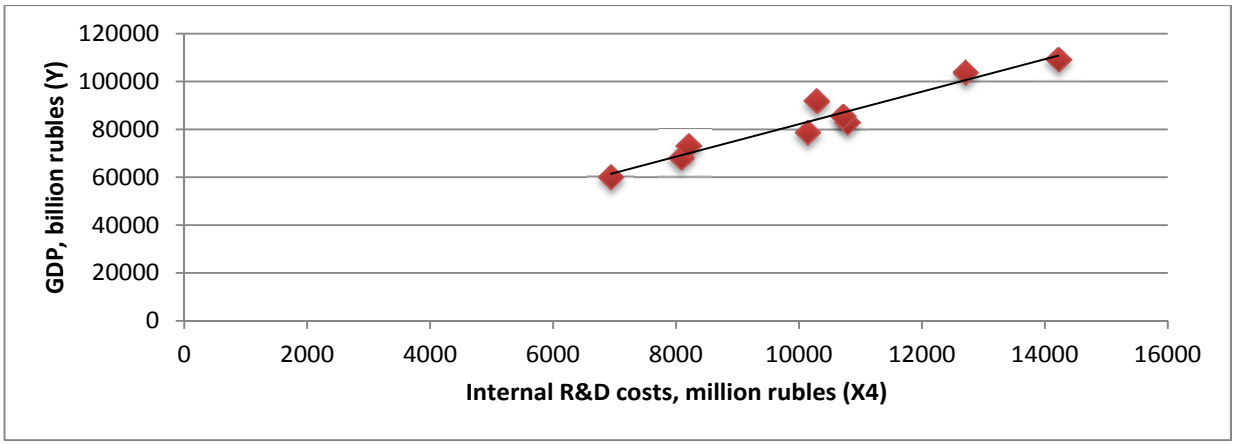

Fig. 4. **Correlation of *Y* and *X4* indicators (GDP and internal research costs)**

Source: compiled by the authors.

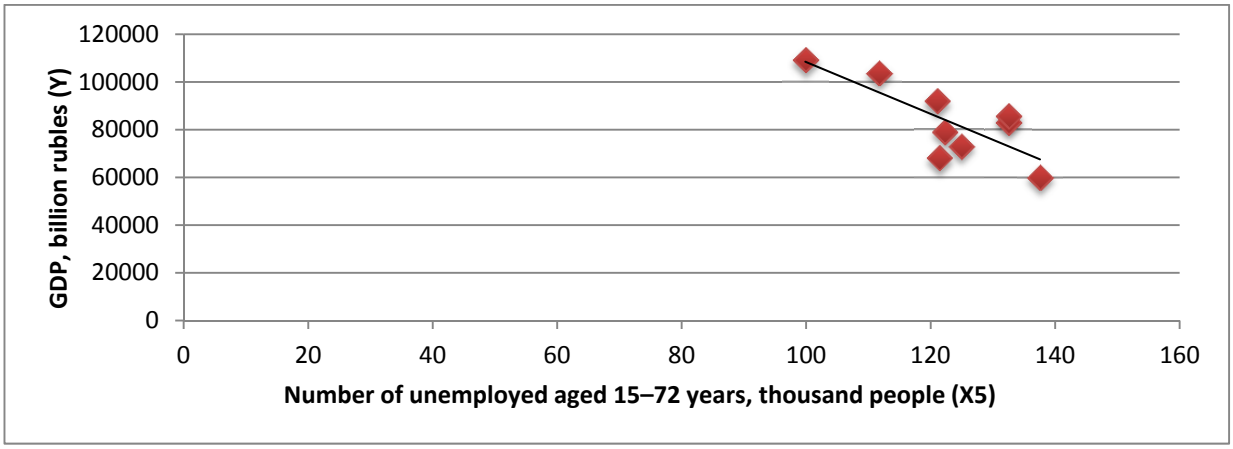

Fig. 5. **Correlation of *Y* and X_5 indicators (GDP and number unemployed aged 15–72 years)**

Source: compiled by the authors.

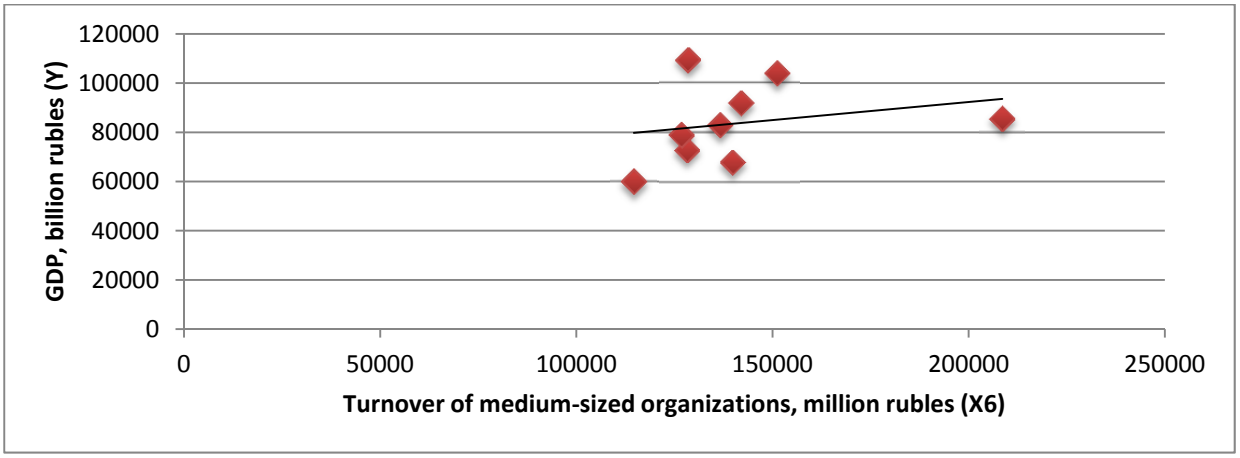

Fig. 6. **Correlation of *Y* and X_6 indicators (GDP and turnover of medium-sized organizations)**

Source: compiled by the authors.

Table 3

Correlation coefficients for X_i factors

GRP per capita, thousand rubles	Average monthly nominal accrued wages of employees for a full range of organizations in general / in the economy, RUB	Cargo turnover of motor vehicles, million tons/km	Internal research and development costs, mln rubles	Number of unemployed aged 15–72 years, thousand people	Turnover of medium-sized organizations, million rubles
X_1	X_2	X_3	X_4	X_5	X_6
0.984884129	0.996573704	–0.817637179	0.969858264	–0.780136884	0.248410145

Source: compiled by the authors.

Table 1 for those entities that are part of the Arctic zone. The results obtained, necessary for assessing the economic contribution, are presented in *Table 2*.

At *the third stage*, the actual regression analysis of the considered factors is carried out. To do this, we use the most common and reliable linear method:

$$Y_t = f(X_i) + e_t,$$

where Y — the volume of GDP; X_i — i-th factor of influence on GDP; e_t — the forecast error. Each factor X_i must be tested to see if it can be used as an independent variable.

Using the paired correlation coefficient, we will establish a close relationship between each of the selected factors separately and the volume of GDP. To do this, we will build graphs (*Fig. 1–6*).

Table 3 shows the correlation coefficients for each factor.

The graphs and correlation coefficients show that a linear relationship between GDP and the factors under consideration exists to varying degrees in all cases, except for factor X_6 — the turnover of medium-sized organizations.

For the purity of the test, we will build one-factor models and check the impact of each indicator on the volume of GDP individually. When checking the significance of the influence of the selected indicators on GDP, it was found that R squared of the X_6 — the turnover of medium-sized organizations turned out to be less than 0.5. This indicates that the model is of poor quality. The influence of this variable X also turned out to be very insignificant, less than 0.15. Given all the results, this factor will not be considered in further study. The calculation results are presented in *Table 4*.

Table 4

Analysis of GDP by the indicator "turnover of medium-sized organizations"

Regression statistics indicators	Meaning
Multiple R	0.248
R squared	0.062
Normalized R squared	–0.072
Standard error	16 638.559
Observations	9
Y-intersection	62 896.378
Variable X_1	0.147

Source: compiled by the authors.

Now, having established that five of the six selected indicators individually give satisfactory results (R-squared indicators are greater than 0.5, and the values of the X variables are greater than 1), we can perform an overall regression analysis of the linear

Table 5

Results of regression analysis of a five-factor linear model

Regression statistics								
Multiple R	0.999							
R-squared	0.999							
Normalized R-squared	0.997							
Standard error	840.770							
Observations	9							
Analysis of variance								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	5	2063217942.801	412643588.560	583.741	0.000112			
Remainder	3	2120683.272	706894.424					
Total	8	2065338626.073						
	Coefficients	*Standard error*	*t-statistic*	*p-value*	*Bottom 95%*	*Top 95%*	*Bottom 95%*	*Top 95%*
Y-intersection	3087.840	15698.249	0.197	0.857	–46870.995	53046.674	–46870.995	53046.674
Variable *X* 1	2.846	1.251	2.275	0.107	–1.136	6.827	–1.136	6.827
Variable *X* 2	0.643	0.267	2.410	0.095	–0.206	1.493	–0.206	1.493
Variable *X* 3	2.345	1.335	1.757	0.177	–1.903	6.594	–1.903	6.594
Variable *X* 4	–0.099	0.610	–0.161	0.882	–2.041	1.844	–2.041	1.844
Variable *X* 5	–37.521	54.252	–0.692	0.539	–210.176	135.133	–210.176	135.133

Source: compiled by the authors.

five-factorial model. Applying the data analysis package MS Excel, we obtain the following results, reflected in *Table 5*.

The linear model of dependence of GDP on development indicators has the following form:

$$Y = 3087.84 + 2.845X_1 + 0.643X_2 + \\ + 2.345X_3 - 0.098X_4 - 37.521X_5.$$

This model shows that the X_5 — the number of unemployed aged 15 to 72 (thousand people) — turned out to be negative. This indicates the reverse effect of this indicator on the volume of GDP, which is quite logical. The lower the unemployment rate, the greater the return to the economy. Indicator X_4 — internal costs for R&D (million rubles) — is not only negative but also tends to be zero. It turns out that this barely affects the gross domestic product. A rather strange result, given that it is scientific development and innovation that drive the economy forward. However, the specifics of the Arctic zone as an economic territory should be considered. Conducting scientific developments in the extremely harsh conditions of the North, and even with a much less developed infrastructure than in the European part of Russia, is much more expensive and often unproductive. It is more logical and cheaper to develop innovations in other regions of the country, and in the Arctic zone to engage in the direct implementation of their results [15, p. 221].

Based on the obtained model, it is possible to formulate the main priorities for the development of the Arctic zone:

The subjects of the Arctic zone have common problems that need to be addressed: these are low population density, underdeveloped infrastructure for living, insufficient development of the transport system, and the presence of environmental risks.

The presence of large volumes of hydrocarbon reserves requires adjustments to the program for the integrated development of both the Arctic zone and the rest of the mainland of Russia. One of the directions of this development was reflected in the annual message of the President of Russia to the Federal Assembly, which outlined a new goal — the construction of the Northern Latitudinal Railway, which will connect the Yamal

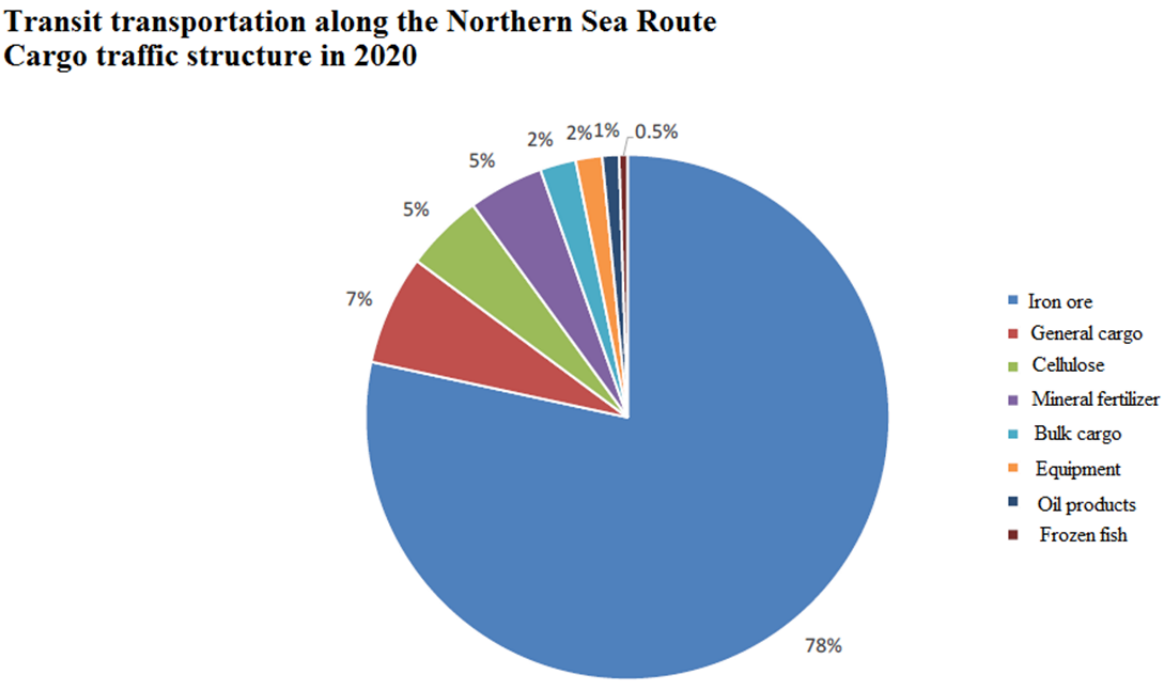

Fig. 7. **Transit traffic along the Northern Sea Route, the structure of cargo traffic in 2020**
Source: URL: https://arctic.gov.ru/wp-content/uploads/2021/02/2020.pdf (accessed on 28.10.2021).

Peninsula with the Urals by rail, which will give impetus to the economic development of this region.[4]

NORTHERN SEA ROUTE

Currently, the main driver for the development of the Arctic zone is the Northern Sea Route (NSR) [16, p. 17]. This is due to the extraction and transportation of minerals and hydrocarbons along the NSR. At the same time, it is important to understand that for Russia the NSR in the coming decades can become a source of income, in the future, able to cover the income from the export of hydrocarbons. This is due to the ever-increasing role of the NSR as an international transport artery. Several factors contribute to this.

- Melting Arctic ice and increased navigation season. If until recently ships sailed along the NSR from July to November, then the last navigation of 2020–2021 started in May and ended at the end of January. If the climate continues to change in the same direction, then year-round navigation may be opened along the NSR in the coming years.
- Nuclear icebreaker fleet. At the moment, Russia is the only country in the world that has a whole fleet of nuclear-powered icebreakers, which, moreover, will be actively replenished with new vessels that have no analogs in the next three years. Our country already now has the opportunity to provide year-round navigation along the NSR, and as the climate warms, this will be even easier.
- No bottlenecks. Up to 20% of all cargo flows from Asia to Europe now pass through the Indian Ocean and the Red Sea, ending in the Suez Canal. As recent events have shown,[5] it turned out that one dry cargo ship was enough to literally block one of the largest cargo transportation routes in the world and endanger entire sectors of the economy. There are no such bottlenecks on the NSR. The problems of one ship will not be able to stop all the cargo flows passing through it.

[4] Project for the Arctic and regional development. URL: https://yamal-region.tv/news/58122/ (accessed on 31.03.2021).

[5] URL: https://ria.ru/20210329/ever-given-1603255675.html (accessed on 31.03.2021).

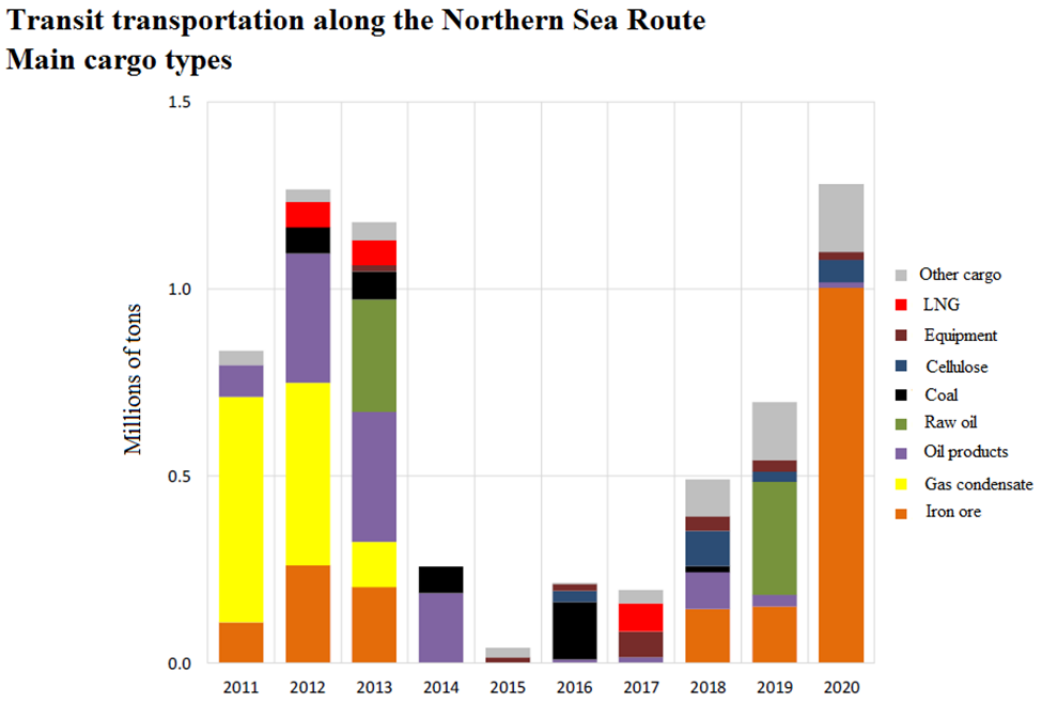

Fig. 8. **Transit transportation along the Northern Sea Route, the main cargo groups**

Source: URL: https://arctic.gov.ru/wp-content/uploads/2021/02/2020.pdf (accessed on 28.10.2021).

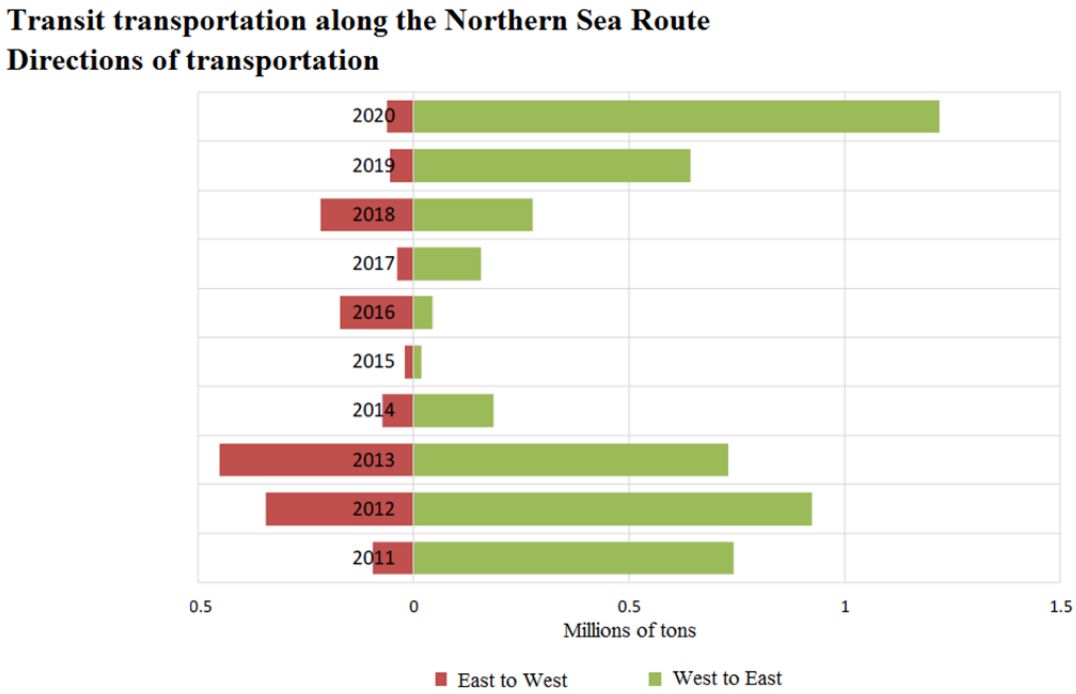

Fig. 9. **Transit transportation along the Northern Sea Route, directions of transportation**

Source: URL: https://arctic.gov.ru/wp-content/uploads/2021/02/2020.pdf (accessed on 28.10.2021).

• More relaxed environment. The traditional route from Asia to Europe, in addition to bottlenecks, passes through the territorial waters of many countries, in some of which the political situation is far from calm. In addition, Somali pirates are still active in the Red Sea area. The NSR is completely under the control of Russia, which is deprived of all these issues. Ships can safely go on their course without fear of becoming a victim of a terrorist attack, a pirate attack, or simply falling under a stray missile of another military conflict.

• Time-saving. Even considering the lower speed of vessels associated with the difficulties of navigation, the NSR is almost two times shorter than its southern competitor — 14 thousand kilometers versus more than 23 thousand kilometers.

The cargo turnover along the NSR is growing from year to year, and this was not prevented even by the outbreak of the coronavirus pandemic at the very beginning of 2020. Thus, the Directorate of the Northern Sea Route of the State Corporation Rosatom reports that in 2020, 32.97 million tons of cargo[6] passed through the NSR, which is 1.5 million tons more than a year earlier. Moreover, the Government of the Russian Federation in the federal project "Northern Sea Route" set a target of 29 million tons. In total, the task is to reach 80 million tons by 2024.

At the same time, the structure of goods transported along the NSR leaves much to be desired. As of 2020, iron ore accounts for more than three-quarters of all transit traffic. That is, the NSR is used to transport raw materials, not finished products (*Fig. 7*).

At the same time, if you look at the map of transit cargo transportation in recent years, it will be clear that the main growth is due to iron ore (*Fig. 8*).

It is no less interesting to analyze the direction of cargo flows (*Fig. 9*).

It turns out that the main cargo flow does not go from Asia to Europe, but vice versa. It is also interesting to note that over the past five years there has been a fairly large increase. Freight traffic from Europe to Asia is growing, despite the active sanctions policy of the Europeans against Russia.

Given the above, the Northern Sea Route has great prospects of becoming one of the most important trade routes in the future [17, p. 125]. Now it is important to develop the infrastructure for its service, laying the prospects for cargo flows many times, or even tens of times more than now. The development of the NSR is impossible without the development of the land territories of Russia adjacent to it, i.e. our Arctic zone [18, p. 57]. The NSR should not be cut off from other roads in the country. Therefore, it would be expedient to connect the ports of the Arctic zone of the country with railway lines, which is already being implemented. As a result, only the NSR, with a skillful approach, can have a huge multiplier effect on the economy of the whole country, and not just the Arctic zone [19, p. 158].

CONCLUSIONS

The potential opportunities possessed by the Arctic zone of Russia are only increasing every year, and a clear growth trend is demonstrated by the assets possessed by this economic zone. As the study showed, the modern Arctic policy of Russia is focused, first of all, on the formation of conditions and foundations for launching innovative projects as the basis for solving all other problems. An important feature of the economy of the modern Arctic is spatial risks that negatively affect the socio-economic development of the region. Scientific and technical capabilities make it possible to implement the most complex logistics, transport and energy plans [20, p. 667]. The authors show that economic activity in the economy of the Arctic has its own specifics. It is as a result of spatial risks in the economy of the Arctic that there is a weakening of economic ties with the more southern regions of the country, an outflow of the able-bodied population, and

[6] URL: https://www.korabel.ru/news/comments/obem_gruzoperevozok_po_sevmorputi_v_2020_godu_sostavil_okolo_ 33_mln_tonn.html (accessed on 28.10.2021).

a decrease in the export of certain types of products (for example, wood), a decrease in the import of necessary goods [21, p. 6330]. Economic activity is concentrated around large mineral projects implemented by large companies, usually with state participation, which leads to the emergence of single-industry towns. All this leads to a departure from the integrated development of the Arctic in the long term and is one of the deterrents in achieving multiplier effects. Indeed, industry restrictions cannot be ignored, primarily in the field of hydrocarbon production and transportation. All these risks create a steady demand for personnel and technologies. The search for reasonable solutions to the emerging problems of the socio-economic development of the Arctic is impossible without scientific support and innovative support.

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